A19 Downhill Lane Junction Improvement

Scheme Number: TR010024

6.1 Environmental Statement – Volume 1: Main Text

APFP Regulation No. 5(2)(a)
Planning Act 2008 Infrastructure Planning
(Applications: Prescribed Forms and Procedure) Regulations 2009

Volume 6
January 2019

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Infrastructure Planning

Planning Act 2008

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

A19 DOWNHILL LANE JUNCTION IMPROVEMENT

The A19 (Downhill Lane Junction Improvement) Development Consent Order 201[ ]

ENVIRONMENTAL STATEMENT

VOLUME 1, MAIN TEXT

Regulation Number:	APFP Regulation 5(2)(a)
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CHAPTER 1 INTRODUCTION

1.1 A19 Downhill Lane Junction Improvement Scheme

1.1.1 Highways England intends to alter the A19 Downhill Lane junction in South Tyneside and Sunderland, near Town End Farm (see Figure 1.1 in Volume 3 of the ES); hereafter referred to as the 'Scheme'.

1.1.2 Overall the Scheme involves alteration to the existing grade separated junction, to create a two bridge, grade separated, signalised roundabout junction, with a fully circulatory carriageway. This would involve the construction of a new bridge over the A19 south of the existing bridge, realignment of Washington Road and part realignment of Downhill Lane (West) at the junction with the A1290. The Scheme also includes the construction of a new Non-Motorised User (NMU) route, including a new NMU bridge over the A19 south of the Downhill Lane junction. A full Scheme description is provided in Chapter 2 of this ES.

1.2 Scheme context

1.2.1 The A19 is a strategic route running from Doncaster to north of Newcastle via York. More locally, it links the Tyne and Wear conurbation with Teesside. From the south, it connects the A1 at Dishforth and areas in between (including Middlesbrough and Sunderland) to South Tyneside. Approximately 1.2 km north of Downhill Lane, the A19 / A184 Testo's junction forms part of a Tyneside eastern orbital route, which crosses the River Tyne via the Tyne Tunnel and meets the A1 again at Seaton Burn Interchange.

1.2.2 The A19 dual carriageway runs approximately north-south under Downhill Lane which crosses above the A19 via an overbridge. The A1290 also joins this junction from the south-west.

1.2.3 An International Advanced Manufacturing Park (IAMP) is proposed north of the Nissan Plant (approximately 1 km south of Downhill Lane junction) by the IAMP Limited Liability Partnership, established by South Tyneside Council and Sunderland City Council to progress and deliver the IAMP; the area of land affected straddles the boundary between the two authorities. The aim is to attract advanced manufacturing businesses, with a particular focus on the automotive supply chain (given the proximity to the Nissan Plant). The main elements of IAMP would be on a 150-hectare site either side of the A1290 to the west of the A19 and Downhill Lane junction; see Illustration 1.1, below. IAMP is being delivered in two phases; IAMP One received Town and Country Planning Act consent in May 2018, whilst IAMP Two is currently preparing to submit an application for Development Consent under the Planning Act 2008. IAMP One comprises erection of nine light general industrial and storage & distribution units with ancillary office and research & development floorspace within the southern area of the IAMP area to the north of the Nissan plant. The plans include a new link road from the A1290, associated car parking, service yards, access, landscaping and drainage ponds (see Illustration 1.2, below). IAMP Two encompasses the larger IAMP area to support the remaining two-thirds of the total IAMP masterplan proposals.

1.2.4 The IAMP development will significantly increase the amount of traffic using Downhill Lane junction. However, the current capacity of the junction would not be sufficient for the anticipated additional traffic, so would affect the flow of traffic on the A19 and local roads.

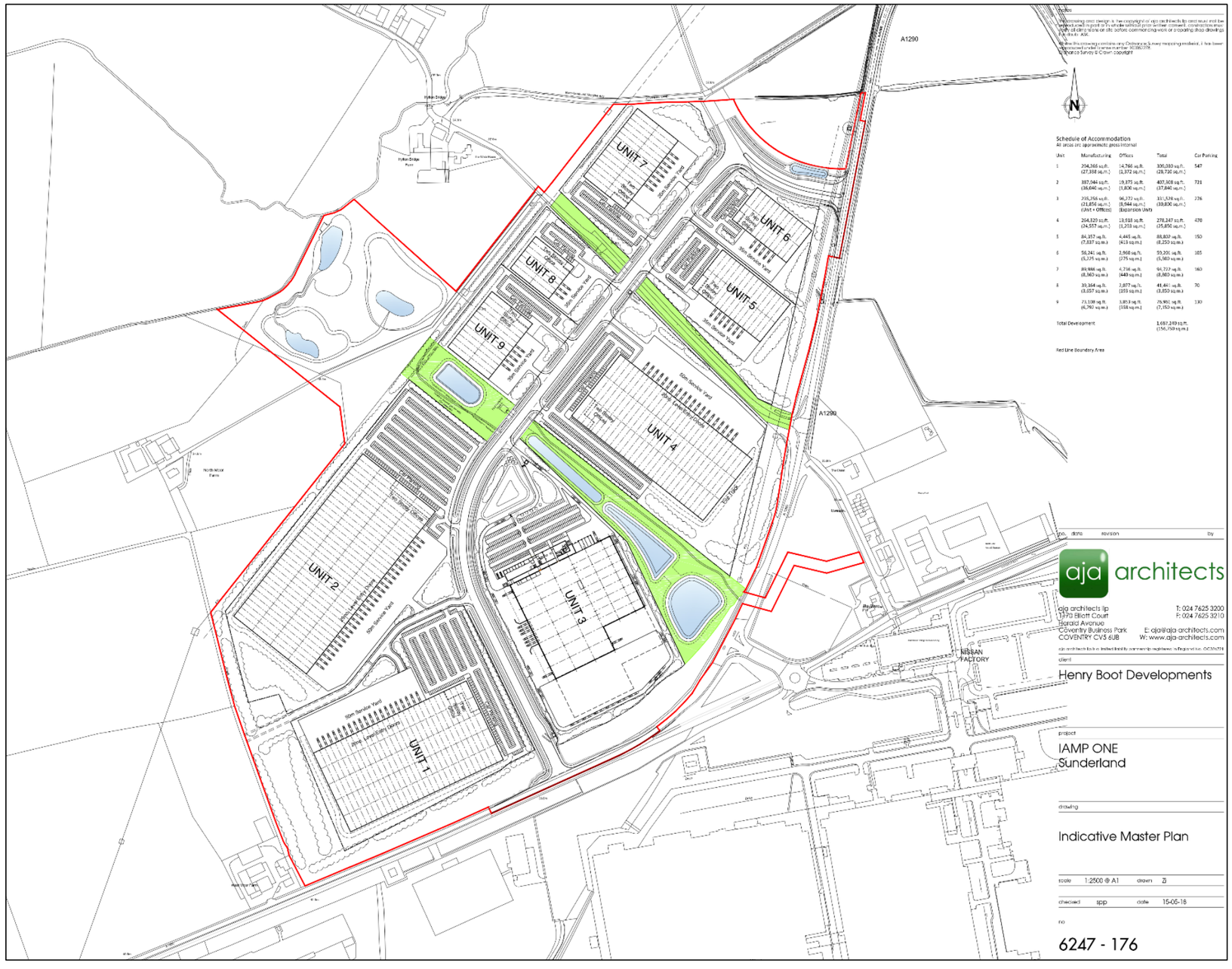
1.2.5 The Road Investment Strategy Part 1 for the 2015 to 2020 Road Period, published by the Department for Transport, announced Downhill Lane as a junction to be improved to support local plans for an IAMP to the north of the existing Nissan Plant.

1.2.6 The Scheme aims to increase capacity by providing a two bridge, grade separated, signalised roundabout junction.

Illustration 1.1 IAMP Masterplan[1]

[1] Obtained from the Planning Inspectorate website at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/BC030001/BC030001-000107-BCO30001%20-%20Scoping%20Report.pdf

Illustration 1.2 IAMP One Masterplan[2]



[2] Planning Application Reference 18/00092/he4 available on-line at: https://www.sunderland.gov.uk/online-applications/search.do?action=simple

1.3 Legislative and policy framework

1.3.1 The Scheme has a total DCO boundary footprint of 36.81 hectares (17.42 hectares' permanent development area) and is a highway 'alteration' project. Therefore, the Scheme is a Nationally Significant Infrastructure Project (NSIP) under sections 14(1)(h) and 22(1)(b) of the Planning Act 2008 (the 2008 Act). Development consent to construct a NSIP may only be granted by a Development Consent Order (DCO) following an application under Section 37 of the 2008 Act.

1.3.2 In accordance with Section 104(3) of the 2008 Act, the Secretary of State would assess an application for development consent for a nationally significant infrastructure project on the strategic road network against the Government's vision and policy outlined in the National Networks National Policy Statement (NNNPS) (January 2015), A full review of the Scheme against the NNNPS is set out in Appendix A of the Planning Statement (DCO application document reference TR010024_APP_7.1).

1.3.3 Section 37 of the 2008 Act also governs the content of an application for a DCO, including the requirements for the necessary accompanying documents. These requirements are given effect by the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (the APFP Regulations), which also require an application for a DCO to be accompanied by an Environmental Statement (ES) if the Scheme has been identified as an 'Environmental Impact Assessment (EIA) project'.

1.3.4 The size and potential for significant environmental impacts of the Scheme mean it has been identified as an Annex II EIA project in accordance with the Infrastructure Planning (Environment Impact Assessment) Regulations 2009, as amended, referred to in this document as 'the EIA Regulations'. The EIA Regulations implement European Union Council Directive 85/337/EEC, as amended by Council Directive 97/11/EC, 'on the assessment of the effects of certain public and private projects on the environment' into UK law.

1.3.5 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (2017 Regulations) came into force in England and Wales on 16 May 2017. Regulation 37 of the 2017 Regulations provides transitional arrangements for the continued applicability of the Infrastructure Planning (Environmental Impact Assessment) 2009 Regulations (as amended) (2009 Regulations). These transitional provisions apply to any application for an order granting development consent or subsequent consent where an Applicant has requested that either the Secretary of State or the relevant authority adopts a Scoping Opinion (as defined in the 2009 Regulations) before the commencement of the 2017 Regulations in respect of the development to which the application relates.

1.3.6 In May 2017, the Secretary of State received a request for a Scoping Opinion from Highways England under Regulation 8 of the 2009 Regulations. The request related to the Scheme and was accompanied by a Scoping Report. The request for a Scoping Opinion was made before the 16 May 2017, when the 2017 EIA Regulations came into force, so the 2009 Regulations continued to apply and the EIA has been undertaken in accordance with the 2009 Regulations.

1.3.7 This ES is the final report on the EIA that has been carried out for the Scheme. The EIA has been carried out over a period of time, between September 2017 and November 2018, and has influenced the development of the Scheme design.

1.4 General principles of EIA and the purpose of the environmental statement

1.4.1 An EIA is the process of information gathering, consultation and impact assessment leading to preparation of an ES. Throughout this ES both the terms EIA and ES are used. Where the terms EIA is used, it is within the context of the EIA process undertaken by a number of environmental specialists. The term ES relates to this document, which presents the outcomes of the EIA process.

1.4.2 General principles for EIA on highway schemes are set out in the 'Design Manual for Roads and Bridges' (DMRB)[3], together with specific guidance on individual environmental topics. Further information about the application of the DMRB to this EIA scheme is given in Chapter 5 (Approach to Assessment).

1.4.3 Some of the individual topics are subject to their own specialist regulations and / or guidance. These will be applied together with guidance in the DMRB. The details of any such guidance are provided as part of the methodology for each specialist topic.

1.4.4 The Scheme is being procured under an 'Early Contractor Involvement' (ECI) Contract. This contract makes the Contractor and its Design Consultant responsible for the EIA, so all parties, including the Contractor, are fully committed to any mitigation measures proposed in this document.

1.4.5 This ES describes the potential effects of the Scheme on the environment and the measures proposed to mitigate those effects. It is designed to accompany an application to the Planning Inspectorate for a DCO authorising Highways England to build the Scheme. The role of the Planning Inspectorate is to examine the application and make a recommendation to the Secretary of State for Transport as to whether the DCO should be granted. The principal purpose of this ES is to provide the Planning Inspectorate with the relevant environmental information. This information, along with other application documents, will allow the Planning Inspectorate to make an informed recommendation to the Secretary of State on whether or not to grant a DCO, and to influence the terms of the DCO in relation to environmental matters.

1.4.6 The ES also makes the same information available to other interested parties who have a role in, or wish to participate in, the statutory decision-making process.

1.5 Scope and content of the environmental statement

Scope of the Environmental Statement

1.5.1 The scope of this ES was determined initially by a collaborative process within the project team, leading to production of an EIA Scoping Report. This defined the overall approach to be taken, the topics to be covered and the methods to be applied for each topic. The scoping process was guided by the DMRB. A request for a Scoping Opinion was issued to the Planning Inspectorate in May 2017, and the scope of the EIA was amended to take the Scoping Opinion into account. More information on the Scoping Opinion and our responses is given in Chapter 4 (Consultation) and in Appendix 1.1 of this ES.

1.5.2 Testo's junction is to the north of the Scheme (see Figure 1.1), where the A19 and A184 join, and has recently been granted a Development Consent Order to improve traffic flow; further information on Testo's is provided in Section 2.5 of this ES. While determining the scope of the EIA and the resulting ES for the Scheme, consideration was also given to the A19/A184 Testo's Junction Improvement Scheme (hereafter referred to as the Testo's scheme). The two schemes

[3] Design Manual for Roads and Bridges, Volume 10 (Environmental Mitigation) and Volume 11 (Environmental Assessment) (Highways Agency, 1993, as amended)

are physically linked and until 2016 were considered as a combined scheme. For consistency and compatibility, given the physical linkages between the two schemes, previous EIA work as a combined assessment and stakeholder interest in the Scheme's cumulative effects, the scope of the EIA and the production of the ES has been aligned with that of the Testo's scheme's ES.

1.5.3 It is important to note that the 19.39 ha of temporary land take within the Scheme DCO boundary includes 6.13 ha for the provision of the opportunity to share use of the Testo's main site compound for some of the facilities associated with the A19 Downhill Lane Junction Improvement Scheme. With both schemes expected to be under construction within the same timeframe, it would be possible for the Scheme to share the use of the Testo's scheme's main site compound for general storage, traffic management and office-based administrative purposes.

1.5.4 For the purposes of the main assessment and to present the worst-case effects within the specialist Chapters 6 to 14, it was assumed that the Scheme would be a standalone development using the full temporary land-take for the Scheme, excluding any benefits from the shared use of the Testo's main site compound.

1.5.5 In late 2018, 0.45 ha of the temporary land take within the DCO boundary was included to enable the Scheme to establish a NMU route north-east of Downhill Lane junction to replace a NMU route that has been consented in the Testo's scheme DCO, but does not yet exist. The NMU route proposed in the Testo's scheme does not complement the segregated NMU facilities proposed under the Scheme; whereas the existing B46 bridleway would form a more desirable route. Accordingly, the Scheme proposes:

- the removal of the proposed non-motorised user route consented in the Testo's DCO; and
- the establishment of the NMU route proposed under this Scheme that would be improved by maintaining part of the B46, which is proposed to be stopped up under the Testo's DCO.

1.5.6 This is explained in more detail in the revised plans, drawings and sections for the A19/A184 Testo's Junction Alteration Scheme (application document reference TR010024/APP/7.5) and the Explanatory Memorandum (application document reference TR010024/APP/3.2).

1.5.7 As the 0.45 ha extension of the DCO boundary, along the east side of the improved A19 southbound link from Testo's, encompasses an area where there are no proposed physical works, this ES did not include the additional 0.45 ha within the assessments presented in Chapters 6 to 15 of the ES. This avoided unnecessary revising of study areas and reporting of additional receptors that were would never be at risk of any impacts. Instead, Appendix 1.2, in Volume 3 of the ES, provides a qualitative assessment of the environmental impacts and benefits of the proposed NMU changes, whilst the main assessment in this ES assumes the embedded design retains the existing Bridleway B46 as unchanged at the southern end near Downhill Lane junction.

Structure and content of the Environmental Statement

1.5.8 The structure of this ES is governed by the requirements of the EIA Regulations, supplemented by Volume 11 of the DMRB. The ES comprises the following elements:

- Volume 1 of the ES, containing the main text;
- Volume 2 of the ES, containing the drawings and other illustrative material; and
- Volume 3 of the ES, containing the appendices.

1.5.9 Volume 1 of this ES is written, so far as possible, in a non-technical style. This is to make the text accessible and clear to a wide, non-specialist audience. Nevertheless, it is still a technical document with technical content. An explanation of the technical terminology is given in the text, footnotes and / or in a glossary at the end of the text. Volume 3 (the appendices) provides some technical material of specialist interest, and also other information considered too bulky for Volume 1 of the ES. Finally, a non-technical summary of the ES is provided as a standalone document.

1.5.10 Volume 1 of the ES divides naturally into three parts:

- Chapters 1 to 5 provide information applicable to the whole of the EIA, including an introduction to and detailed description of the Scheme and the EIA itself, a summary of alternatives considered, an account of how the public have been consulted during the development of the Scheme, and a description of the approach taken to the EIA;
- Chapters 6 to 14 describe and assess the potential effects of the Scheme in relation to a series of specialist topics covering particular aspects of the environment, including consideration of the inter-relationships between topics in Chapters 6 - 14; and
- Chapter 15 considers the cumulative effects between this Scheme and other developments in the surrounding area.

1.5.11 The specialist topics covered in Chapters 6 to 14 of Volume 1 are:

- Chapter 6 - Air quality;
- Chapter 7 - Cultural heritage;
- Chapter 8 - Landscape and visual effects;
- Chapter 9 - Ecology and nature conservation;
- Chapter 10 - Geology and soils;
- Chapter 11 - Materials;
- Chapter 12 - Noise and vibration;
- Chapter 13 - People and communities; and
- Chapter 14 - Road drainage and the water environment.

1.5.12 Each of these specialist ES chapters describe the following (further information on the nature and scope of each topic is given in Chapter 5, and in Chapters 6 - 14):

- an executive summary;
- an introduction to the topic, including the legislative, policy and regulatory background to the topic;
- existing environmental conditions;
- the potential adverse or beneficial changes in environmental conditions that could arise from the Scheme;
- proposed measures to avoid, reduce or mitigate any adverse impacts;
- an assessment of the significance of any effects that would still occur after measures to avoid, reduce or mitigate adverse effects are taken into account; and
- consideration of the effects on receptors arising from multiple inter-relationships within the Scheme between topics in Chapters 6 - 14.

Other key documents

1.5.13 There are a number of documents that work in conjunction with information contained within the ES. The key documents and linkages between them are shown on Illustration 1.3, below.

1.5.14 A summary of all the mitigation measures included in each of the specialist ES chapters are collated and summarised in the Register of Environmental Actions and Commitments (REAC; Appendix 1.3). These measures are cross referenced with the relevant 'Requirements' that secure those commitments in the Development Consent Order. The REAC comprises two parts: a register of environmental commitments; and an environmental action plan (EAP).

1.5.15 The EAP details all the environmental actions required to make sure the commitments are met and the Scheme is delivered in accordance with this ES. Its sets out specific actions at the pre-construction, construction and post-construction stages of the Scheme and assigns responsibility for these actions to specific parties.

1.5.16 Information from the REAC is used during the development of the Construction Environmental Management Plan (CEMP).

1.5.17 A number of other documents either form part of or are closely related to the ES:

- Illustrative Environmental Masterplan (EMP) – this is included at the end of Volume 1 of the ES (see page 219). The EMP is designed to visually illustrate the key mitigation measures for the Scheme, allowing these to be viewed spatially within the context of the overall Scheme. The EMP is illustrative of what would be the final measures taken on the Scheme. The nature and content of an EMP is directed by the nature of the proposed design and the mitigation proposed by environmental specialists as a result of the EIA process. For the Scheme the EMP provides information on landscape planting, reinstatement of agricultural land, vegetation retention, areas of habitat creation and non-motorised user route proposals; and shows the specific locations for these on the plan.
- Construction Environmental Management Plan – the purpose of a CEMP is to present how a construction project would avoid, minimise or mitigate effects on the surrounding environment. The contractor would produce and manage a CEMP in advance of the start of construction. Further information on the content and aims of the CEMP is outlined in Section 5.8 of this ES. For the purposes of the DCO submission an outline CEMP would be produced that would contain sufficient information to support the DCO application. This document would continue to be developed throughout the detailed design stage. The outline CEMP also contains a number of supporting documents referenced within the ES, which would be provided as samples and refined in later stages, including:
  - A Site Waste Management Plan (SWMP) – sets out how the contractor would manage waste produced during construction and is designed to encourage the use of the waste hierarchy to help minimise waste production and effective waste management;
  - Soil Management Plan – sets out how the contractor would manage the use of soils on site; and
  - Materials Management Plan (MMP) – sets out how the contractor would manage materials during construction.

1.5.18 The final CEMP, which will apply to the Scheme will be based on the outline CEMP and the mitigation measures in the REAC. The final CEMP will be approved in accordance with the terms of Requirement 4 of the DCO.

1.6 Availability of the environmental statement

1.6.1 All of the application documents, including this ES, have been published via the Planning Inspectorate's website and can be downloaded, free of charge, via the following link:

https://infrastructure.planninginspectorate.gov.uk/projects/north-east/a19-downhill-lane-junction-improvement/

1.6.2 Documents can be viewed electronically via the website at the locations outlined in Table 1-1. Paper copies of the application documents will be placed on deposit at two locations in the area surrounding the Scheme, plus Highways England's office. The intended locations are:

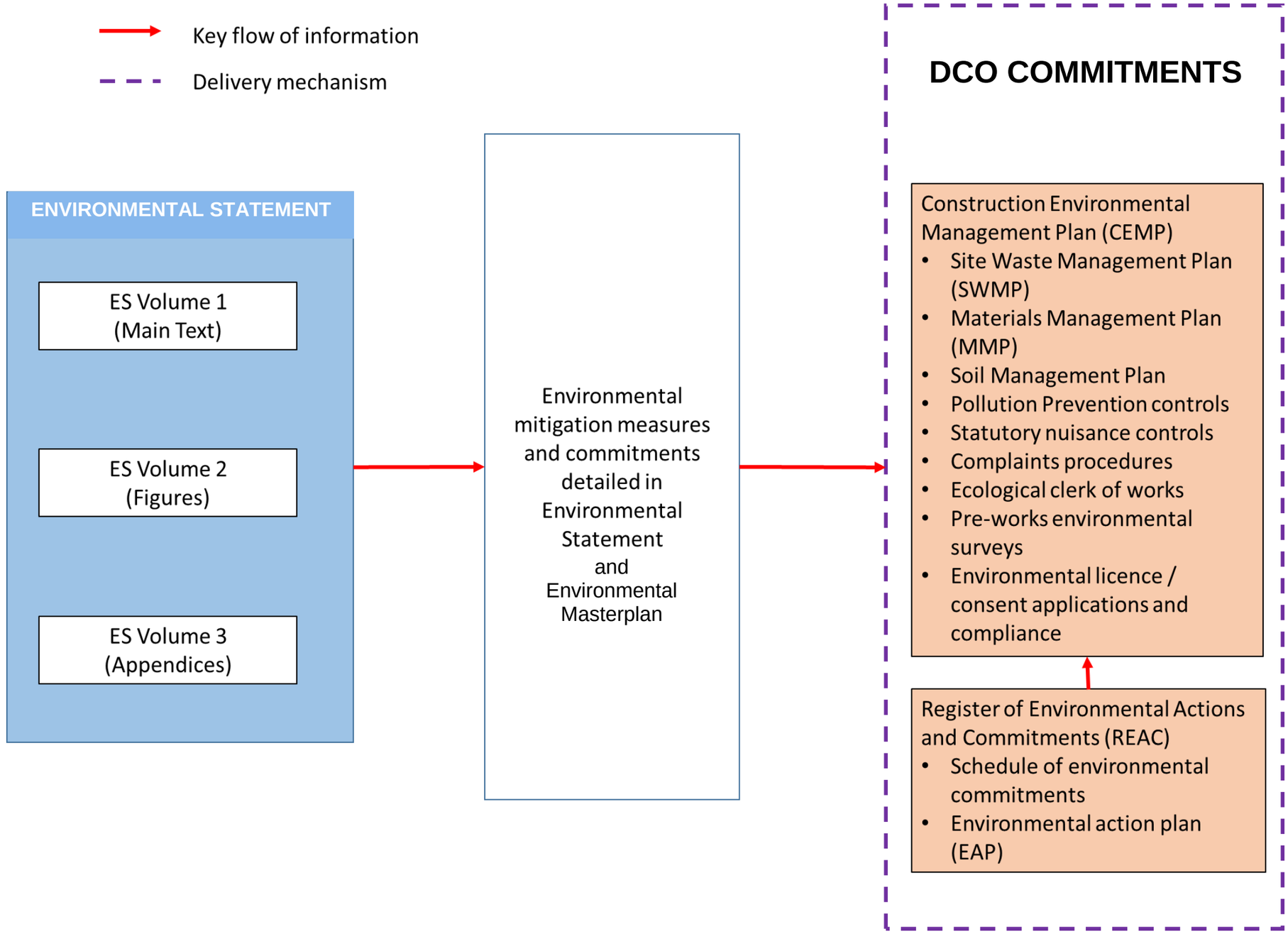
- Bunny Hill Customer Service Centre, Sunderland;
- The Word Library, South Shields; and
- Highways England (Leeds Office).

Table 1-1 Electronic access locations

Library / Address	Opening Hours	Opening Hours
East Boldon Library Boker Lane East Boldon NE36 0RY Telephone: 0191 424 7853 **Free access to computers for Library members, or £1 charge per 20 minutes.**	Monday – 09:30 to 17:00 Tuesday – 09:30 to 19:00 Wednesday – Closed Thursday – 09:30 to 19:00 Friday – 09:30 to 17:00 Saturday, Sunday and Bank Holidays – Closed	
East Boldon Library Boldon Lane South Shields NE34 0LZ Telephone: 0191 456 2852 **Free access to computers for Library members, or £1 charge per 20 minutes.**	Monday – 09:30 to 17:00 Tuesday – 09:30 to 17:00 Wednesday – 09:30 to 19:00 Thursday – Closed Friday – 09:30 to 17:00 Saturday, Sunday and Bank Holidays – Closed	

Printing Costs	Black and White	Colour
A4	10p	50p
A3	Not available	

Illustration 1.3 Document Organogram



1.6.3 These documents will be available for the public to view at these locations, free of charge, for the duration of the pre-examination and examination period. Details of the locations will be published in advance in the Highways England's statutory notice of the submission and acceptance of the application, through newspaper advertisements in the Newcastle Evening Chronicle, Sunderland Echo, Shields Gazette, The Guardian and the London Gazette.

1.6.4 Additionally, the application documents are available on the Highways England website: https://highwaysengland.co.uk/programmes/a19-testos-and-downhill-lane-junction-improvements/

1.6.5 Copies of the non-technical summary of the ES are available for members of the public to take away, free of charge, from these locations.

1.6.6 Copies of the non-technical summary can also be obtained in paper form, free of charge, by writing to the following postal address:

- Highways England, Lateral, 8 City Walk, Leeds LS11 9AT

1.6.7 Copies of the complete ES in electronic format on a USB card can be obtained from the same address, free of charge. Paper copies are available at a cost, as follows:

- the complete ES (all three volumes) - £900;
- Volume 1 (Main Text) - £220;
- Volume 2 (Figures) - £175; and
- Volume 3 (Appendices) £590.

1.6.8 To obtain any part of the ES or provide comments, please write to Highways England at the address given above, enclosing payment if required. All costs are inclusive of VAT.

1.7 How to make comments / next steps in the process

1.7.1 On receipt of the application for a DCO, the Planning Inspectorate has a period of 28 days to determine whether the information submitted with the application meets all the criteria to enable them to accept it as a valid application.

1.7.2 Should the Planning Inspectorate accept the application, the applicant (Highways England) must publish a notice to inform the public that an application has been made and accepted, and to invite them to make representations about the application. This would mark the start of the 'pre-examination period'.

1.7.3 Third parties (individual members of the public or organisations) would then be able to register as interested parties. This would entitle them to make representations to the Planning Inspectorate about the application and to be involved in the examination of the application.

1.7.4 The pre-examination period would close with the 'preliminary meeting', to which all those who have registered as interested parties would be invited. At the preliminary meeting, the Planning Inspectorate would determine what the key issues affecting the application are. This decision would be based on the information in the application documents and the representations that have been made by registered interested parties.

1.7.5 The preliminary meeting would mark the start of the 'examination period', which has a maximum duration of six months. Examination is designed primarily to address each of the key issues identified during the pre-examination period and at the preliminary meeting. It operates through the provision of written representations to the Examining Authority and written questions from the Examining Authority to both the applicant and to interested parties. It is likely that there would be a number of hearings which parties who have registered an interest could attend, and where they could make statements and ask questions.

1.7.6 At the end of the examination period, the Planning Inspectorate has a period of up to three months to consider its recommendation. The recommendation and a supporting report would be passed to the Secretary of State for Transport, who would then have three months to consider a decision on whether to grant or withhold a DCO. Finally, the Secretary of State's decision would be published, and there would be a six-week High Court challenge period. At the end of this period, unless there have been High Court challenges, the decision would be final.

1.8 Other regulatory regimes

1.8.1 This ES has been written to inform an application for a DCO. In addition to the application for a DCO, the potential applicability of other regulatory regimes and consent requirements has been considered; see DCO application document TR010024_APP_3.3 'Consents and Agreements position statement'.

1.8.2 No Environmental Permit is currently required for the Scheme. It is anticipated that a local watercourse drainage-related consent would be required for the Scheme, such as for the construction works within the tributary to the River Don.

1.8.3 The potential need for Habitats Regulations Assessment (HRA) has been considered alongside the EIA, in Appendix 1.4 ('Other Regulatory Regimes') and in DCO application document TR010024/APP/6.10.

1.8.4 It has been concluded that no assessment for potential effects on Natura 2000 sites is necessary as there is no potential for the Scheme to have likely significant effects on any Natura 2000 site.

1.8.5 The potential need for protected species licences or consents has been considered and it has been determined that such licenses or consents are not required for the Scheme. The Scheme does not include any works whose impacts require any category of protected species licence and no mitigation works are required that would need a protected species licence to allow their implementation.

CHAPTER 2 THE SCHEME

2.1 Need for the Scheme

2.1.1 The Road Investment Strategy for the 2015-2020 Road Period, published by the Department for Transport, announced in December 2014 that the A19 Downhill Lane junction would be altered to support local plans for an IAMP to the north of the existing Nissan Plant. This formed part of Highways England's programme of investment in the strategic road network in the North East that supports the government's growth agenda for the region.

2.1.2 Initially, Highways England considered combining the Scheme with an ongoing scheme to improve the neighbouring A19 / A184 Testo's junction. However, the A19 / A184 Testo's Junction Improvement Scheme was at a more advanced stage, so progressed as a separate project to avoid delaying the DCO application for that scheme whilst the proposals for Downhill Lane junction were being developed.

2.1.3 The Scheme was initiated to reduce congestion, provide safety benefits and support growth in the local and regional economy.

2.1.4 Future developments, including IAMP, to the north of the existing Nissan Plant are likely to increase the amount of traffic using Downhill Lane junction significantly. The current capacity of the junction is limited by the single bridge and lack of a full circulatory system for the carriageway. This would not be sufficient for the anticipated additional traffic and would therefore affect the A19 and local roads.

2.2 The Scheme objectives

2.2.1 The main objective of the Scheme is to increase capacity by providing a two bridge, grade separated, signalised roundabout junction with full circulatory flow of traffic. The Scheme is also being designed with the following key objectives, for the wider strategic network in mind, which are set out in Highways England's Delivery Plan 2015-2020:

- **Supporting economic growth** – This would be achieved by improving the attractiveness of the area for large-scale commercial development west of Downhill Lane junction and north of the Nissan Plant, such as the IAMP development and other prospective developers and businesses, by improving road access. The Scheme would help connect key employment sites, schools, colleges and residential areas, thereby delivering major benefits.
- **A safe and reliable network** – The Scheme aims to reduce accidents, provide safer crossings for non-motorists and improve journey time reliability, leading to a reduction in driver stress.
- **A more free-flowing network** – The Scheme aims to contribute to achieving a freer flowing strategic network for the region.
- **An improved environment** – The environmental effects resulting from the Scheme have been considered during the options identification stage. Measures to mitigate effects on the local environment and opportunities to provide enhancements, where reasonably practicable, would be further developed as the design progresses.
- **A more accessible and integrated network** – The Scheme would provide improved connectivity with the local road network. We are investigating ways to maintain existing facilities for pedestrians, cyclists and horse-riders and, where possible, provide enhancements. We would continue to work with the local access forum and user groups to develop our proposals.

2.2.2 The objectives and need for the Scheme are comprehensively set out in the Planning Statement[4].

2.3 The applicant and design team

2.3.1 Highways England, the applicant, is responsible for the maintenance and improvement of the trunk road and motorway network in England.

2.3.2 Costain is Highways England's Early Contractor Involvement (ECI) Contractor. Costain appointed Jacobs UK Ltd (Jacobs) to prepare the preliminary design of the Scheme, carry out the EIA and assist in preparation of the application to the Planning Inspectorate for a DCO. Costain and Jacobs comprise the 'design team'. As ECI Contractor, Costain has been responsible for overseeing development of this ES by Jacobs.

2.3.3 After submission of the DCO application, Costain and Jacobs would continue supporting Highways England during the statutory process, and would undertake the detailed design and construction of the Scheme after the grant of a DCO. This would include refining the design of environmental mitigation measures, obtaining any relevant environmental licenses, carrying out additional environmental surveys in advance of construction and detailed design and overseeing implementation of environmental mitigation works.

2.4 The site and its surroundings

2.4.1 Downhill Lane junction is located in South Tyneside, approximately 5 km south of the Tyne Tunnel entrance at Jarrow (see Figure 1.1). Information about the site and its surroundings outlined below reflects the baseline situation in 2018, followed by a summary of any known major changes expected before 2020 in Section 2.5 of this ES.

2.4.2 Downhill Lane junction lies in a narrow belt of countryside that separates the urban areas of South Tyneside and Sunderland. The A19 / A184 Testo's junction is approximately 1.2 km to the north, whilst the A19 / A1231 junction is approximately 2.6 km south of Downhill Lane. The environmental context for the Scheme, as outlined below, is included on Figure 2.1.

2.4.3 Outside of the highway boundary, most of the land required to build the Scheme is farmland, mainly in arable use. However, there are adjacent residential areas, particularly at Town End Farm, which is a dense residential area approximately 350 m to the south-east. Make-Me-Rich Farm properties lie approximately 100 m to the west of the A19 and approximately 300 m north of Downhill Lane junction; access to the farm is located off Downhill Lane (West). The Chalet and Usworth Cottages are located approximately 850 m to the south-west of Downhill Lane junction. There are community facilities and commercial properties, such as the North East Land, Sea and Air Museum, located to the north of Washington Road, approximately 1 km south of Downhill Lane junction, and the Three Horse Shoes pub located south of the A1290, approximately 1 km south of Downhill Lane junction. The Gateshead College Skills Academy lies approximately 150 m to the east of the A1290. The Nissan Plant lies approximately 1 km south of Downhill Lane junction.

[4] Application document 7.1, Planning Statement including NNNPS Accordance Table

2.4.4 The River Don passes beneath the A19 in a long culvert, just north of Downhill Lane junction, flowing from west to east. Most of the River Don corridor is designated as part of several Local Wildlife Sites (LWSs). Make-Me-Rich Meadow LWS lies adjacent to the River Don and to Downhill Lane junction to the east, while East Hylton Bridge LWS lies adjacent to the River Don, west of Downhill Lane junction. The River Wear is approximately 3 km to the south of Downhill Lane junction.

2.4.5 Most of the surrounding landscape comprises a pattern of rectilinear fields divided by hedgerows, whilst there are small blocks of woodland in the surrounding area. To the east, the ground rises to the Boldon Hills.

2.4.6 Scot's House, a historic Grade II* Listed Building, lies approximately 1.8 km to the north-west of Downhill Lane junction, adjacent to the A184. Scot's House sits in landscaped grounds, surrounded by mature trees. Several subsidiary buildings in the Scots House complex are Grade II Listed Buildings. Another group of Grade II Listed Buildings around Downhill House are 750 – 840 m north-east of Downhill Lane junction, adjacent to Downhill Lane.

2.4.7 Downhill Lane either side of the A19, continued further west by Follingsby Lane, forms part of a popular recreational cycling and horse-riding route (the Great North Forest Trail). Although the funding and local authority partnership promoting the route of the Great North Forest Trail have lapsed, along Downhill Lane and Follingsby Lane the policies remain in place. This route is still included on Ordnance Survey Maps, although it is no longer designated as a Long Distance Footpath. The Great North Forest Trail remains a well-used, popular recreational route in this area (as shown by survey evidence), even though there may be no official designation. In addition, a bridleway (Bridleway B46) runs southwards from the West Boldon area to meet Downhill Lane at Downhill Lane junction; surveys show this bridleway is also very well used. In general, the junction remains busy with non-motorised traffic throughout the year, particularly with cycle commuters crossing the junction to reach the Nissan Plant.

2.5 Future baseline

2.5.1 In addition to the site and its current surroundings outlined in Section 2.4, above, consideration also needs to be given to the future baseline of the site (i.e. the baseline that will exist in July 2020 at the start of the Scheme's construction).

2.5.2 Located to the west of the A1290 is the IAMP One development. This is the first phase of a wider development and consists of nine industrial units and associated highways and car parks. The site is anticipated to be operational from January 2020, with construction for Downhill Lane planned to start in July 2020. As such IAMP One has been assumed to be fully built prior to the start of the Scheme construction to reflect their worst case presence as receptors when the Scheme starts construction.

2.5.3 At the start of construction for the Scheme the Testo's scheme will also be under construction, with this expected to start in Autumn 2019. Testo's is located approximately 1.2 km north of Downhill Lane. The Testo's scheme involves raising the A19 to an elevation of 7.5 m above ground level over an enlarged roundabout. Traffic on the A19 mainline would flow freely above the roundabout, while traffic using the A184 would still use the roundabout. Traffic would be raised to this height using approach ramps to the north and south of the junction. Further detail on the Testo's scheme and a full scheme description can be found in the ES for the Testo's scheme, located at:

https://infrastructure.planninginspectorate.gov.uk/projects/north-east/a19-a184-testos-junction-improvement/

2.5.4 The close proximity of two proposed grade-separated junctions at Testo's and Downhill Lane junctions means that they would not be able to safely accommodate a full suite of slip roads, as would be conventional with grade-separated junctions. Therefore, the Testo's scheme proposes that the existing northbound on-slip road from Downhill Lane junction to the A19 and southbound off-slip road from the A19 to Downhill Lane junction would be reconfigured. These slip roads would be extended north to form new link roads running parallel to the A19 on either side, between Downhill Lane and Testo's junctions. This means that traffic travelling north from Downhill Lane junction would first travel to Testo's junction using the link road, and then join the A19 via the northbound slip road from Testo's roundabout. Traffic travelling from the north to Downhill Lane junction would leave the A19 at Testo's junction and use the southbound link road.

2.5.5 The northbound link road will have two lanes and the southbound link road will have one lane, increasing to two lanes on the approach to Downhill Lane junction.

2.6 Other developments

2.6.1 Other highways and non-highways schemes have been taken into account in this ES. Chapter 15 (Cumulative Effects) provides more information on the other schemes that are in the vicinity of the Scheme and how these have been incorporated into the environmental assessments. The most notable other proposed development near the Scheme is IAMP Two, as described in Section 1.2 of this ES.

2.6.2 In addition, there are also proposals to expand the Nissan Plant, which is located 1 km south of Downhill Lane junction.

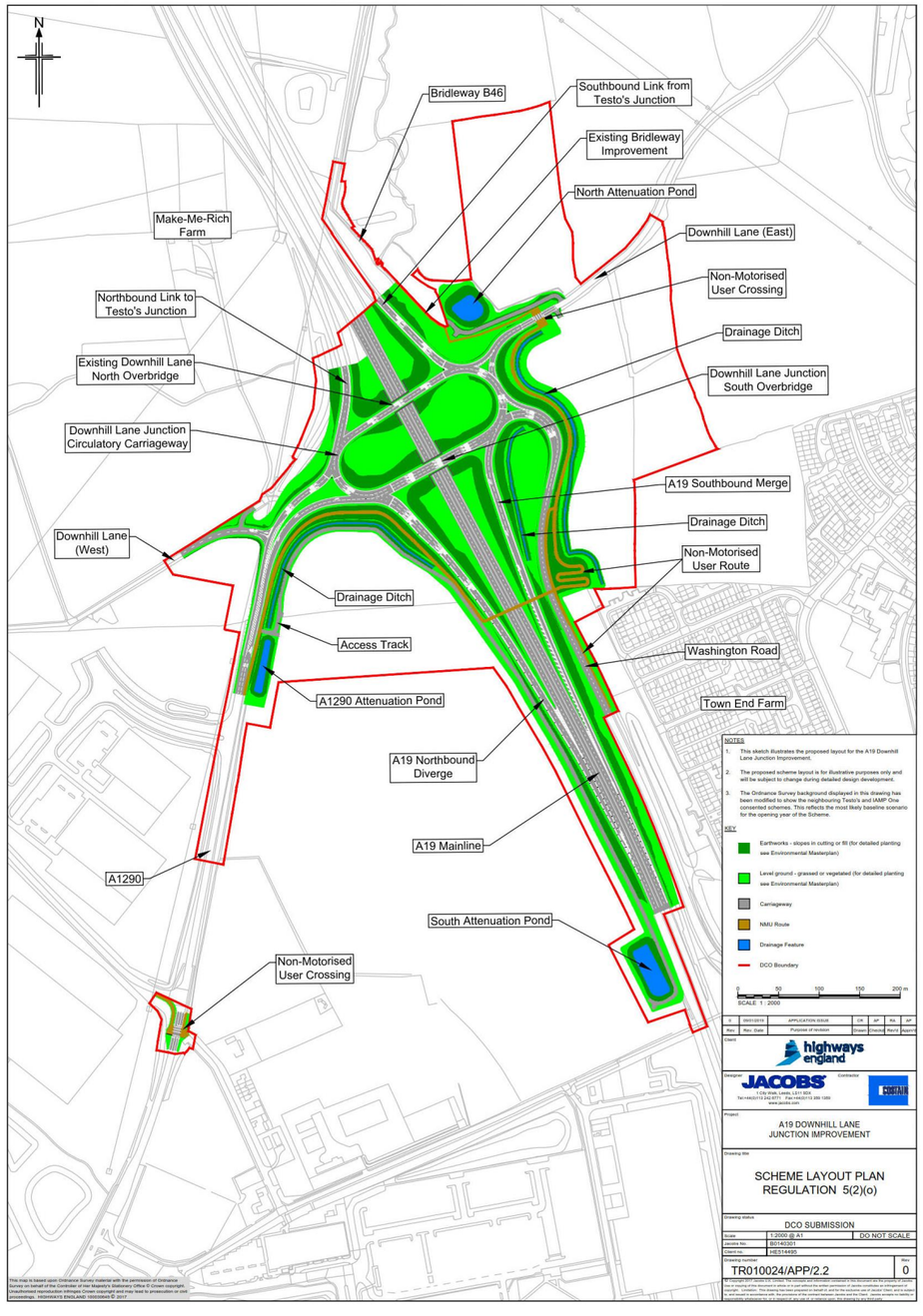
2.7 Scheme description

2.7.1 Figure 2.2 shows the General Arrangement for the Scheme. Overall the Scheme involves upgrading the A19 Downhill Lane junction from a signalised priority, grade-separated junction with a single bridge crossing, to a two-bridge, grade separated, signalised roundabout junction, with a full circulatory carriageway across the mainline A19. Although the Scheme is an online improvement option, there would be no change to the route of the mainline A19. The Scheme layout is included in Illustration 2.1.

2.7.2 A new overbridge would be constructed immediately to the south of the existing A19 overbridge creating a full circulatory carriageway over the A19. The existing Downhill Lane bridge would be retained to form part of the circulatory carriageway construction. A structural assessment undertaken on this bridge has confirmed that the existing structure has adequate load-bearing capacity to accommodate the proposed improvement works. The existing northbound and southbound A19 slip roads would be realigned to tie in with the new circulatory junction layout. The slip roads south of the junction would continue to provide direct access to and from the A19. As the ~~A19 / A184~~ Testo's ~~Junction Improvement S~~scheme has been granted consent, as outlined in Section 2.5 of this ES, the Scheme would modify the existing slip roads north of the junction to tie in with the Testo's scheme link roads.

The A1290, Downhill Lane (East) and Washington Road (East) local roads would be re-aligned to suit the new circulatory junction layout.

Illustration 2.1: Scheme layout



2.7.3 The junction of Downhill Lane (West) and the A1290 would be modified, making this a left-in and left-out junction that may require permanent relocation of the northbound bus stop for routes 50 and 56 between Sunderland and Newcastle and Concord, Gateshead and Newcastle; if required, as this bus stop is not recessed into a layby, it would be possible to relocate this further south on the A1290 in discussion with relevant stakeholders. The left-in and left-out junction would also require the realignment of the access road and private means of access for the properties at Make-Me-Rich farm.

2.7.4 A new NMU route would be constructed, to link the existing Bridleway B46 with the A1290. This would be a dedicated NMU route, with full segregation of vehicular and NMU traffic to the point where this links with the existing provision along the A1290. The new NMU route would include a NMU bridge across the A19. Further details are provided in Section 2.12 of this ES. The IAMP One site includes the provision of a green corridor for NMU users which follows the route of Follingsby Lane off the A1290. The Scheme includes a signalised crossing at this location.

2.7.5 The Scheme would also involve the construction of three new attenuation (drainage) ponds: the north attenuation pond, located to the north-east of Downhill Lane junction; the south attenuation pond, located to the south of the junction adjacent to the existing A19 mainline; and the A1290 attenuation pond, located to the east of the A1290. Further details are provided in Section 2.11 of this ES.

2.7.6 Site clearance and preparation works prior to the construction works are outlined in Section 2.15 of this ES.

2.7.7 A summary of the key design elements of the Scheme is presented below. Note that all of these elements are based on the July 2018 preliminary design and are subject to the potential for change at the detailed design stage. The detailed design of the Scheme and any changes from the preliminary design will be subject to the Requirements of the DCO. The description is supported by the following figures in Volume 2 of the ES and illustrations in this chapter:

- Figure 2.1 Scheme environmental context
- Figure 2.2 General arrangement
- Figure 2.3 Proposed traffic signs
- Figure 2.4 Land take
- Figure 2.5 Features of the water environment
- Figure 2.6 Proposed drainage design
- Figure 2.7 Proposed changes to non-motorised user routes
- Illustration 2.1 Scheme layout
- Illustration 2.2 Diagrammatic highway network and traffic flows in the opening year for Do-Minimum
- Illustration 2.3: Diagrammatic highway network and traffic flows in the opening year for Do-Something
- Illustration 2.3 Overview of Downhill Lane and Testo's construction programmes

Structures

2.7.8 Two new structures are proposed as part of the Scheme:

- A new highway overbridge, located to the south of the existing overbridge at Downhill Lane junction. The proposed bridge would be a single span, multi-girder, composite bridge with a span of 37.5 m and a width of 17.55 m, accommodating a three-lane carriageway.
- A new NMU bridge is proposed to cross the realigned Washington Road and southbound merge slip road to the east, spanning the mainline A19 and crossing the northbound diverge slip road to the west. It is proposed that this bridge would be a three-span parallel truss bridge, with ramps (also parallel truss) constructed either side to allow NMU access (see Section 2.12 of this ES).

Earthworks

2.7.9 The improvement and alteration of Downhill Lane junction would require embankments of approximately 6.5 m above existing ground level. A maximum earthworks slope profile of 1V:2.5H would be applied throughout the Scheme, though 1V:3H would be sought where practicable.

2.7.10 Embankments would be required within the newly created circulatory carriageway to the east and west of the existing A19 mainline and also surrounding the realigned Washington Road approach to Downhill Lane to the east of the A19. To the east and west of the Scheme, embankments would be created to provide separation of the road layout to the proposed NMU route (as outlined in Section 2.12 of this ES) and to facilitate the introduction of the proposed NMU bridge.

Gantries and signs

2.7.11 Existing road signs would be removed and replaced with conventional post-mounted signs, as shown on Figure 2.3. No gantries are required for the Scheme.

Lighting and cabling

2.7.12 The existing Downhill Lane junction is lit, with the existing lighting consisting of Light Emitting Diode (LED) lamps. Existing lighting is also in place along the existing NMU routes on Washington Road and the A1290 towards the Nissan Plant.

2.7.13 The improved and altered junction would continue to be lit and the approach roads and slip roads would have lighting installed. The length of the lighting on the approaches to the junction would be determined based on factors such as forecast queue length.

2.7.14 Typically, lighting columns would be installed on the verges of the slip roads and approaches, adjacent to the carriageway in a single sided arrangement. Newly installed lighting would typically be LED Lighting, mounted on 12 m high lighting columns, positioned at existing ground level and designed to modern standards to minimise light pollution. An estimated total of 1,800 m of new lighting ducts would be required for the Scheme, with the lighting columns placed at regular intervals. This includes replacement of all existing lighting and any additional areas required due to road realignment.

2.7.15 The verge mounted signage would also be lit using LED lighting, where deemed necessary by standards.

2.7.16 For cabling, new ducts and loops would be required. If a new electricity supply is required, there would be a need to verify off-site pole installation and wayleave requirements for the power supply, if there are any. It may be possible to reuse the existing lighting loops and ducts, however this would be subject to the capacity and condition of these being established prior to construction.

2.7.17 Section 2.12 of this ES describes the existing and proposed lighting related to the NMU routes crossing Downhill Lane junction.

Fencing

2.7.18 The new highway boundary (i.e. the extent of the permanent land take area, as outlined on Figure 2.4) would be fenced with standard wooden post and rail fencing that would be either newly installed or retained from the existing fence lines.

2.7.19 There would be no requirement for specific environmental fencing (e.g. noise barriers).

Safety Barriers

2.7.20 The Scheme design includes steel barriers on the edge of the carriageway, which would be installed where roads are realigned. All the safety fencing for the Scheme would be constructed of steel and would be in accordance with the relevant DMRB standards.

2.7.21 Drainage works within the A19 central reserve would require the removal of sections of the existing steel barrier and reinstatement with new steel barrier following completion of the drainage works.

Road surface

2.7.22 The surface of the roads for the Scheme would be black asphalt. The existing roads within the Scheme footprint are hot rolled asphalt (HRA), but a thin surface course system (TSCS) would be used where roads require resurfacing in order to minimise road-surface-related noise emissions[5]. During the detailed design stage of this Scheme, the specification of the road surfaces would be refined (i.e. the specific aggregate base).

2.8 Landscaping and environmental design

2.8.1 Landscape features are described in more detail in Chapter 8 (Landscape and Visual Effects) and illustrated on the Environmental Masterplan included at the end of Volume 1 of this ES.

2.8.2 Appropriate landscape planting would be provided within the new highway boundary to replace lost features, enhance visual amenity and provide visual screening to the completed scheme. The nature and type of planting is outlined on the Environmental Masterplan.

2.9 Temporary and permanent land-take

2.9.1 Although for the most part this is an on-line improvement[6], the footprint of the new A19 Downhill Lane junction would occupy a larger footprint than the current junction, due to the creation of a full circulatory carriageway, the realignment of Washington Road and the new NMU provision.

[5] To the north of the Scheme a low noise road surface is to be applied on the A19 and associated slip roads as part of the Testo's scheme, whilst a section of A19 mainline has already been resurfaced. Therefore, a low noise road surface currently covers the A19 from the A19/A1231 junction to Testo's junction.

[6] 'on-line' improvement means the Scheme follows the existing road.

2.9.2 Figure 2.4 shows the DCO boundary for the Scheme and the permanent and temporary land-take that is required to deliver the Scheme. The DCO boundary encompasses all the land on which any work would take place. The total DCO boundary footprint of the Scheme is 36.81 hectares.

2.9.3 Much of the land that would be acquired for the permanent works is within the current highway boundary, so not currently in agricultural use, and classified as urban. Permanent land acquisition is required to the west and east of the Scheme for the NMU provision and to the north, south-west and south of the Scheme for three separate drainage attenuation ponds. The total permanent land take for the Scheme is 17.42 hectares.

2.9.4 An additional 12.81 hectares of land within the DCO boundary would be required temporarily during construction for a standalone Scheme, but would be returned to agricultural use after construction is complete. This land would be needed mainly for a construction site main compound, access and haul roads to the work areas, and for temporary storage of topsoil and subsoil and bulk fill material.

2.9.5 The additional 6.13 ha of agricultural land within the Scheme DCO boundary identified for temporary uses covers the Testo's scheme's main compound (see Figure 2.4). With the Testo's scheme having been granted development consent, there is an opportunity to share the use of the Testo's main site compound for general storage, traffic management and office-based administrative purposes. The creation and removal of the Testo's scheme main site compound and the land's restoration to agricultural production is covered by the Testo's scheme's ES. However, the Scheme would require its continued use post completion of the Testo's scheme before the compound is dismantled and land restored to agricultural production.

2.10 Changes to traffic flows

2.10.1 The Downhill Lane junction is located on the A19, 1.2 km south of the Testo's roundabout. Downhill Lane junction connects the A19 to the A1290 which supplies the northern access of the Nissan Plant. Nissan operates on shift patterns and, as a consequence of the change in shift, Downhill Lane junction suffers from severe congestion at these times. The proposed IAMP adjacent to Downhill Lane junction, will also require access onto the A19 via Downhill Lane junction. This is anticipated to exacerbate the congestion problem at shift change times.

2.10.2 Changes to traffic flows are central to the potential impacts of the Scheme on the environment. Traffic-flow factors that affect the environment are quantity of traffic, distribution of traffic, composition (i.e. the proportions of different types of vehicles), traffic speed and whether the traffic is stopping and starting or flowing smoothly. Changes in the flow of traffic are the central factor in identifying potential environmental impacts in the following topics:

- Chapter 6 - Air quality;
- Chapter 12 - Noise and vibration;
- Chapter 13 - People and communities (journey times and driver stress); and
- Chapter 14 - Road drainage and the water environment.

2.10.3 Other environmental aspects that could be affected by changes to the flow of traffic include (this is not intended to be an exhaustive list):

- the setting of historic buildings (Chapter 7);
- visual amenity (Chapter 8);
- wildlife and habitats through disturbance (Chapter 9); and
- accessibility and amenity value of Public Rights of Way and open spaces (Chapter 13).

2.10.4 Future traffic forecasts have been predicted for the Scheme. Computer traffic models have been used to forecast the future traffic flows based on simulations of the existing traffic conditions.

2.10.5 Traffic modelling is an iterative process, which considers current and future infrastructure projects and other developments and updated guidance. More detail can be found in the Transport Assessment Report (DCO application document reference TR010024/APP/7.4).

2.10.6 This model is the starting point for predicting traffic flows and behaviour in the future, allowing for growth in housing, employment and the number of cars on the network. Traffic forecasts have been developed for the proposed opening year of the Scheme, assumed to be in 2021[7], and a future year in 2036[8] to help predict the long-term impacts of the Scheme.

2.10.7 The forecasts examine two network development scenarios: 'Do Minimum' (DM) and 'Do Something' (DS), for the purposes of comparison. The DM network scenario only includes changes in traffic flows caused by other committed highway and development schemes, but excludes the Scheme proposals. The DS network scenario includes changes in traffic flows caused by the Scheme as well as other committed highway and development schemes.

2.10.8 The IAMP One development was assumed to be open by 2021, but the IAMP Two development was not expected to be operational until 2026. The 2021 assessment has been undertaken on the basis that the local highway network upgrades associated with the IAMP Two would not be complete before 2022. As such a one-hour shift pattern offset would be in operation in 2021 as part of Highway Operation Masterplan (HOMP) with a view to limiting the impact that trips associated with IAMP One would have on the congestion currently occurring during Nissan shift change times. The terms of this HOMP could then be reviewed upon completion of the local highway network upgrades. The modelling of this scenario is referred to as Scenario TA1 within Section 3.11 of the Traffic Assessment (application document reference TR010024/APP/7.4).

2.10.9 A second opening year scenario, Scenario TA2 assumes the removal of the one-hour shift pattern offset; therefore, the shift pattern for IAMP One is the same as that for Nissan traffic. It also assumes that the A1290 is dualled between Downhill Lane and Cherry Blossom Way. Scenario TA2 represents a worst-case assessment in terms of traffic demand within the opening year during shift change times.

[7] Though the construction programme, presented in Section 2.15 within Chapter 2 of this ES, indicates the Scheme opening in Spring 2022, there is a realistic potential the construction programme could be accelerated to complete in 2021. Consequently, the traffic models reflect the realistic worst-case scenario of the Scheme opening the same year as the Testo's scheme (i.e. in 2021).

[8] The future year is a specified year in the future, usually 15 years after opening of the Scheme, for which predictions are made using computer models for both traffic flows and related environmental effects.

Illustration 2.2 Diagrammatic highway network and traffic flows in the opening year for Do-Minimum

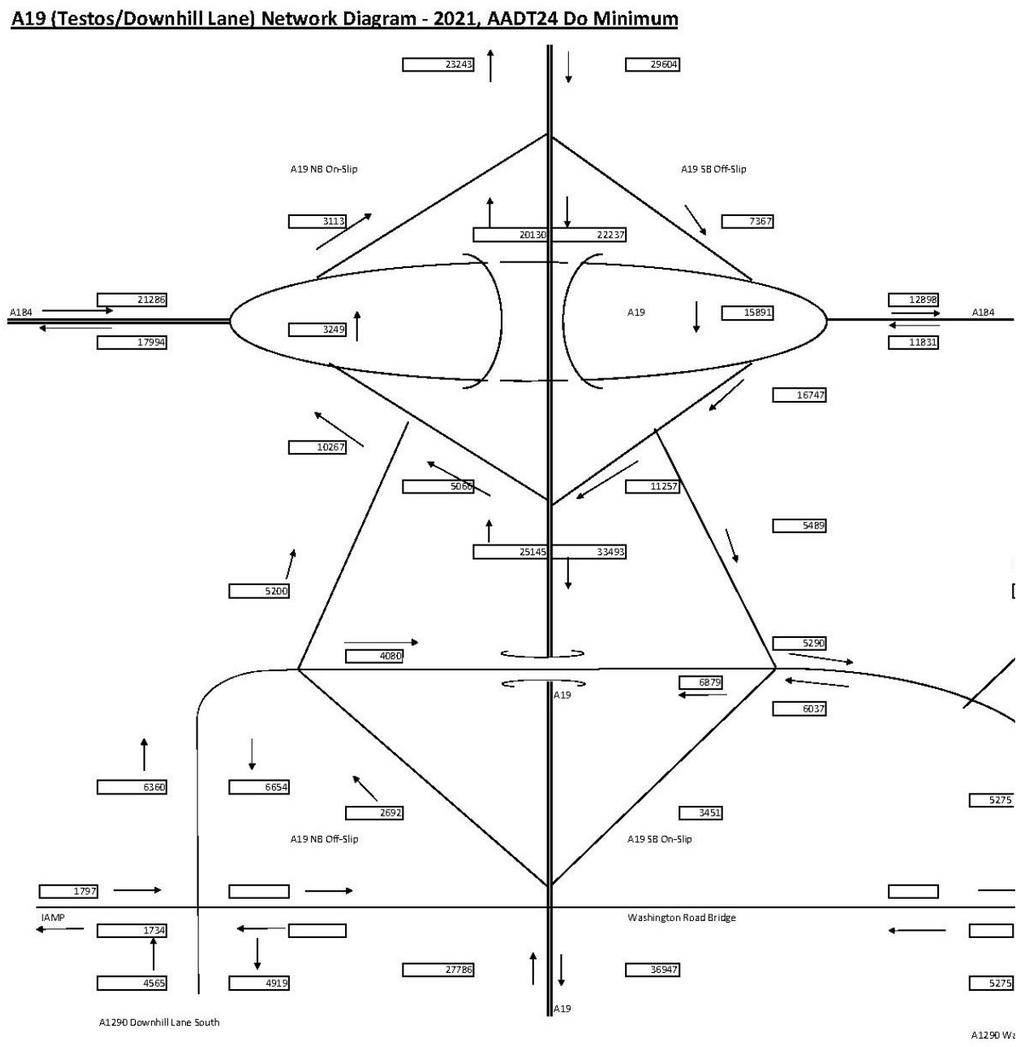
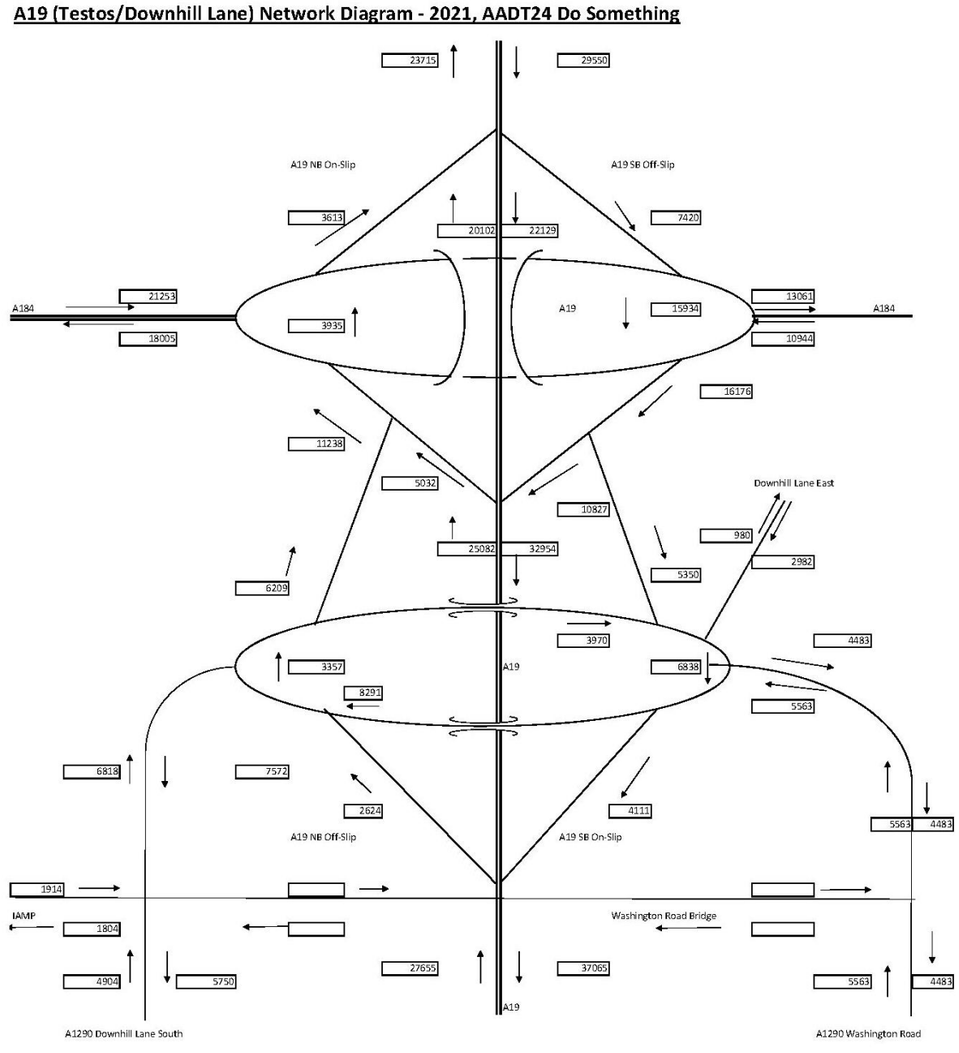


Illustration 2.3: Diagrammatic highway network and traffic flows in the opening year for Do-Something



2.10.10 Two traffic demand scenarios were considered in the ES regarding the arrival profiles of IAMP Two staff for the forecasts in 2036 as the realistic worst-case scenario differs for each environmental assesment topic (i.e. the significance and magnitude of any particular impact on receptors).

- Scenario 1 – The IAMP Two working hours for all staff follow the conventional hours worked by administrative staff (i.e. arriving before 9am and leaving after 5pm). This scenario has not been discussed within the Traffic Assessment given that it does not constitute a worst-case for 2036 in terms of highway link and junction capacity. For clarity, this scenario will be referred to as 'ES1'.
- Scenario 2 – The IAMP Two shift change for all manufacturing employees occurs at the same time as at the Nissan Plant and IAMP One, which operate continental shifts. The office employees would arrive for the traditional administrative hours. This scenario is referred to as Scenario TA3 within the Traffic Assessment. Compared to Scenario 1 above, this scenario constitutes a worst-case in in terms of highway link and junction capacity.

2.10.11 An assessment of two different 2036 demand scenarios was found to be necessary given the uncertainty around the final composition of the IAMP, and the possible significant effect that additional trips may have on the road network during shift change time.

2.10.12 A comparison of the predicted traffic flows on the approach roads is set out in Table 2-1 below. The table shows the predicted percentage difference in the flow of traffic between the DS and DM scenario on the main road links around Downhill Lane junction. Illustrations 2.2 and 2.3 show the predicted traffic levels for the DM and DS scenarios for the opening year (2021).

Table 2-1: Summary of the predicted percentage difference in traffic flows between the 'Do Something' and 'Do Minimum' scenarios[9]

Approach Road	2021 (TA2 Scenario)	2036 (TA3 Scenario)
Link roads north of Downhill Lane junction	8%	17%
Downhill Lane east of Downhill Lane junction	-3%	-5%
Washington Road east of Downhill Lane junction	-3%	8%
A19 Slip Roads south of Downhill Lane junction	10%	22%
A1290 Downhill Lane west of Downhill Lane junction	10%	18%

2.10.13 Table 2.1 shows that the DS scenario would result in an increase in traffic flows for the link roads north of Downhill Lane junction, the A19 slip roads south of Downhill Lane junction, Washington Road east of Downhill Lane junction and the A1290 Downhill Lane west of Downhill Lane junction. The DS scenario would result in a slight decrease in traffic flows on Downhill Lane (East). Delays at Downhill Lane junction within the DM network scenario prevent traffic from Washington Road travelling north on the A19, and so use Downhill Lane (East) to travel to Boldon. In the DS network scenario this delay is removed, allowing this traffic to reassign onto the A19. The traffic impacts due to the Scheme are smaller in 2021 than in 2036 as in 2021 the HOMP is in operation, which is serving to spread traffic out throughout the day and thereby limiting the effectiveness of the Scheme. Additionally, by 2036 there is more development related traffic to be supported by the Scheme.

2.10.14 The A19 / A1231 Downhill Lane Junction Improvement Scheme Transport Assessment (Arup, August 2018), which forms part of the DCO submission (see DCO application document reference TR010024/APP/7.4), provides more detail of the predicted traffic forecasts for the Scheme and the overall impacts of the Scheme on transport-related receptors. The key conclusions of the Transport Assessment are that:

"*The analysis presented indicates that the Scheme:*

- *Meets the requirements of central government's transport objectives around economy, environment, social and public accounts;*
- *Aligns with national and local planning policy;*
- *Addresses future traffic demand issues through assisting the development of the IAMP, and creates improved traffic congestion conditions and journey experience for motorists;*
- *Improves facilities for NMUs; and*
- *Creates a safer environment for all users. Accident rates are forecast to reduce as a result of the Scheme".*

2.11 Drainage design

2.11.1 The drainage design for the Scheme has been developed with advice from environmental assessment practitioners and specialists in water related environmental disciplines. The assessment process, predicted impacts and any betterment related to the water environment are reported in Chapter 14 (Road Drainage and the Water Environment) of this ES, and associated appendices. The key environmental issue concerned in developing the drainage design was the need to improve protection of the local watercourses and water bodies, relative to the existing drainage from the A19. The existing drainage was installed in the 1970s and does not meet modern standards in relation to either flood risk or protection of the local watercourses from pollution.

2.11.2 The proposed drainage for the Scheme would generally follow existing drainage patterns, although improvements would be added to achieve the environmental aim. Figure 2.5 shows the existing water environment features for the Scheme and Figure 2.6 shows the proposed drainage design.

2.11.3 The Scheme involves utilising two existing outfalls (i.e. the locations at which run-off is discharged into a watercourse). The locations of these outfalls are (see Figure 2.5):

- adjacent to the A1290 (Outfall 7), discharging indirectly to the River Wear via the existing drainage system; and
- adjacent to the A19 (connection point to Outfall 8), discharging indirectly to the River Wear via the existing drainage system.

2.11.4 The Scheme also includes changes to the existing outfall arrangement for two of the catchment areas:

- Outfall 6, from Catchment 6, to a tributary of the River Don would be removed as part of the Scheme, and a new Outfall 6 constructed downstream of this location to allow for construction of other features; and

[9] Note that flows vary at different locations on each road, and that there are several different ways of measuring traffic that would give different numbers. These figures are based on Annual Average Daily Traffic (AADT) for 24 hours.

- Outfall 4 to the River Don would be removed as part of the Scheme and the drainage system for this catchment would discharge via Outfall 1; to be constructed as part of the Testo's scheme.

2.11.5 Three attenuation ponds would be constructed for the Scheme; these would be in addition to the attenuation ponds proposed for the Testo's scheme. Pond 1, which is to be constructed as part of the Testo's scheme, will also be sized to attenuate and control the flow being discharged from Catchment 4 to the River Don.

2.11.6 One attenuation pond (north) is located to the north-east of the Scheme and would attenuate flows to better than existing rates. A new Outfall 6 would be constructed downstream of the proposed pond, as shown on Figure 2.6. The new outfall would discharge to a tributary of the River Don to the east of the A19; the existing highway discharge to an existing nearby outfall on this tributary would be diverted to this new outfall to align with the new attenuation pond.

2.11.7 A second attenuation pond (south) would be constructed to the south of the Scheme, and discharge via the existing Outfall 8 at a controlled rate indirectly to the River Wear.

2.11.8 The third attenuation pond (A1290) is located to the east of the A1290 downstream of an attenuation ditch running along the east of the A1290 and the existing / proposed drainage system. These features would discharge at a controlled rate via the existing Outfall 7, to indirectly discharge to the River Wear.

2.11.9 The attenuation ponds would slow down the rate that surface water run-off would flow into the drainage system and the River Don and indirectly the River Wear. The ponds would do this by storing surface water run-off during peak flow (i.e. heavy rainfall) and slowly releasing the water after the peak flow had passed. In accordance with Highways England guidance, the capacity of the ponds has been designed with an additional allowance of 20% to allow for climate change. A sensitivity check was undertaken for an additional allowance to check for sufficient capacity.

2.11.10 A secondary effect of the attenuation ponds would be to treat the water. Sediment and pollutants would settle to the bottom of the attenuation ponds and, as a result, remove or reduce pollutants which would otherwise enter the water environment. Additionally, planting associated with the ponds would uptake nutrients and soluble pollutants, providing additional water quality improvements and increased biodiversity.

2.11.11 The drainage design would also provide protection against spillage events and subsequent contamination of the watercourses. The attenuation ponds would be designed with overflow and isolation systems in order to retain contaminants before they flow into the water environment. This would allow contaminated water to be removed or treated before being discharged.

2.11.12 Existing buried storage facilities at the junction would be removed as part of the Scheme and the required attenuation provided by the proposed ponds.

2.11.13 The drainage infrastructure proposed at this stage is standard (i.e. a mixture of concrete surface-water channels, kerb-and-gully and combined-kerb drainage units for edge-of-carriageway surface water collection). Carrier drains, a few filter drains and possibly an open ditch at the bottom of the embankments would be used to convey the water to an outfall. Appropriate attenuation and flow-control measures would be provided upstream of all outfalls. Sub-surface drainage would be provided in the form of narrow filter or fin drains.

2.11.14 The north of the Scheme lies adjacent to the River Don floodplain, there are no known flooding issues associated with the existing road drainage, and the Scheme avoids works directly affecting the River Don itself. A Scheme design objective is to avoid any impact on the River Don culvert under the existing A19 and slip roads.

2.12 Non-motorised user facilities

2.12.1 The proposed NMU route for the Scheme is outlined on Figure 2.7, showing the existing and revised NMU provision within the vicinity of the Scheme.

2.12.2 Existing NMU routes would remain open, with suitable diversions where required, for the duration of the construction period; specific diversion routes would be identified during the detailed design phase.

2.12.3 The NMU proposals would involve the creation of a dedicated NMU route, connecting Bridleway B46 to the north-east of Downhill Lane junction with the A1290 to the west of the junction via a new NMU bridge across the A19 to the south of Downhill Lane junction. The key features of the proposals are:

- Bridleway B46 – connection of the existing Bridleway B46 to a new crossing point at Downhill Lane (East). The B46 is currently un-lit along the course of its length and is a heavily used NMU route for cyclists, in particular, those travelling from the north to the Nissan Plant. No lighting is proposed beyond that included for the slip-road and junction.
- Downhill Lane (East) crossing – a new signalised Pegasus crossing across Downhill Lane (East) is proposed to connect Bridleway B46 with the new NMU route.
- NMU route (Washington Road) – creation of a new shared-use NMU route running adjacent to the re-aligned Washington Road. This would be a dedicated NMU facility and segregated from the traffic on Washington Road. It would connect to the new NMU bridge and also to the existing NMU provision along Washington Road to the south, creating further connectivity for residents of Town End Farm. For the purposes of environmental assessment, we have proposed that low-level lighting would be provided along the newly constructed route. The provision of low level lighting in this location will be subject to further discussions with South Tyneside Council.
- NMU bridge (A19) – to the south of the junction a new NMU bridge, of a single-span, parallel-truss type, would be provided from the east side of Washington Road crossing Washington Road, the southbound merge slip road, the mainline A19 and the northbound diverge slip road. Ramps would be provided on either side of the bridge to allow access for cyclists and equestrians, plus those with reduced or impaired mobility. It is proposed that the bridge would be lit using low-level deck lighting and solid infill parapets to reduce glare for motorists on the A19.
- A19 (west) to the A1290 – creation of a new shared-use NMU route, running adjacent to the northbound diverge slip-road towards Downhill Lane junction and along the eastern side of the A1290. As for the eastern part of the route, it would be lit using low level lighting. It would connect with the existing NMU facility along the east side of the A1290. The provision of low level lighting in this location will be subject to further discussions with South Tyneside Council.
- A1290 crossing – a new signalised Pegasus crossing would be provided to the south at the junction of Follingsby Lane with the A1290, to connect to the NMU route through IAMP One. This would connect with Downhill Lane (West) at Hylton Bridge Farm.

2.12.4 The new NMU route would provide improved connectivity for users travelling from the north and Testo's roundabout (i.e. the residential areas of West and East Boldon, Fellgate and Hedworth) and from Town End Farm to the Nissan Plant, and would provide full segregation for NMU and vehicular traffic along the route. Compared to the existing provision this provides improved safety for NMU users.

2.12.5 Chapter 13 (People and Communities) describes the potential impacts of the NMU provision and Chapter 3 discusses the alternative options that were considered.

2.13 Agricultural accommodation works

2.13.1 Agricultural accommodation works include works to reconnect any land drainage or land access severed or blocked by the Scheme, during construction and operation. A number of agricultural access points would be relocated and diverted due to the Scheme. These accommodation works have been determined in principle at this stage so that sufficient land is available, and they would be designed during the detailed design phase of the Scheme. Consultation would be undertaken with landowners so that accommodation works would suit their requirements, where reasonably practicable to do so, and would enable continued operation of farm vehicles.

2.13.2 The proposed accommodation works would be provided as part of the construction works. If necessary, temporary accommodation works would be provided during the construction period.

2.13.3 Chapter 13 (People and Communities) provides more detail on the proposed accommodation works.

2.14 Materials

2.14.1 It is expected that fill material would need to be imported to the site. The estimated bulk earthworks cut volume would be 9,619 m^3 compared to an estimated fill volume of 69,244 m^3. Therefore, the anticipated overall volume of imported fill required would be 59,625 m^3. These volumes have been derived from the preliminary design and are subject to change as the design progresses.

2.15 Construction programme

2.15.1 It is expected that the majority of construction works would normally take place between 07.30 - 18:00 Monday to Friday and 08:00 to 13:00 on Saturday. There may be exceptions to these hours for oversize deliveries, and junction tie-ins, etc. In addition, there are likely to be extended working hours in the summer months for the earthworks to take advantage of the weather or daylight.

2.15.2 Night-time construction work would be required to allow for installing beams, decking and parapets. This would be undertaken at night to minimise disruption to the strategic road network.

2.15.3 While preparing the construction programme and the traffic model for the Scheme, consideration has been given to the Nissan Plant shift changes and Nissan Motor Manufacturing UK have been consulted throughout the Scheme development. The traffic model for the Scheme outlined in Section 2.10 of this ES has been developed based on peak flows using Nissan Plant shift changes.

Construction enabling works phase

2.15.4 Subject to development consent being granted, construction work would start in Autumn 2020 and be completed by Spring 2022, there is a potential the construction programme could be accelerated to complete in 2021. The first phase of the works would comprise enabling activities including:

- construction of the main site compound, access and haul roads;
- certain environmental mitigation works;
- site clearance and fencing;
- establishment of traffic management; and
- construction of drainage features.

2.15.5 There is some statutory undertaker's apparatus owned by BT, Northern Gas Networks, Northumbrian Water and Northern Powergrid within the footprint of the Scheme, adjacent to the A1290; consultation is on-going with Statutory Undertakers to agree the necessary protective provisions and where necessary diversions or works to protect their assets.

Construction main site compound and haul roads

2.15.6 The initial work on site would involve construction of a main site compound located to the north-east of Downhill Lane (East), with additional storage areas located to the south of Downhill Lane (East) and to the west of Washington Road (see Figure 2.4). the main site compound of a construction site is used for general storage, traffic management and office-based administrative / welfare purposes.

2.15.7 With the Testo's and Downhill Lane junction improvement schemes expected to be under construction within the same timeframes, it would be possible for the Scheme to share the use of the Testo's scheme's main site compound.

2.15.8 Haul roads would be created within the temporary land take areas to facilitate the movement of plant and materials around the Scheme and minimise the use of the local road network. Temporary land take areas would be subject to topsoil stripping and the main site compound and haul roads would be constructed using suitable aggregate material to facilitate the movement of vehicles. Access to the main site compound and the associated haul roads to the east of the Scheme would be from Downhill Lane (East). Access to storage areas and working areas to the west of the Scheme would be from the A1290. The use of the strategic road network has been minimised as much as possible, however there may be occasions where construction traffic would be required to use the A19 both from the south and also from the north. These traffic movements have been taken into account during the EIA process and have informed the development of the specialist chapters as appropriate. A traffic management plan would be developed prior to the start of construction that would outline specific traffic management controls.

2.15.9 There are no temporary roads to be retained for maintenance. There would be two permanent maintenance accesses and these are identified on the Works Plans (DCO application reference TR010024/APP/2.4) as Works 1 and 12.

Site clearance and mobilisation

2.15.10 Site clearance activities which would take place throughout the construction works would include removal of redundant pavements and associated concrete kerbs, for example for the realignment of Washington Road. Topsoil stripping activity would be required for temporary

land take areas to the west and east of the Scheme. Topsoil would be retained and stored on site for reinstatement of temporary areas on completion of the Scheme. There would be approximately 1 hectare of structures (pavements, existing roads, concrete kerb) cleared from the Scheme and approximately 22 hectares of vegetation clearance (open fields, woodland areas and hedges).

2.15.11 Prior to any construction work commencing, there would be a mobilisation period, including traffic-management installation and site enabling works. Traffic management would typically comprise lane closures, lane narrowing and speed restriction for the duration of the works, with supporting temporary CCTV cameras. However, the contractor would be required to keep two lanes of traffic open in each direction throughout the contract during peak hours. Full closures will would be required during occasional night closures (e.g. for installing bridge beams).

2.15.12 A Traffic Management Plan would be developed for the Scheme, prior to construction, which would outline the specific traffic management proposals. This would be produced during the detailed design stage of the Scheme.

Main construction works

2.15.13 The main construction works would be divided into 5 phases, these construction phases are not completely discrete and there would be some overlap in different areas of the construction site.

Construction phase 1A

2.15.14 Phase 1A works are planned to take place between Autumn 2020 and Spring 2021.

2.15.15 During phase 1A, traffic would remain on the existing roads, while works would begin 'offline' to the south-west of the existing junction, including works to the northbound diverge slip road and the west side of the roundabout.

2.15.16 Work would also commence on the offline section of the A1290 approaches.

2.15.17 To the south and south-east, work would commence on construction of the new temporary Washington Road link and on the substructure for the NMU bridge.

Construction phase 1B

2.15.18 Phase 1B works are planned to take place between Autumn 2020 and Spring 2021 and would overlap with phase 1A. Phase 1A offline works on the west side of the roundabout and to the south-west of the Scheme would continue.

2.15.19 To the east of the Scheme, traffic to and from Washington Road would be moved to the new temporary link road.

2.15.20 The construction of a temporary southbound merge slip road would also commence.

2.15.21 The substructure of the NMU bridge would be completed.

Construction phase 2

2.15.22 Phase 2 is planned to last between early 2021 and early 2022.

2.15.23 The east and west bridge abutment installations for the southern bridge are planned from Spring 2021 to Summer 2021.

2.15.24 The new bridge deck for the southern bridge and the NMU bridge would be installed. This is likely to require a few overnight road closures, including for the A19 mainline, to carry out the required lifting operations. Suitable diversion routes would be established during the period of closure. These diversion routes are still subject to confirmed, although it is anticipated that these would be the same routes as those used currently by the road operator, which make use of other parts of the strategic road network.

2.15.25 The new southbound merge slip road would be constructed while traffic would be moved to the completed temporary southbound merge slip road.

Construction phase 3

2.15.26 Phase 3 is expected to last from Autumn 2021 to early 2022.

2.15.27 During this phase the junction would start to operate as a single lane roundabout, while upgrades would be taking place to the southern part of the existing northern bridge.

2.15.28 The connection between Downhill Lane and the roundabout would be completed during this phase.

Construction phase 4

2.15.29 Phase 4 is planned to last from early 2022 through to completion of the works in early 2022, and overlaps with Phase 3.

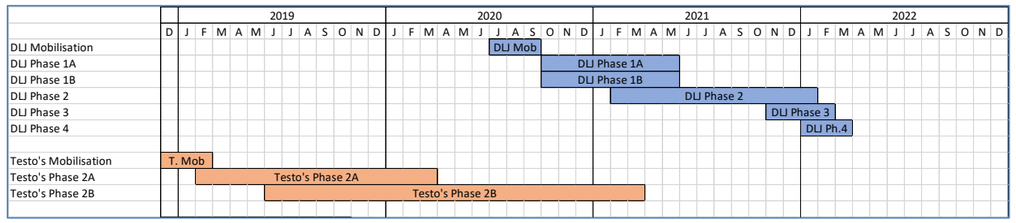
2.15.30 Traffic would be switched to the other side of the northern bridge, allowing upgrade works to be undertaken on the northern side of the bridge deck.

2.15.31 Removal of the temporary link roads, temporary slip road and the old Washington Road junction.

2.15.32 Landscaping works, including planting would be undertaken within this phase during 2022.

2.15.33 Illustration 2.4 shows the construction programmes for the Scheme in relation to the Testo's scheme.

Illustration 2.4: Overview of Downhill Lane and Testo's construction programmes



Construction activities

2.15.34 A CEMP would control construction operations that could have an impact on the environment. The CEMP includes an 'Environmental Aspects Register', listing such operations and the activities ('environmental aspects') that the Scheme requires that could have environmental impacts. Some activities appear as several different aspects, because they can have more than one type of environmental effect.

2.15.35 Each environmental aspect is graded as 'no significance', 'medium priority' or 'high priority', on a risk assessment basis (i.e. using a calculation based on the potential severity of the effect and its likelihood of occurrence). For all medium or high priority aspects, control measures are identified to prevent the occurrence of an impact, or reduce the scale of impact.

2.15.36 The outline CEMP for the DOC application would be further developed during the detailed design phase of the project. Key operations to which these aspects relate are as follows:

- setting-up, operating and removing the main site compound;
- delivery, storage and handling of fuels and other oil-based materials;
- delivery, storage and handling of other materials, including bulk materials such as soils and imported fill;
- clearance of vegetation;
- top-soil stripping;
- excavation to form cuttings and formation of embankments;
- demolition works – planning out the existing carriageway and burning off road markings;
- construction of drainage – especially grouting and concrete pouring;
- construction of structures (e.g. bridges) – especially concrete pouring;
- waste management; and
- operation of plant and equipment (especially leakage or spillage of fuel or oil and cleaning of plant).

2.16 Maintenance proposals

2.16.1 Operational maintenance of the A19 would experience relatively few changes as compared to the current situation. Maintenance of the trunk road network is the responsibility of Highways England, whilst maintenance of the local road network is the responsibility of the local authorities. These arrangements would apply to the Scheme, meaning that the A19 mainline, structures, link roads and slip roads would be maintained by Highways England. The circulatory carriageway would be the responsibility of South Tyneside Council. The local authorities would have responsibility for Downhill Lane (East) and (West), Washington Road and the A1290.

2.16.2 Existing maintenance activities include inspection and repair of barriers and signage, drain inspection and clearance, road repairs and road verge / vegetation maintenance (amongst other activities). For Highways England and parties acting on their behalf, future maintenance activities would include these same tasks, plus the addition of inspection and maintenance of the new bridge and drainage attenuation features. Highways England and parties acting on their behalf would be responsible for maintaining vegetation clearance on NMU routes within their tenure and local authorities would be responsible for maintenance outside of Highways England's tenure.

Decommissioning

2.16.3 Decommissioning has not been considered during the EIA process. This is due to the fact that road schemes have very long operational life times and most likely to be subject to a consent application, with supporting environmental assessment, as part of any future changes.

2.17 Environmental design principles and embedded mitigation

2.17.1 The design of the Scheme was developed with the following Highways England design principles in mind:

- Good road design makes roads safe and useful.
- Good road design is inclusive.
- Good road design makes roads understandable.
- Good road design fits in context.
- Good road design is restrained.
- Good road design is thorough.
- Good road design is environmentally sustainable.
- Good road design is innovative.
- Good road design is long-lasting.
- Good road design is a collaborative process.

2.17.2 Further to the above, it is important to recognise that a number of design decisions were made that embedded measures, within the design before being assessed, that have avoided or minimised the risk of environmental impacts, thus are not presented as mitigation recommendations within this ES. The following measures demonstrate the integration of environmental mitigation into the development of the proposed design prior to commencing the assessment and recommendation of additional environmental mitigation presented within this ES:

- Locating the main site compound north of Downhill Lane (East), moving away from the proposed location south of Downhill Lane (East), to reduce construction disturbance impacts to residents of Town End Farm.
- Selecting fields for temporary storage to avoid those of high ecological value (e.g. beside Town End Farm).
- Designing the new drainage system to avoid an increase in run-off rates (incl. from climate change increases) into local watercourses from new hard surface areas and maximising the use of vegetated storage solutions which would reduce pollution entering those watercourses.
- Engaging the Local Access Forum and public in the selection of the NMU proposals to take account of local users' needs and concerns.
- Landscape planting retained, where possible, to maintain existing visual screening (esp. between Town End Farm and the A19) and avoid visual impacts during construction and the operational re-growth period.
- Embracing lighting technology to improve the existing lighting network to achieve energy and carbon emission savings, maintenance savings, reduced environmental implications and a safer network.
- Use of internal haul roads used to minimise plant movements on the local road network.
- Keeping open the existing road and NMU network (apart from occasional overnight temporary closures / diversions) to avoid impacts (noise, air quality, driver stress, etc.) of temporary major road diversions.
- Retaining the NMU connectivity across Downhill Lane during construction to avoid temporary loss of access and associated stress on NMU users, especially those commuting to the Nissan Plant.

2.17.3 The above measures also demonstrate Highways England is meeting its legal duties, as the Licence holder under Section 5 of the Infrastructure Act 2015: minimise the environmental

impacts of operating, maintaining and improving its network and seek to protect and enhance the quality of the surrounding environment (section 4(g)); and conform to the principles of sustainable development (section 4(h)).

2.18 Design uncertainties, limits of deviation and the 'Rochdale envelope'

2.18.1 The design has been developed to a level of detail that is sufficient to provide confidence during examination of an application for a DCO, with due consideration given to aspects of the design that have not yet been fixed in the light of Planning Inspectorate Advice Note 9 'Using the Rochdale Envelope'. This information is based on a preliminary Scheme design of July 2018.

2.18.2 Where there are specific areas of uncertainty, or potential alternative designs still under consideration, these are identified within the Scheme description and the limitations statements in Section 5.4 and the specialist assessment chapters of this ES. The detailed design will continue up until construction, but any changes will not be significant. A limit of deviation has been defined in the DCO (DCO application reference TR010024_APP_3.1) and incorporated into the design to allow for adjustments during the detailed design stage without causing significant changes to the effects presented in this ES. In considering this vertical limit of deviation, it should be noted that there are restrictions on where it can practically be applicable (principally in the vicinity of the new bridge over the A19 carriageway) as in other areas the Scheme has to tie in to existing highway levels. All members of the EIA team were briefed on the limits of deviation and the design uncertainties before beginning their assessment work, and these factors were taken into account throughout the assessment to ensure that it was based on a 'reasonable worst-case' scenario. This is so that the permanent and temporary land-take boundaries would not be exceeded and to provide confidence that the EIA covers all eventualities.

CHAPTER 3 CONSIDERATION OF ALTERNATIVES

3.1 Origins of the Scheme and strategic alternatives

3.1.1 Downhill Lane junction was considered as a combined project with the A19 / A184 Testo's Junction Improvement Scheme until 2016. However, the Testo's scheme was then progressed separately since it was at a more advanced stage and was required to meet a separate transport network improvement need.

3.1.2 The Road Investment Strategy Part 1 (RIS 1) for the 2015/16 to 2019/20 Road Period, published by the Department for Transport, announced that Downhill Lane junction would be improved to support local plans for development, such as the IAMP to the north of the existing Nissan Plant.

3.1.3 The A19 Downhill Lane Junction Improvement Scheme is being designed to meet the key objectives outlined in Section 2.1 of this ES and as set out in the Planning Statement (DCO application reference TR010024_APP_7.1).

3.2 Design options examined

3.2.1 Consideration of potential options to improve Downhill Lane junction was undertaken primarily through a sifting process, which involved a spreadsheet based scoring against defined criteria and objectives, including the environmental considerations of each option. 25 options were scored against the spreadsheet criteria, which resulted in six options being taken forward, as outlined below.

3.2.2 Six options (A to F) were shortlisted for consideration in 2016:

- **Option A** – A new bridge would be constructed to the south of the existing Downhill Lane bridge, creating a roundabout over the A19. The improvement would require re-alignment of Washington Road and Downhill Lane to the east of the junction. The existing northbound diverge and southbound merge at Downhill Lane junction would be modified to provide connectivity between the A19 mainline and the proposed grade separated roundabout. New northbound and southbound link roads would connect the Downhill Lane junction to the Testo's roundabout junction, located approximately 1.2 km north of Downhill Lane junction.
- **Option B** – A new bridge would be constructed to the south of the existing Downhill Lane bridge creating a roundabout above the A19. To the north, a diverge from the northbound merge slip road would merge with a northbound link road from Downhill Lane junction, providing connectivity to the Testo's roundabout junction. A19 southbound traffic for Downhill Lane junction would leave the A19 at Testo's junction and use the southbound link road. To the south, there would be a southbound merge slip road and a north bound diverge slip road to and from the A19 mainline. Additional 'segregated left turn' lanes would be added for north bound traffic leaving the A19 and northbound traffic from the A1290, to join the A19 via Testo's junction.
- **Option C** – A new bridge would be constructed to the north of the existing Downhill Lane bridge creating a roundabout above the A19. To the north, the slip roads would be realigned to provide link roads connecting to the Testo's roundabout junction. A19 northbound traffic would leave for Testo's junction via a new diverge north of Downhill Lane. A1290 northbound traffic wishing to join the A19 at Downhill Lane junction would do so via Testo's junction. To the south, same as Option B.
- **Option D** – A new bridge would be constructed to the north of the existing Downhill Lane bridge, creating a roundabout above the A19. To the north, the slip roads would be re-aligned to provide link roads connecting to Testo's roundabout. A19 northbound traffic would leave for Testo's junction via a new diverge north of Downhill Lane. A1290 northbound traffic wishing to join the A19 at Downhill Lane junction would do so via Testo's junction. To the south, same as Option B.
- **Option E** – A new bridge would be constructed to the south of the existing Downhill Lane bridge to carry south bound traffic leaving the A19 on to the A1290. This option would provide the same solution as the other options for southbound traffic at Downhill Lane junction. For northbound traffic, a new junction would be constructed to the west of the A19 north of the Nissan Plant. This roundabout would provide improved access for northbound A19 traffic via new slip roads. A19 northbound traffic would leave for Testo's junction via a new diverge north of Downhill Lane. A1290 northbound traffic would join the A19 without having to negotiate Testo's junction, unlike the other options. To the east, Downhill Lane and Washington Road would be realigned to allow a larger gyratory.
- **Option F** – New northbound exit and entry slip roads would be constructed to the south-west of Downhill Lane junction. The slip roads would be positioned in the area of land to the north of the Nissan Plant and connect to the A1290. The new slip roads would provide direct access to and from the A19 northbound carriageway.

3.2.3 Further consideration of these options resulted in the rejection of options (as outlined in Table 3-1) that included a new bridge to the north of the existing road bridge at Downhill Lane. Construction of a bridge to the north would lead to impacts on the River Don corridor and associated protected species within the Local Wildlife Site, therefore options relating to a northern bridge were discounted.

3.2.4 The rationale behind the option selection is complex and includes a number of non-environmental factors. The main environmental factors influencing the option selection were:

- Avoiding the River Don Corridor – the River Don is home to a number of protected species, including Water Voles and Otters. It is also a designated Local Wildlife Site. Options were discounted that would involve working within the River Don, which would help to minimise the effects of the Scheme on these ecological receptors. This resulted in discounting Options B, C and D; all of which would have required work to the River Don A19 culvert to construct the Scheme.
- Land Take – there are a number of agricultural receptors in the area and also land allocations that are earmarked for potential development. This contributed to the rejection of Options E and F.
- Landscape considerations were similar across all the options, with each having some adverse effects on visual receptors. Options E and F would have moved traffic closer to residential properties at The Chalet and Usworth Cottages and would have had adverse noise effects in this area. There were no significant air quality effects across any of the options considered.

3.2.5 Option A (see Illustration 3.1) was taken to a public consultation in December 2016 as the preferred option because it would:

- be the most cost effective option, providing similar or greater benefits to other options, but at a lower cost;

- provide the best fit with the Testo's preferred route design so it would have no impact on the programme to deliver the improvements at Testo's junction;
- require the least land take of all the options, minimising the impact on the proposed development site and the surrounding environment; and
- be one of the simplest options to construct as it would not require work within the River Don corridor or work to divert the Northern Powergrid overhead power lines.

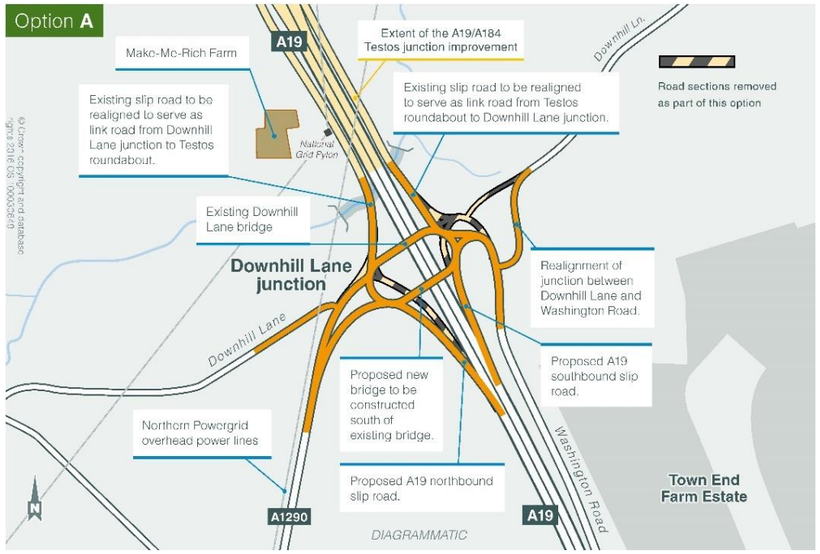


Illustration 3 1: Option A at December 2016 consultation

3.2.6 Environmental considerations had been taken into account, including land take and effects of the River Don and its associated habitat. Option A would require the least land take of all the options and would not require work within the River Don corridor.

3.2.7 The scheme description presented in Chapter 2 reflects some design refinements in response to consultation feedback and design development for buildability, such as changing the eastern connection between Downhill Lane junction and Washington Road. The final alignment with the Testo's junction DCO boundary was also reviewed prior to fixing the Scheme layout (see Illustration 2.1). These resulted in the Scheme layout being slightly different to Option A outlined above.

3.2.8 Some additional changes were made to the design in July 2018 as a result of the IAMP One development being granted planning permission. This included: amendments to the lane layout on the A1290; changes to the drainage design to include the addition of a third attenuation pond beside the A1290; and also a refinement of the NMU proposals, to move the NMU crossing of the A1290 further south to tie in with Follingsby Lane, instead of Downhill Lane (West), as the lane will become a new NMU route through IAMP One to Hylton Bridge.

3.2.9 The reasons for discounting options B to F are presented in Table 3-1.

Table 3-1: Summary of reasons for rejecting options B – F

Discounted Option	Reason for Rejecting
B	• Strengthening works would be required to the River Don culvert which would increase costs. • Safety concerns over traffic interaction on the northbound link road. • Significant additional land would be required east of Make-Me-Rich farm. • Northern Power grid overhead lines supplying the Nissan Plant would need diversion works. • Maintenance access issues for the National Grid pylon. • Not directly compatible with the preferred route announced for the Testo's scheme.
C	• Strengthening and extension of the River Don culvert would be required, which would increase costs and impact on the natural habitat of the local wildlife site. • Significant additional land would be required east of Make-Me-Rich farm. • Maintenance access issues for the National Grid pylon. • Northern Power grid overhead lines supplying the Nissan Plant would need diversion works. • Not directly compatible with the preferred route announced for the Testo's scheme.
D	• Strengthening and extension of the River Don culvert would be required, which would increase costs and impact on the natural habitat of the local wildlife site. • Poor ground conditions for construction of the new bridge to the north of the existing junction. • Significant additional land would be required east of Make-Me-Rich farm. • Northern Power grid overhead lines supplying the Nissan Plant would need diversion works. • Maintenance access issues for the National Grid pylon. • Not directly compatible with the preferred route announced for the Testo's scheme.
E	• Requires considerably more land take than all other options. • Requires a significant area of land which is earmarked for development. • Not directly compatible with the preferred route announced for the Testo's scheme.
F	• Does not meet the scheme objectives for improving Downhill Lane junction. • Requires a significant area of land which is earmarked for development. • Not directly compatible with the preferred route announced for the Testo's scheme.

3.3 Non-Motorised User Options

3.3.1 A number of NMU proposals were identified for the Scheme, which have been discussed and consulted upon with the Tyne and Wear LAF and as part of the public consultation for the Scheme. Further information on consultation is provided in Chapter 4 (Consultation).

3.3.2 A total of 4 options were originally identified as solutions for NMU provision for the Scheme, which are outlined in Table 3-2 below, along with the key feedback based on consultation.

Table 3-2: Screening of NMU options

NMU Options	Key Concerns from Consultation Feedback
Option 1: An at-grade solution retaining the existing desire-line, crossing directly over the existing bridge between Downhill Lane to the east and the A1290/Downhill Lane to the west. The NMU facility would be widened on the north side of the existing bridge with at-grade crossings of the northbound on-slip to the A19 and the southbound off-slip, as well as Downhill Lane and Washington Road to the east. The at-grade crossings would be signalised where possible, but it was noted that there is a strong desire from other stakeholders for free-flow lanes on the northbound on-slip and this would not be compatible with a signalised crossing.	• The location of the signalised crossing for Option 1 was not ideal, coming just after the exit from the roundabout and there was concern that Option 1 would continue to be difficult for NMUs to navigate as the signalised crossing would be complex and in inconvenient locations. There were also safety concerns having the crossings so close to the junction. • In general, all options utilising underpasses were not preferred. Concerns about difficulties for horse riders in accessing the underpasses were raised and also anti-social behaviour concerns within the underpasses. • Noise was a concern for Options 2 and 4 as NMUs would be confined within the roundabout at different levels while using the facility, with specific concerns about the effect of noise on horses.
Option 2: A mainly grade-separated solution, using an underpass beneath Downhill Lane to the east and three underpasses beneath segments of the roundabout to link the NMU facilities either side of the junction to the interior of the roundabout. Looped ramps would raise the facility to the level of the new, southern bridge to cross the A19. The relative levels do not permit the use of an underpass to cross from the interior of the roundabout to Downhill Lane to the west, so this link is achieved with an at-grade signalised crossing, in two stages via a traffic island.	
Option 3: A mainly grade-separated solution using a dedicated NMU bridge to cross the A19. The bridge would be located approximately 200 m south of the new south bridge at the junction. An at-grade crossing would be provided over Downhill Lane to the east and an underpass beneath Washington Road. It was assumed that the facility to the west would tie-in to provision being made by the IAMP on the A1290 and no specific crossing provision has been identified for the A1290, but it is recognised that a crossing facility would be required.	
Option 4: A variant of Option 2, with one less underpass (using an at-grade crossing of Downhill Lane instead of an underpass).	

3.3.3 As a result of the feedback outlined in Table 3-2, the NMU options were amended and two options were taken forward to public consultation in September 2017, as follows:

Option 1B

3.3.4 Option 1B (see Illustration 3.2) would provide NMU routes through Downhill Lane junction via a combination of at-grade crossings; located at signalised points around the roundabout and an independent NMU bridge over the A19 within the junction roundabout. Where possible the NMU route would be taken away from the carriageway to provide separation of NMU and motorised traffic.

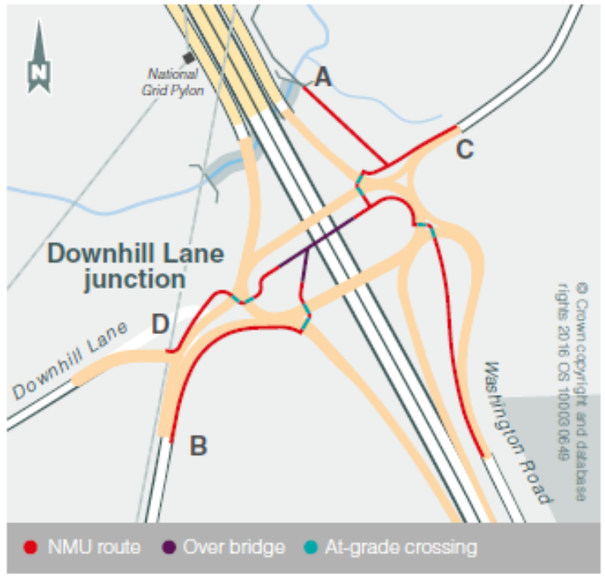


Illustration 3.2: NMU Option 1B

3.3.5 This option offers the shortest journey lengths in terms of distance and is closer to the 'desire line', identified in Appendix 13.1 NMU Context Report; it also avoids the need for an underpass. However, the route would require waiting at the at-grade crossings located at the traffic lights on the proposed roundabout, it would involve a greater number of signalised crossings and is therefore a longer journey time for cyclists when compared to Options 2A/2B. It would not be fully segregated from traffic.

Options 2A/2B

3.3.6 Options 2A2/B (see Illustration 3.3) would provide NMU routes around Downhill Lane junction via a separate NMU bridge over the A19 and Washington road, located to the south of the junction, and either an at-grade signalised crossing of (Option 2A) or underpass beneath (Option 2B) Downhill Lane. Where possible, the NMU route would be taken away from the carriageway to provide separation of NMU and motorised traffic. Estimates of change in journey times take into consideration an at-grade signalised crossing of Downhill Lane junction.

3.3.7 Both Options 2A and 2B could potentially be fully segregated from traffic. The options offer an opportunity for adaptation to integrate with the future IAMP proposals and, where an underpass

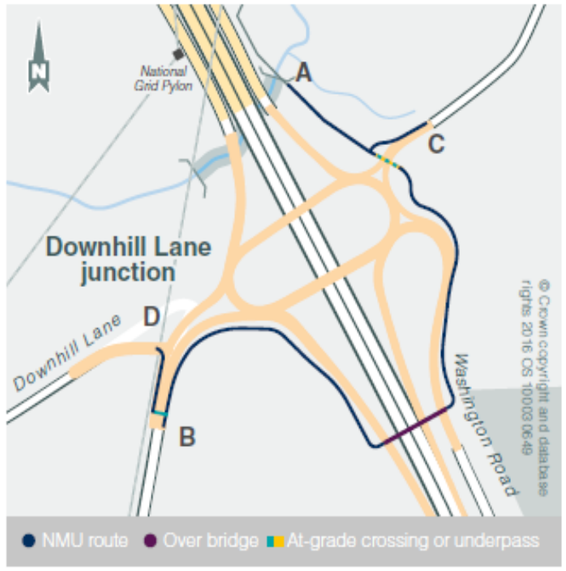


Illustration 3.3: NMU Options 2A/2B

is used, journey times would be quicker. However, these options have the longest journey length in terms of distance and deviates from the desire line. The height required to span Washington Road and the A19 results in a tall bridge with probable significant visual impacts.

3.3.8 Based on feedback from the LAF and public consultation, Option 2A was identified as the preferred NMU route in November 2017. Option 2A was selected for the following reasons:

- The inclusion of an underpass was generally not preferred as a result of concerns about anti-social behaviour; and
- It would provide for full segregation of NMUs and vehicular traffic, which would improve safety.

3.3.9 The NMU route described in Section 2.12 of this ES reflects some refinement to the proposals to include ramped access to the NMU bridge in order to meet the slope profile required for equestrian riders and achieve the necessary gradient to access the bridge.

3.3.10 Further refinements were included in July 2018 to achieve tie in with the IAMP One development; see Illustration 3.4. This included removal of the NMU link to be provided on the west side of the A1290 up to Downhill Lane (West). The new route would link with the existing NMU provision on the eastern side of the A1290 and head south towards the Nissan Plant. The proposed A1290 Pegasus Crossing would be moved south to the junction of the A1290 with Follingsby Lane, which would be closed to vehicle access by IAMP One and converted into an NMU corridor; thus, the Scheme 's NMU route would link with the NMU corridor through IAMP One to Downhill Lane (West) at Hylton Bridge Farm. The vast majority of the NMU movements are Nissan workers, so would not be affected by the change. The Local Access Forum and Local Authorities preferred full segregation from the new Downhill Lane circulatory and the forecast increased traffic flows.

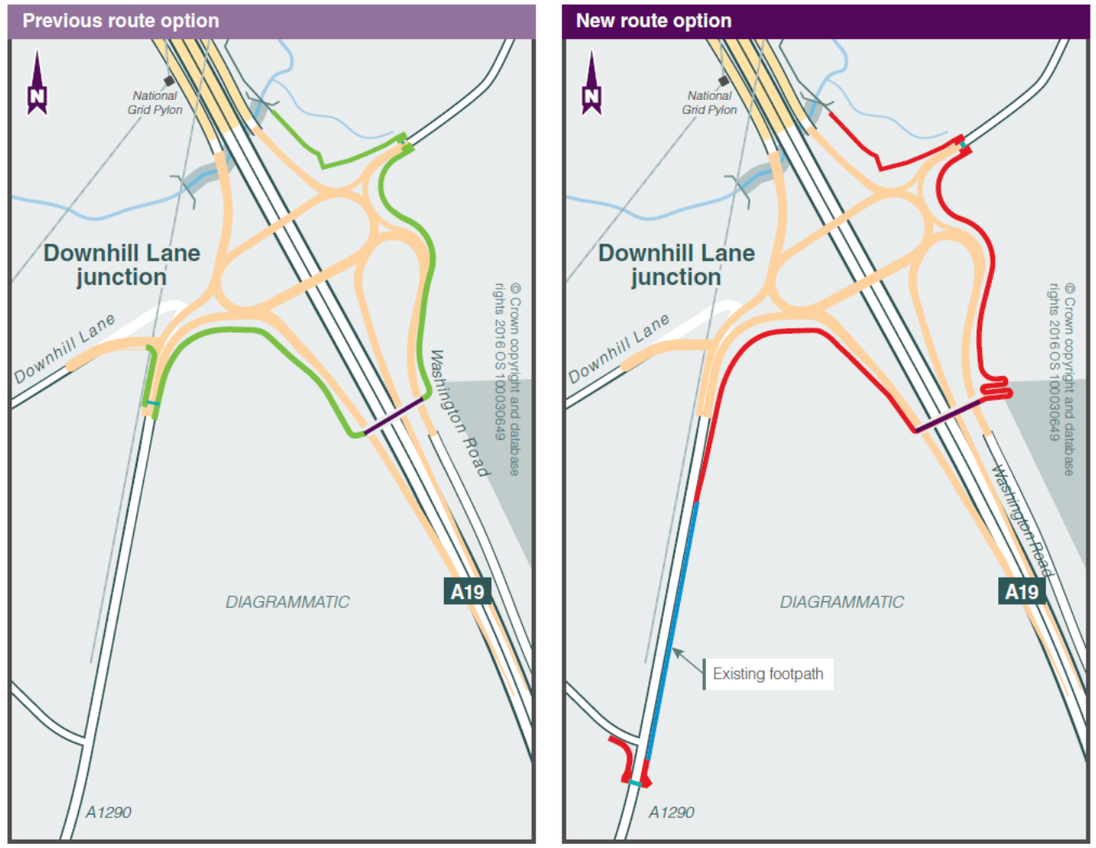


Illustration 3.4: A comparison between the proposed Non-Motorised User route and the previous one presented in November 2018

3.3.11 In November 2018, Highways England presented the plans for the Scheme to maintain an existing non-motorised user route north-east of Downhill Lane junction which would otherwise be replaced by a non-motorised user route that has been consented in the Testo's scheme DCO, but that is not yet built. A full description of the amendment and revised plans, drawings and sections for the A19/A184 Testo's Junction Alteration Scheme are available in DCO application document reference TR010020/APP/7.5.

CHAPTER 4 CONSULTATION

4.1 Purpose of consultation

4.1.1 Consultation has been key to the Scheme from the outset. Consultation was undertaken between 2006 and 2017 on the A19 / A184 Testo's Junction Improvement Scheme, which covered the Downhill Lane area even though the A19 Downhill Lane Junction Improvement Scheme was not announced until 2014. Relevant information from these consultations, applicable to the Scheme, have been taken into account while developing the current design for the Scheme. Independent consultation, specific to the Downhill Lane junction, was undertaken in 2016, 2017 and 2018.

4.1.2 Consultation throughout has included consultation on environmental aspects of the Scheme including, where relevant, the EIA. This chapter focuses on the environmental aspects of consultation.

4.1.3 The A19 Downhill Lane Junction Improvement Scheme Consultation Report (DCO application reference TR010024/APP/5.1) provides more details on consultation activities, stakeholder feedback and amendments to the Scheme based on this feedback. The consultation report forms part of the DCO submission and is available on Highways England's website and the Planning Inspectorate's website.

4.1.4 Consultation has been broadly divided into two main components – consultation with the community, and consultation of statutory environmental bodies and other third parties.

4.1.5 The consultation process for the Scheme was intended to address any or all of the following purposes:

- obtain factual information about the environment;
- obtain advice or comment on the scope of the EIA work;
- obtain comment and advice about the environmental merits of the Scheme or strategic environmental issues it may affect;
- obtain comment and advice on the factors influencing our assessment of how significant each environmental impact may be;
- obtain advice about potential design changes or other measures we could take to remove or reduce impacts or make them less significant; and
- obtain advice or comment about the methods proposed in this report.

4.2 Timeline of Consultation

4.2.1 A simplified timeline of consultation is set out below, with early consultation undertaken when Testo's and Downhill Lane were considered as a combined scheme:

- 2016 – formal consultation with key businesses, land interests environmental and other stakeholders in the local community and local area and the general public regarding two Scheme options.
- 2017 – formal consultation on the EIA scope, through the Planning Inspectorate in accordance with the EIA Regulations.
- 2017 – preferred route announcement made in June 2017.
- 2017 – statutory consultation as required by Section 42 and Section 47 of the Planning Act, undertaken between September and October 2017.
- 2018 – formal consultation with key stakeholders to discuss the EIA results and proposed mitigation.
- 2018 – formal consultation with key stakeholders, land interests and businesses in relation to design amendments.

4.3 Consultation on options

4.3.1 A non-statutory public consultation was undertaken between 21 November 2016 and 6 January 2017 to receive feedback on two design options; Option A and Option B (as outlined in Chapter 3).

4.3.2 Highways England hosted two public consultation events during the period and information was also posted to homes in the area. Information was also made available online.

4.3.3 Overall there was general support from the public and the local authorities for the Scheme and the majority were in support of Option A (preferred route). The outcomes of this consultation are given in the Consultation Report (DCO application reference TR010024/APP5.1).

Preferred route development

4.3.4 Following the consultation in 2016/2017 and taking into account the responses received from the public and local authorities, the preferred route announcement was made in June 2017 confirming Option A as the preferred route for the Scheme.

4.3.5 Following on from the preferred route announcement, further design refinement and ongoing consultation led to the need to amend the footprint of the Scheme. Further consultation on the design refinements was undertaken during 2018 with key stakeholders, businesses and statutory consultees.

4.4 Consultation with third parties on EIA matters

Consultation with the Planning Inspectorate on the scope of the EIA

4.4.1 Consultee bodies under the Planning Act 2008 are defined by the Planning Inspectorate's Advice Note 3 'EIA Consultation and Notification' (version 6, June 2015).

4.4.2 The consultee bodies were consulted on the Scoping Report issued to the Planning Inspectorate in May 2017. The Planning Inspectorate approached 61 consultation bodies before the Secretary of State's Scoping Opinion was provided. Eleven of these consultation bodies replied within the statutory deadline and two replied outside of the deadline. Several responses to the consultation were to state that the body had no comment, while other bodies gave comments regarding the Scheme but were not relevant to the EIA. The Scoping Opinion was received on 23 June 2017 and was considered when completing the EIA and preparing the ES.

4.4.3 The consultee bodies that provided feedback to the Planning Inspectorate were:

- Durham County Council;
- Historic England;
- Natural England;

- North Tyneside Council;
- Northumbrian Water;
- Public Health England;
- Royal Mail;
- South Tyneside Council;
- Sunderland City Council;
- The Coal Authority;
- The Environment Agency; and
- The Health and Safety Executive.

4.4.4 Both the original Scoping Report and the Scoping Opinion are available on the Planning Inspectorate's website. The Scoping Opinion includes copies of all responses from consultation bodies to the Planning Inspectorate's consultation. Appendix 1.1 (PINS Scoping Opinion responses log) of this ES sets out a summary and analysis of the Scoping Opinion and of the responses. In addition, the Scoping Issue Log demonstrates how these comments have been taken into account during the EIA and within the ES.

4.4.5 Following receipt of the Scoping Opinion, ongoing consultation in relation to the Scheme focused on those consultation bodies who had responded expressing an interest in the Scheme. Selected additional organisations were also consulted, including some of the prescribed consultees who had not responded to the Planning Inspectorate consultation within the statutory deadline.

4.4.6 Consultation with third parties prior to receipt of the Scoping Opinion had been focussed on key environmental bodies (including, but not limited to the Environment Agency, Natural England and Historic England). In addition, South Tyneside and Sunderland City Councils were consulted in respect of their wide range of areas of interest and responsibility.

Consultation with South Tyneside Council

4.4.7 Consultation with South Tyneside has been ongoing throughout the EIA and preliminary design process. South Tyneside Council is very supportive of the Scheme and have provided invaluable input into the proposed NMU provision and also in relation to the ecological approach and mitigation (see Chapter 9 (Biodiversity)).

4.4.8 South Tyneside Council responded to the consultation undertaken by PINs. The council noted that a Flood Risk Assessment would be required for the Scheme (one has been included as Appendix 14.2 to this ES). It was also identified that the Council would like to see an updated ground investigation as the current report is from 2007. Further ground investigation was undertaken in April and June 2017 and information from this has been taken into account in Chapter 10 (Soils and Geology).

4.4.9 South Tyneside Council expressed its support for NMU Option 2A as the preferred solution.

4.4.10 During the examination stage for the Testo's scheme several issues were raised that have been taken into account during the preparation of the Downhill Lane Junction Improvement Scheme ES. These mostly centred around ecological matters relating to mitigation, such as landscape planting and habitat loss. Learning points from the Testo's scheme's DCO hearing have been incorporated into the development of the Downhill Lane Junction Improvement Scheme EMP, with habitats retained as much as possible and proposed mitigation reported in Chapter 9 (Ecology and Nature Conservation). Other issues resulting from the Testo's examination period were around the approach to cumulative effects, which have been taken into consideration within Chapter 15 (Cumulative Effects).

4.4.11 Consultation meetings were held with South Tyneside Council in June 2018 to discuss the outcomes of the EIA process and the proposed mitigation for the Scheme, including discussions on landscape, ecology, cultural heritage, land drainage and the cumulative effects assessment. Feedback included making sure that consideration for the absorption capacity of the surrounding environment in relation to the temporary displacement of birds resulting from the combined effects of IAMP, Testo's and Downhill Lane schemes had been considered within Chapter 9 (Ecology and Nature Conservation).

4.4.12 Feedback was also received on the long list of third party developments presented in Chapter 15 (Cumulative effects), with the details updated accordingly.

Consultation with Sunderland City Council

4.4.13 As with South Tyneside, consultation with Sunderland City Council has been ongoing throughout the EIA and preliminary design process. Sunderland City Council is supportive of the Scheme and the approach to the EIA outlined.

4.4.14 Sunderland City Council responded to the consultation undertaken by PINs. Specific comments related to the need for a Flood Risk Assessment, which is included as Appendix 14.2 to this ES.

4.4.15 Sunderland City Council expressed its support for NMU Option 2A as the preferred solution.

4.4.16 Sunderland City Council were also included in consultation on the outcomes of the EIA process and the proposed mitigation for the Scheme in June 2018. Feedback received was consistent with that of South Tyneside and has been incorporated into the relevant chapters within this ES.

4.4.17 Feedback was also received on the long list of third party developments presented in Chapter 15 (Cumulative effects), with the details updated accordingly.

Consultation with the Environment Agency

4.4.18 The Environment Agency has been consulted directly in relation to the drainage design, water quality, flood risk and the impacts on aquatic habitats. The Environment Agency also provided recommendations on the scope of the environmental assessments and on proposed mitigation measures. Up-to-date Information was also provided on the River Don.

4.4.19 The Environment Agency's response to the PINs consultation expressed support for a Water Framework Directive (WFD) assessment (which has now been undertaken and is provided in Appendix 14.3). The Environment Agency's comments in relation to flood risk in conjunction with IAMP have been considered within Chapter 14 (Road Drainage and the Water Environment) and Chapter 15 (Cumulative Effects). Information was also provided on the presence of two invasive species within 1 km of the Scheme, and this has been considered in Chapter 9 (Ecology and Nature Conservation).

4.4.20 During the Testo's examination period, a number of comments were raised surrounding the cumulative impacts of Testo's, IAMP and Downhill Lane and the methodology for assessing water quality, particularly for the River Don. The comments raised have been taken into consideration in Chapter 14 (Road Drainage and the Water Environment) and Chapter 15 (Cumulative Effects).

4.4.21 The Environment Agency were also consulted on the outcomes of the EIA process and the proposed mitigation for the Scheme in June 2018.

Consultation with Natural England

4.4.22 Natural England responded to the PINs consultation and provided a number of comments, which are outlined in Appendix 1.1. Natural England's comments have been considered and, where possible, guided the EIA and the design of the Scheme. Natural England raised the point concerning the Scheme taking into account the impacts of climate change. This has been included and has informed the assessment undertaken in Chapter 9 (Ecology and Nature Conservation).

4.4.23 Through the Testo's scheme's DCO hearing, a number of issues were raised regarding surveys for protected species. These have been taken into account in Chapter 9 (Ecology and Nature Conservation), although it should be noted that the Scheme would have no impacts on protected species.

4.4.24 Natural England were also consulted on the outcomes of the EIA process and the proposed mitigation for the Scheme in June 2018. Natural England confirmed the conclusion that there was no potential for the Scheme to have significant effects on any Natura 2000 site.

Consultation with IAMP LLP

4.4.25 Consultation with the IAMP LLP has been ongoing throughout the EIA and preliminary design process. IAMP LLP is supportive of the Scheme and has provided input into the proposed NMU provision, through attendance at the Local Access Forum (LAF) meetings. Discussions with IAMP have also focussed on the integration of the two schemes.

4.4.26 The continuing consultation has helped to provide input into the EIA in relation to programme, updates to the IAMP scheme and any pertinent environmental information. This has helped to develop the cumulative effects assessment in particular.

Consultation with Historic England & Tyne and Wear Archaeology Officer

4.4.27 Historic England responded to the PINS consultation and stated there were no comments to be made in relation to the Scheme.

4.4.28 Consultation with the Tyne and Wear Archaeology Officer, the South Tyneside Historic Environment Officer and Historic England was undertaken on the methodology used in the preparation of this report, and to identify any specific concerns regarding the Scheme.

4.4.29 The Tyne and Wear Archaeology Officer and Historic England confirmed they were content with the proposed scope of assessment.

4.5 Section 42 consultation

4.5.1 In 2017, Highways England conducted a consultation exercise, under Section 42 of the Planning Act, over a six-week period between 11 September and 22 October 2017. In relation to this ES the following prescribed consultees:

- Durham County Council;
- Environment Agency;
- Forestry Commission;
- Gateshead Council;
- Health and Safety Executive;
- Historic England;
- Natural England;
- Newcastle City Council;
- North Tyneside Council;
- South Tyneside Council;
- Sunderland City Council;
- The British Waterways Board;
- The Canal and River Trust;
- The Commission for Rural Communities; and
- Town End Farm Partnership.

4.5.2 These prescribed consultees were sent a consultation pack on the 25 August 2017, including:

- A covering letter;
- A copy of the Section 48 Notice, which provided background to the Scheme and detailed the upcoming consultation events;
- A link to the Preliminary Environmental Information (PEI); and
- A consultation brochure with enclosed questionnaire.

4.5.3 The Environment Agency highlighted concerns regarding potential flood risk with the proximity to the IAMP development and requested that this be taken into consideration within the ES. The Health and Safety Executive confirmed that the Scheme does not fall within any Major Hazard Site. Both South Tyneside Council and Sunderland City Council expressed support for the Scheme.

4.5.4 Responses were also received from Town End Farm Partnership, a property developer owning land to the south-west of the Scheme, and Hellens, a private contractor and developing company promoting land to the north of Town End Farm as housing allocation for inclusion in South Tyneside's emerging Local Plan.

4.5.5 Hellens supported developing NMU Option 2A as it provided the most separation of NMUs and vehicular traffic and had the greatest potential for integration with IAMP. Town End Farm Partnership responded to state that Option 2A was considered to be the least cost-effective.

4.6 Consultation with NMUs

4.6.1 A NMU meeting was held on 14 December 2016 and was attended by representatives of the Tyne and Wear LAF, including:

- Cycling UK;
- Gateshead Council;
- South Tyneside Council;
- Sunderland City Council;
- Sustrans;

- The British Horse Society; and
- The urban traffic manager for Tyne and Wear.

4.6.2 The meeting addressed potential effects on the rights-of-way network and identified the facilities that these groups would like to see incorporated into the design. The IAMP project coordinator was in the attendance and an update was provided on relevant aspects of the IAMP project and its potential interactions with the Scheme.

4.6.3 A further NMU meeting was held with the LAF on the 19 June 2017 to present four NMU options, two of which were subsequently modified and taken forward to the statutory consultation in September 2017.

4.6.4 In November 2017 a further meeting was undertaken with the LAF to discuss the results of the public consultation in September 2017. Option 2A was identified by the LAF to be the preferred option as it:

- provided separation of the NMUs and vehicular traffic and therefore offers safety benefits; and
- has no underpass, for which there was significant concern about anti-social behaviour.

4.6.5 Further information is included in the Consultation Report (DCO application reference TR010024/APP/5.1).

4.7 Consultation with the community – 'Section 47'

4.7.1 A statutory consultation was undertaken under Section 47 of the Planning Act 2008 in September, with two additional statutory consultations during 2018. These are summarised below.

September 2017

4.7.2 The consultation ran from 11 September to 22 October 2017. The main purpose of the community consultation was to engage with local residents, communities and stakeholders to provide information about the Scheme and an opportunity to raise concerns. In addition, the proposals were published for the public via notices under Section 48 of the Planning Act 2008.

4.7.3 With respect to the environment, the main document was the PEI report, prepared to inform community members before they responded to the consultation. The PEI provided information about:

- the existing environmental conditions;
- the environmental objectives of the Scheme;
- the potential environmental effects of the Scheme; and
- the planned environmental mitigation measures.

4.7.4 A Statement of Community Consultation (SoCC) setting out the arrangements for consultation, was issued on 11 September 2017. Alongside the SoCC, over 35,000 leaflets were distributed to local residents in the vicinity of the Scheme. The SoCC and the leaflets informed local residents and interested parties about the upcoming exhibition events and available consultation materials. The Section 47 consultation programme was publicised in the local newspapers and was also available at: http://www.highways.gov.uk/roads/road-projects.

4.7.5 Two public exhibition events were held on the 22 and 23 September 2017 at the Bunny Hill Community Centre and the Monkton Suite at the Quality Hotel, Boldon. These exhibitions included exhibition boards to provided information on the Scheme and also a virtual flythrough using 3D visualisations for the improvement area.

4.7.6 Consultation materials, including the PEI, were also available to view during the consultation period at the following locations:

- Boldon Village Hall;
- Bunny Hill Customer Service Centre;
- East Boldon Library;
- Gateshead Civic Centre;
- Hedworthfield Community Centre;
- Highways England (Leeds Office);
- Jarrow Library;
- Library at Hebburn Central;
- North Tyneside Council;
- Sunderland City Centre Customer Service Centre;
- The Quadras Centre;
- The Word Library; and
- Washington Library.

4.7.7 Additionally, the consultation materials were made available on Highways England's website for the duration of the consultation.

4.7.8 The outcomes of this consultation are reported in the Consultation Report, which is part of the DCO submission. Stakeholder concerns and comments regarding the environment have been considered, and where possible the Scheme design has been amended to address these concerns.

4.8 Additional consultation

July - August 2018

4.8.1 Following changes to the Scheme design, a further round of consultation was undertaken in February and March 2018 on the refined design then again in July and August 2018 on the design changes to accommodate IAMP One's planning approval, including relocating the A1290 NMU pegasus crossing to connect with IAMP One's Follingsby Lane NMU route.

November - December 2018

4.8.2 The third supplementary consultation followed design development to amend the Bridleway B46 realignment and provision proposed as part of the A19/A184 Testo's Junction Improvement Scheme.

4.8.3 The change provides the Downhill Lane scheme with the powers to stop up of the cycle-track approximately 265 m in length between Bridleway B46 and Downhill Lane Junction proposed under the A19/A184 Testo's Junction Alteration Development Consent Order 2018. This cycle-

track is not required as part of the Scheme as the desire line associated with the segregated NMU route, which is to be provided as part of the Scheme, renders the provision of the new cycle-track to be provided as part of the works for the Testo's scheme, obsolete.

4.8.4 The consultation also addressed the stopping up of the approximately 90 m of re-aligned section of Bridleway B46. As a result of this proposed change, the realigned section of Bridleway B46 is not required as part of the Scheme. The effect of this change is that the existing B46 bridleway is unaffected, as it would be under the Testo's scheme DCO. The above changes to the Testo's scheme DCO powers resulted in an extension to the DCO boundary east of the improved A19 southbound link from Testo's.

4.8.5 In addition, as per the previous consultation in Spring 2018, with both the Scheme and the Testo's scheme expected to be under construction within the same timeframe, it was proposed that the Scheme shares the use of the Testo's scheme main site compound. However, with the Testo's scheme expected to complete prior to the Scheme, it was proposed to extend the use of the Testo's scheme main site compound for general storage, traffic management and office-based administrative purposes until the completion of the Scheme.

4.9 Other consultation

4.9.1 Highways England has recently been granted development consent for the A19/A184 Testo's Improvement Scheme. This was undergoing the examination stage, including a number of hearings, during the development of the A19 Downhill Lane Improvement Scheme design and EIA. A number of learning points have resulted from these hearings (see Section 4.4 of this ES), that have been captured and used to influence the EIA process and the production of the ES.

4.9.2 A particular area of interest during the Testo's scheme DCO process related to the cumulative effects of the A19 Downhill Lane and A19/A184 Testo's junction improvement schemes with the IAMP development. Feedback from the Testo's scheme DCO process has been used to inform the scope and methodology for the assessments in this ES.

4.10 Environmental data requests

4.10.1 Information and data required for environmental assessments was requested from relevant environmental organisations. In Chapters 6 - 15, the organisations consulted and the type of information obtained have been reported. The main organisations consulted regarding environmental information and data were:

- South Tyneside Council;
- Sunderland City Council;
- Natural England;
- Environment Agency; and
- Historic England.

CHAPTER 5 APPROACH TO THE ASSESSMENT

5.1 Statutory legislation and scope of the EIA

5.1.1 The principal legislation governing EIA is the European Directive 85/337/EEC and its subsequent amendments, codified in Directive 2011/92/EU ('the EIA Directive') [10]. The EIA Directive is given effect in the UK by a range of different Regulations applicable to various sectors and geographic jurisdictions. In this case, the relevant Regulations are the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009, as amended.

5.1.2 Though newer EIA Regulations came into force in 2017, the 2009 EIA Regulations apply to the Scheme as a result of the Scoping Report being submitted to the Planning Inspectorate prior to 16th May 2017[11]. This approach was approved by PINS in the Scoping Opinion received in June 2017.

5.2 The Design Manual for Roads and Bridges

5.2.1 The design of major highway schemes is governed by guidance set out in the 15 volumes of the Design Manual for Roads and Bridges (DMRB). Volume 11 of the DMRB provides guidance on EIA that is specifically applicable to highway schemes. Volume 10 of DMRB covers environmental mitigation.

5.2.2 All EIA work and environmental reporting on the Scheme has been undertaken in accordance with guidance set out in the DMRB. The DMRB is constantly being amended so that the EIA process is updated and appropriate mitigation measures are recommended. Highways England's Interim Advice Notes (IANs) have been taken into consideration for the assessments in this ES.

5.2.3 DMRB Volume 11, Section 1, Part 1, supplemented by IAN 125/15 'Supplementary guidance for users of DMRB Volume 11 Environmental Assessment Update' advises that the environmental assessment should consider the following environmental topics:

- Air Quality;
- Noise and Vibration;
- Ecology and Nature Conservation;
- Cultural Heritage;
- Geology and Soils;
- Materials;
- People and Communities;
- Road Drainage and the Water Environment; and
- Inter-relationship and Cumulative Effects.

5.2.4 The adopted scope, approach and method of assessment for each topic are outlined in Chapters 6 - 15.

5.2.5 DMRB guidance on EIA sets out three 'levels' of EIA assessment and reporting: 'scoping', 'simple' and 'detailed'. These levels are not intended to be sequential (i.e. applied one after another in order), but 'consequential', in that the level to be applied at any stage of environmental reporting is determined on a topic-by-topic basis according to the following factors:

- results of any previous assessment work (especially the Scoping Report);
- likely scale or significance of impact (not the scale of development);
- nature of the decision-making process to which the report relates; and
- degree of uncertainty about the potential impact of the Scheme.

5.2.6 Guidance published in the DMRB or in Highways England's IANs for most topics defines topic specific requirements for each level of assessment and reporting. For some topics (e.g. People and Communities) there are no specific methods and criteria to define the assessment as 'simple' or 'detailed'. DMRB guidance has been used in the assessment of the various sub-topics, within the Chapter, but the scope of the assessment undertaken for People and Communities was discussed and agreed with Highways England. The levels of assessment to be applied to the various topics in this ES are stated in each of the specialist topic chapters (Chapters 6 - 14), but has also been summarised in Table 5-1.

Table 5-1: Level of EIA assessment undertaken by topic

Topic	Construction phase	Operational phase
Air Quality	Detailed	Detailed
Cultural Heritage	Simple	Simple
Landscape and Visual	Detailed	Detailed
Ecology	Simple	Simple
Geology and Soils	Simple	Simple
Materials	Detailed	
Noise and Vibration	Detailed	Detailed
People and Communities	Not Applicable	Not Applicable
Road Drainage and the Water Environment	Simple	Simple

** Shaded cells indicate that the topic has been scoped out of the EIA.*

[10] A new EIA Directive (2014/52/EU) has been implemented in the UK through the Infrastructure Planning (Environmental Impact Assessment) Regulations, 2017. This Scheme submitted a Scoping report prior to the implementation of these Regulations, therefore the 2009 EIA Regulations under the previous EIA directive continue to apply.

[11] The Infrastructure Planning (Environmental Impact Assessment) Regulations, 2017 entered force on 16th May 2017.

5.3 Study area

5.3.1 Study areas have been defined individually for each environmental topic, taking account of guidance published in the DMRB and the geographic scope of the potential impacts relevant to that topic or of the information required to assess those impacts. The study areas are described within each relevant chapter of this report, and, as a minimum, these study areas cover the entire DCO boundary for the Scheme.

5.4 Existing baseline, future conditions and the assessment scenarios

Baseline and assessment scenarios

5.4.1 In order to identify the effects of the Scheme on the environment, it is important to understand the environment that would be affected by the proposed works (the 'baseline conditions'). Understanding the baseline allows the measurement of changes that would be caused by the Scheme.

5.4.2 However, the 'baseline' used for the measurement of environmental effects is not the situation as it exists now, but the situation as it would exist immediately before the implementation of the Scheme – this is known as the 'future baseline'. The identification of the future baseline takes into account changes that are certain to occur before implementation of the Scheme, but also entirely independent of the Scheme; for example: predicted growth in traffic; third party developments not yet built, but with planning consent and expected to be built before the Scheme; known certain future changes in law, regulations or policy; and any scheduled maintenance or other works on the road itself that would occur if the Scheme were not built. Therefore, identification of the future baseline requires first the identification of the existing situation and then the prediction of how it is likely to change between now and implementation of the Scheme.

5.4.3 For assessment purposes, the future baseline without the Scheme in a specified timeframe is referred to as a 'Do-Minimum' (DM) scenario. The 'Do-Something' (DS) scenario is the future baseline with the Scheme included. The potential environmental impacts are then predicted by identifying the changes between the DS scenario and DM scenario.

5.4.4 For some topics, the future baseline would vary to cater for impacts predicted against several DM scenarios, in particular: the year construction is due to start; an opening year defined as the year that the road would be opened for public use; and for a 'future year', often defined as 15 years after opening or the worst year in the first 15 years of operation. It should be noted that, in some cases, the worst year in the first 15 years after opening can in fact be the opening year, in which case no separate future year prediction is made. This is usually the case for air quality, for instance.

5.4.5 As discussed in Section 2.4, in Chapter 2 of this ES, the IAMP One development, immediately south-west of Downhill Lane junction, received planning consent in May 2018 and is expected to be built and operational by March 2020. In light of the above and IAMP One's consent, the majority of the EIA chapters assessed the impacts of the Scheme against a future baseline comprising the existing (2017/18) environment combined with the predicted IAMP One changes; including that Elliscope Farm would be vacated of any residential / commercial farm use by 2020 and converted to Estate office buildings after 2021.

5.4.6 In addition, the A19 / A184 Testo's Junction Improvement Scheme was granted DCO consent in September 2018. This means that the Testo's scheme will be under-construction when the Scheme starts construction. As a result, the Testo's scheme has also been incorporated within the future baseline for the Scheme as under construction and operational in the same timeframes as the Scheme; it was assumed these scenarios would present the worst-case, even if there is a period when Testo's is open before the Scheme.

5.4.7 IAMP Two has not been considered in the above future baseline as it is still to submit a consent application, so there is no certainty of whether it will occur and what changes it would create to definitely predict any future baseline changes. Instead, the cumulative effects of IAMP Two being built at the same time as the Scheme are considered in Chapter 15 (Cumulative Effects) for these chapters in relation to the specific assessments outlined. Chapter 15 describes the cumulative effects assessment methodology and describes the tailored DM and DS scenarios applied to that assessment.

5.4.8 However, the following operational impact assessments do use 2021 and 2036 DM and DS traffic models where the future baseline underlying the DM and DS scenarios account for the different road network and traffic flow changes associated with the Testo's scheme, IAMP One and IAMP Two developments predicted for these years (see Section 2.9 in Chapter 2 of the ES). The traffic models account for the traffic flows associated with IAMP 2 [for the year 2036] as the inclusion of IAMP 2 is considered in line with WebTAG and best practice for traffic assessments. Assessments based on the traffic models therefore incorporate the same and consideration of IAMP 2 in Chapter 15 (Cumulative Effects) is not required as it is part of the core assessment for these chapters, in relation to the specific assessments outlined:

- Chapter 6 (Air Quality) – operational air quality impact assessment;
- Chapter 12 (Noise and Vibration) – operational noise impact assessment;
- Chapter 13 (People and Communities) – operational driver stress analysis and journey time; and
- Chapter 14 (Road Drainage and the Water Environment) – operational road drainage and flood risk assessment.

5.4.9 However, the other assessments within Chapters 6, 12, 13 and 14 only assume IAMP One is operational before the Scheme starts construction, and that Testo's is under construction and operational in the same timeframes as the Scheme. These assessments are not based on the traffic models and therefore do not take into consideration IAMP 2 as part of the core assessment. This includes the following assessments within Chapters 6, 12, 13 and 14:

- Chapter 6 (Air Quality) – construction air quality assessment;
- Chapter 12 (Noise and Vibration) – construction noise impact assessment;
- Chapter 13 (People and Communities) – NMU assessment; agricultural assessment, community effects (facilities and amenity), effects on community severance and consideration of economic and employment impacts;
- Chapter 14 (Road Drainage and the Water Environment) – construction road drainage and flood risk assessment.

For this Scheme, it is also important to note the Scheme DCO boundary includes 6.13 hectares for the provision of the opportunity to share use of the proposed Testo's main site compound for some of the facilities associated with the Scheme. This would be mainly for general storage, traffic management and office-based administrative purposes. In order to present the worst-case effects of a standalone Scheme, the effects of the shared use of the Testo's main site compound are discussed separately in Chapters 6 to 14; see Section 5.8 of this ES.

Table 5-2: Level of EIA assessment undertaken by topic

ASSESSMENT SCENARIO	SCENARIO DESCRIPTION	HOW IAMP & TESTO'S ARE CONSIDERED IN THE ASSESSMENTS		
		TRAFFIC MODEL DEPENDENT ASSESSMENTS (as outlined in 5.4.7)	NON-TRAFFIC MODEL DEPENDENT ASSESSMENTS	
			Main assessment chapters (Ch6 - 14)	Cumulative assessment (Ch15)
Underlying baseline (excl. future / pre-2020 changes)	*Environmental baseline defined by survey of existing environment and research of existing data (2012 for traffic data and 2017 /18 for non-traffic related data).*			
Construction DLJ Do Minimum	Baseline adapted to predict future baseline situation in Autumn 2020 without Downhill Lane Junction Improvement Scheme.	N/A*	• IAMP One (built and in operation). • Testo's Scheme (under Construction), with option to share use of the Testo's main site compound.	• IAMP Two and new Washington Bridge road network links (under Construction)**.
Construction DLJ Do Something	Downhill Lane Do Minimum scenario (i.e. future baseline situation in Autumn 2020) with Downhill Lane Junction Improvement Scheme under construction.			
Operational DLJ Do Minimum Opening Year 2021	Baseline adapted to predict future baseline situation in 2021 without Downhill Lane Junction Improvement Scheme.	• Testo's Scheme (built and in operation). • IAMP One (built and in operation). • *IAMP Two **not** included***.* • *New Washington Bridge road network links **not** included***.* • *Traffic model Scenarios TA1 and TA2 within the Traffic Assessment.*	• IAMP One (built and in operation). • Testo's Scheme (built and in operation). • *IAMP Two, including new Washington Bridge road network links, **not** included****.*	• IAMP Two and new Washington Bridge road network links (under Construction)**. ***NOTE:** Chapter 15 of this ES assess the worst-case Construction and Opening scenarios, with all short-listed developments under construction or operation at the same time. IAMP 2 is not proposed to be in operation by end of 2021, but the effects of IAMP Two being under construction when Testo's and the Scheme are operational would not be materially different to the construction effects assessed above.*
Operational DLJ Do Something Opening Year 2021	Downhill Lane Do Minimum scenario (i.e. future baseline situation in 2021) with Downhill Lane Junction Improvement Scheme in operation.			
Operational DLJ Do Minimum Assessment Future Year 2036	Baseline adapted to predict future baseline situation in 2036 without Downhill Lane Junction Improvement Scheme.	• Testo's Scheme (built and in operation). • IAMP One (built and in operation). • IAMP Two (built and in operation). • New Washington Bridge road network Links (built and in operation). • *Traffic model Scenario TA3 within the Transport Assessment and Scenario ES1 as explained in Section 2.10.10 above.*	• IAMP One (built and in operation) • Testo's Scheme (built and in operation). • *IAMP Two, including new Washington Bridge road network links, **not** included****.*	• IAMP Two (built and in operation). • New Washington Bridge road network Links (built and in operation).
Operational DLJ Do Something Assessment Future Year 2036	Downhill Lane Do Minimum Assessment Year 2036 with Downhill Lane Junction Improvement Scheme in operation.			

**Traffic model does not consider construction year.*
*** IAMP Two and new Washington Bridge road network links included in the cumulative construction assessment to present worst-case effects of Downhill Lane and IAMP Two developments under construction at the same time.*
**** IAMP Two and Washington Road Bridge not proposed to be built or in operation by end of 2021, so excluded from the 2021 Opening Year traffic model.*
***** IAMP Two and new Washington Bridge road network links are a third-party development so only assessed in Chapter 15 of this ES for the non-traffic model assessments.*

5.4.10 Considering the complexity of assessment scenarios incorporating the A19 / A184 Testo's Junction Improvement Scheme, IAMP One and IAMP Two into the various specialist topic assessments, Table 5-2 seeks to provide a simplified overview these developments have considered within each construction and operation (2021 and 2036) DS and DM assessment scenario.

Limitations of the traffic model assessment scenarios

Inclusion of future development traffic changes

5.4.11 This use of traffic models for some of the operational assessments was driven by the development of the traffic forecasting model where all transport schemes and local developments have been collated in an uncertainty log, and their status classified in the manner suggested by TAG Unit m4 'Forecasting and Uncertainty'; paragraph 3.2.4 of this guidance states: "*Local sources of uncertainty categorised as near certain should be included in the core scenario, whilst all sources categorised as hypothetical should be excluded. Between these two categories, an element of judgement may be required, but usually it would be expected that those inputs categorised as more than likely will be included in the core scenario, whilst those categorised as reasonably foreseeable will be excluded*."

5.4.12 The guidance states that the status of a scheme that is 'More than Likely' is one where the 'Submission of planning or consent application is imminent'. Highways England's Transport Planning Group (TPG) have applied the TAG guidance consistently across the RIS programme by stating that RIS schemes which are sufficiently progressed should be in the core scenario; the implication being that at this point those schemes have passed through the funding and approvals process to the extent that the submission of a planning or other development consent application is imminent. For the Scheme, this rule justifies the inclusion of the A19 / A184 Testo's Junction Improvement Scheme as part of the core scenario.

5.4.13 At the time of developing the traffic model to inform these assessments, IAMP One had been consented and IAMP Two was well advanced in preparing their DCO application. In addition, RIS 1 announced investment in the Scheme to support regional growth, in particular the IAMP development, so it was assumed that the Scheme would only proceed if IAMP or another project akin to IAMP would exist either upon opening or within 15 years of opening. Therefore, IAMP One and IAMP Two were included in the core traffic model scenarios.

5.4.14 As these assessments look at the operational effects upon opening or 15 years after opening, the above traffic model core scenario development approach also aligns with the EIA principle to identify the expected future baseline operational traffic volumes using Downhill Lane junction with or without the Scheme.

2012 baseline traffic data

5.4.15 The modelling work being undertaken is based upon the A19HAM2.2 traffic model. The history of the A19HAM is summarised as:

- A19HAM – Developed in 2013 for the assessment of the A19(T)/A1058 Coast Road Scheme.
- A19HAM2 – An update of the A19HAM, developed in 2014 for the assessment of the Adjacent Testo's scheme. This model was developed with a particular focus on the operation of the A19 / A184 junction.
- A19HAM2.2 – A further development of the model was completed in 2015 and subsequently updated in 2016 for the assessment of both the Testo's junction and Downhill Lane junction improvement schemes. This model was updated to consider the operation of both the A19 / A184 and A19 / A1290 junctions.

5.4.16 The A19HAM model was originally developed with volumetric traffic flow data collected in November 2012. Origin - Destination data was collected in the form of 9 Road Side Interview Surveys (RSIs) in 2013, around the A19(T)/A1058 Coast Road Scheme. The A19HAM2 model was updated for the A19 / A184 Testo's and A19 Downhill Lane junction assessment using a total of seven RSI surveys within the study area in March 2014. As part of the RSI process, volumetric surveys were undertaken at the RSI sites. The A19HAM2.2 model was refined and reviewed based on a large number of volumetric counts and an Automatic Number Plate Recognition (ANPR) origin-destination survey from March 2015 collected around the A19 / A184 Testo's and A19 Downhill Lane study area, with a particular focus on traffic accessing the Nissan site.

5.4.17 TAG unit M3-1 Highway Assignment Modelling states that trip matrices within models should not be based on (origin-destination) data that is more than 6 years old. The origin destination data around the A19 / A184 Testo's and A19 Downhill Lane junctions was undertaken in March 2014, and as such will remain 'in date' until March 2020. Additionally, the latest model has been refined using volumetric data from March 2015. Whilst the A19HAM2.2 is based on 2012 data within the wider area, the data that the model is based upon around the A19/A1290 Downhill Lane junction is more up to date and is considered to be representative of local conditions.

Traffic model demand scenarios

5.4.18 As described in Section 2.10, in Chapter 2 of this ES, the traffic model presented traffic demand operational scenarios for 2021 and 2036). Though the construction programme, presented in Section 2.15 within Chapter 2 of this ES, indicates the Scheme opening in Spring 2022, there is a realistic potential the construction programme could be accelerated to complete in 2021. Consequently, the traffic models were developed to reflect the realistic worst-case scenario of the Scheme opening the same year as the Testo's scheme (i.e. in 2021).

5.4.19 In addition, the traffic model dependent assessments did not use all of the scenarios in their assessments, but focused on assessing the 'realistic worst-case' scenario in environmental terms. The 'realistic worst-case scenario' may differ for each topic, as the significance and magnitude of any particular impact may differ for different receptors. For example, a period with the largest volume of traffic may be the main concern for air quality, whilst moving traffic into the sensitive early morning hours may be more of a concern for the noise assessment.

5.4.20 Therefore, in order to determine the worst-case traffic model for their assessment, the authors of the relevant chapters (technical experts) were presented with all the options and asked, using either modelled results or their professional judgement, to determine which options constituted the worst-case to report in their assessment. The selected scenarios and justification are reported in the specialist chapter's methodology.

5.5 Data gathering

5.5.1 For each topic, data was gathered from a number of sources during previous phases of Scheme development. Additional or updated information from the same sources and from new sources was gathered during the current phase of work, building on information gathered at earlier stages of the Scheme. The data gathering work carried out is defined in each specialist chapter. However, in most cases the work can be broken down into four elements:

- consultation with third-party organisations to obtain factual information;

- consultation with third-party organisations (including statutory Consultation Bodies) for comment on the scope of work required, on the prediction and assessment of impacts and in relation to mitigation requirements;
- desk-based surveys; and
- field surveys carried out for the EIA or for other aspects of the Scheme.

5.6 Identifying potential impacts

5.6.1 The EIA considers both direct and indirect impacts. Direct impacts are those which arise directly from the Scheme, for example the noise benefits of reduced traffic. Indirect impacts in this context can be "*those that alter the character, behaviour or functioning of the affected environment because of the knock-on impacts over a wider area or timescale*", or "*the effects related to pressure as a result of project-induced change*"[12].

5.6.2 The potential for impacts from other developments or highway schemes to have effects that act cumulatively with the Scheme have been considered in this EIA. Additionally, throughout the EIA the potential for the Scheme to have multiple, different environmental effects on the same receptor has been considered. Both these types of cumulative effects have been considered within the EIA through the following questions:

- Would any environmental feature experience several different types of impact from this scheme in such a way as to compound their effects?
- Would different types of impact occur that would interact in such a way as to alter the significance of their effects?
- Would the effects of this Scheme on any environmental feature be compounded by similar effects of another transport-related scheme or non-transport development already planned?
- Would any cumulative effects that are identified be temporary or permanent?

5.6.3 In addition to other Highways England schemes, relevant recent and future schemes have been identified through consultation with the Local Highways Authority and the Local Planning Authority.

5.7 Design, mitigation and enhancement

5.7.1 Where there would be adverse environmental effects, mitigation measures are required. The purpose of any mitigation measure is to eliminate the effect or, where this is not possible, to reduce its significance.

Design

5.7.2 Section 2.17 summarises the design decisions that are embedded within the design measures that have avoided or minimised the risk of environmental effects, thus are not presented as mitigation recommendations within this ES.

Mitigation of construction effects

5.7.3 Construction effects arise from potential impacts (changes) to the environment that would occur as a result of the actual process of construction (such as the creation of temporary haul roads); or from accidental occurrences during construction, which may or may not occur, and whose timing and location cannot always be accurately predicted (such as accidental spillages of fuels, oils or other chemicals, or the generation of nuisance dust drifting off the construction site).

5.7.4 The likelihood of occurrence and the severity of any effects arising from an impact can be reduced through good construction site management practices. The contractor would make sure such good practices are applied through the application of a detailed Construction Environmental Management Plan (CEMP). A CEMP is prepared and implemented for a specific scheme, and it evolves through the life of the Scheme, developing information and a level of detail appropriate to the particular stage of scheme development. The CEMP would:

- Identify relevant environmental commitments made in the ES and measures put in place to enable their achievement.
- Identify 'environmental aspects' – features of the local environment that may be particularly vulnerable to effects as a result of construction activity, and construction activities that could give rise to accidental damage to the environment or accidental nuisance to local residence.
- Set out good practice site management measures to minimise the routine effects of construction on the environment.
- Set out control measures to reduce the likelihood of accidental occurrences that could lead to environmental damage.
- Set out action plans to respond to any such occurrences that do arise, to minimise the damage caused.

5.7.5 In the environmental topic chapters of this ES, potential impacts are identified that fall into the category of construction period effects. In many cases the mitigation measure specified for such effects would be by reference to the CEMP.

Mitigation of operational effects

5.7.6 This ES details the potential environmental effects of the Scheme and the proposed mitigation measures. These mitigation measures are designed principally to address effects whose occurrence, timing and location can be predicted in advance and are intrinsic to the design of the Scheme.

5.7.7 The first option in mitigating any significant adverse effect is to seek design measures that would enable the impact to be avoided, or at least reduced. Impacts causing the effects can be avoided or reduced, for instance, through changes to the horizontal or vertical alignment of the Scheme, junction strategy or other aspects of the Scheme layout; or through changes in the methods and / or materials to be used in construction. Section 2.17, in Chapter 2 of this ES, summarises the environmental mitigation already embedded into the Scheme design before it was presented for assessment within this ES.

5.7.8 Where avoidance of an effect through design measures is not possible, or is only partly effective, further mitigation measures are required. Such measures fall into three broad categories:

- Measures that do not remove an effect, but make it less significant. A typical example is planting trees to screen views of a road where it is visually intrusive.

[12] Extracts from DMRB, Volume 11 Section 2 Part 5 (HA 205/08), paragraph 1.50 i. and ii.

- The like-for-like replacement of a feature that would be lost, for instance creating a new pond designed to provide habitat similar to that in a pond that is on the Scheme alignment and cannot be avoided.
- The provision of a beneficial effect that is related to the impact, but is not a like-for-like replacement of the feature to be lost. A typical example would be an archaeological excavation, which provides detailed archaeological records of the archaeological remains to offset the loss of the remains themselves.

5.7.9 In some cases, it may be necessary to apply a combination of two or more of these approaches. Where appropriate, statutory Consultation Bodies have been consulted before determining the measures or combinations of measures to be used in mitigation. Each of the specialist topics includes a section on the measures proposed to mitigate potential adverse effects of the Scheme on the environment. In addition, Appendix 1.3 in Volume 3 of this ES details a REAC, incorporating an EAP that sets out the environmental actions that are proposed in the ES, which would be implemented by the Scheme. The EAP includes the environmental actions that would be required before, during and after construction. An EMP is bound into the back of Volume 1 of this ES and illustrates the mitigation measures that have been proposed in accordance with this ES.

Implementation and enforcement of mitigation

5.7.10 Mitigation would be secured by way of requirements in the DCO, including that the Scheme is undertaken in line with the CEMP (which includes provision on mitigation of construction impacts), plus specific mitigation obligations in key topic areas such as landscaping, drainage and contaminated land.

5.7.11 Mitigation and enhancement measures are presented in more detail within the specialist chapters, but are summarised in Appendix 1.3 as a Schedule of Environmental Mitigation Commitments. This is supported by an EAP, which outlines specific actions that need to be undertaken to achieve the mitigation. Collectively this is referred to as the REAC, which also forms part of the CEMP.

5.7.12 The DCO application would place a contractual responsibility on detailed design and construction contractors to comply with the DCO requirements. Discharge of these requirements would be by consent from the Secretary of State, generally following consultation with the relevant planning or environmental authority.

Residual effects

5.7.13 Effects that would still occur after mitigation measures are taken into account are known as 'residual' effects. This ES identifies effects before mitigation, but does not assess their significance. However, it does report the significance of the various environmental effects of the Scheme with the proposed mitigation. As such, the reported significance of all the effects assessed reflects the residual effects of the Scheme.

Enhancement opportunities

5.7.14 Where practicable, opportunities for enhancement beyond the need for mitigation were sought; for example, considering within the EMP and ecological mitigation opportunities to enhance biodiversity through proposing replacement habitats and restoration planting species mixes that offer improved biodiversity over the habitat being replaced.

5.8 Assessment of effects

Significance of effects

5.8.1 The significance of environmental effects can be defined by reference to two key factors:

- the 'value' or 'sensitivity' of the receptor[13]; and
- the 'magnitude' or 'scale' of the impact.

5.8.2 The DMRB specifies both a typical generic set of terminology and criteria and topic specific terminology and criteria for some topics, covering the description of both the sensitivity and magnitude. However, the DMRB does not necessarily use the same scales, terminology or criteria, or indeed the same overall approach, for all topics. For several topics whose guidance was published in the 1990s there are no published criteria, while some recently introduced topics have no published topic-specific guidance. Chapters 6 to 14 provide further details.

5.8.3 All assessments of effect are based on the professional judgement of the relevant environmental specialist, supported by the application of published topic-specific guidance found in DMRB where this is available. As a minimum, all effects, for all topics, can be defined through the following four pairs of opposites:

- adverse or beneficial (i.e. they are undesirable effects, or they represent an improvement over the baseline situation);
- short-term or long-term (i.e. they would be felt for less than 15 years, or they would still be felt 15 years after construction and beyond); and
- construction or operational (i.e. caused by the construction of the Scheme, or by the operation of the Scheme after opening).

5.8.4 However, for topics that benefit from detailed guidance in the DMRB, more detailed techniques can be applied to support and further refine the assessment of effect. For those topics whose effects are most easily definable in absolute numbers, this is done through calculations or computer modelling and the definition of numerical values for the environmental change (e.g. the increase or reduction in the concentration of an air pollutant, or the increase or reduction in noise levels).

5.8.5 For topics where the environmental effects are less amenable to numerical measurement, professional judgement can be applied to determine the significance of effect on a graduated scale. This is done by grading both the value / sensitivity of the receptor and the magnitude of impact on separate graduated scales and then applying a matrix, with the sensitivity of the affected receptor on one axis and the magnitude of the impact on the other axis. A typical matrix for this purpose is given in the DMRB, and is presented below as Table 5-3, showing typical terminology for sensitivity of receptor, magnitude of impact and significance of effect.

5.8.6 Some topics use this matrix unmodified, together with their own tables of criteria for defining value / sensitivity and magnitude of impact; some other topics use modified versions of the matrix, while others use a combination of matrix and calculations. The assessment of effects used for each topic is set-out in each of the methodology section of Chapters 6 –15.

[13] The 'receptor' is the existing environmental feature that would be affected by an impact – for instance, the population of a protected species, or a specific archaeological site, or the occupants of a residential property

Table 5-3: Typical matrix for assessing the level of significance of an effect

Value / Sensitivity	Magnitude of Impact				
	No change	**Negligible**	**Minor**	**Moderate**	**Major**
Very High	Neutral	Slight	Moderate or Large	Large or Very Large	Large or Very Large
High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
Medium	Neutral	Neutral or Slight	Slight	Slight or Moderate	Moderate or Large
Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

Shared use of Testo's scheme main site compound

5.8.7 With both the Downhill Lane and Testo's junction improvement schemes expected to be under construction within the same timeframe, it would be possible for the Scheme to share the use of the Testo's scheme's main site compound for general storage, traffic management and office-based administrative purposes. However, in order to present the worst-case effects of a standalone Scheme, the ES specialist Chapters 6 to 14 assumed that the Scheme would be a standalone development using the full temporary land-take for the Scheme excluding the Testo's main site compound.

5.8.8 Any additional effects that may subsequently arise from the Scheme sharing use of the Testo's scheme's main site compound, including extending its use beyond completion of the Testo's scheme, are qualitatively discussed at the end of each specialist ES chapter.

Inter-relationship effects between topics

5.8.9 Multiple effects on receptors may arise from this Scheme alone as a result of a combination of the individual effects reported in separate specialist topics affecting shared receptors. The potential for any such combined effects is discussed at the end of each specialist chapter within this ES.

Cumulative effects assessment

5.8.10 The potential for other developments (including other infrastructure projects) to have effects that act cumulatively on receptors affected by this Scheme and our approach to assessing them are discussed in detail within Chapter 15 (Cumulative Effects).

CHAPTER 6 AIR QUALITY

Executive summary

People living near busy roads, such as the A19, are potentially exposed to air pollution concentrations from road traffic. Changes in traffic flows associated with the proposed A19 Downhill Lane junction improvements could result in changes in the concentrations of air pollutants at nearby residential properties or other sensitive receptors.

A detailed air quality assessment has been carried out, based on computer modelling of future conditions. The assessment used forecast traffic data and other predicted parameters as part of the modelling procedure, in accordance with the most recent relevant guidance[14].

The assessment focused on the effects of air pollution on local people, nature conservation and the global climate. As such, the receptors considered were residential properties, and the assessment incorporated an assessment of carbon emissions at a regional level. The prescribed methodology for assessment also covers nature conservation sites, designated at international and European level, that are sensitive to nitrogen deposition; however, no such sites were located within the air quality study area (see Section 6.3). Local Wildlife Sites are designated at a local level, and therefore their inclusion in the assessment is not required.

The principal pollutants of concern in relation to effects on human health are nitrogen dioxide (NO_2) and particulate matter with an aerodynamic diameter of less than 10 microns (particulates, or PM_{10}). Whilst PM_{10} is considered in this chapter, more emphasis is placed on NO_2 due to the existing concentrations and potential effects of the Scheme with regard to NO_2.

The outcome of the assessment indicates that no exceedances of the relevant Air Quality Objectives are predicted to occur at representative sensitive receptors with the Scheme in place. The air quality impact of the Scheme is considered to be not significant.

6.1 Introduction

6.1.1 Air quality is a consideration in any development proposal involving significant changes in the nature and location of emissions to air. The Scheme would change the way in which traffic flows around the A19 Downhill Lane junction and the wider surrounding road network. Vehicle traffic is the largest contributor to air pollution at a local level in the UK, so changes in the flow of traffic could have the potential to increase emissions from vehicle traffic and change ambient air quality concentrations at nearby receptors.

6.1.2 A detailed air quality assessment has been undertaken in accordance with the DMRB to establish the potential effects of the Scheme on local and regional air quality. This chapter describes the assessment and the predicted construction and operational effects arising from the Scheme.

6.2 Legislative and policy framework

6.2.1 The assessment considers the relevant air quality legislation and policy, and Local Air Quality Management Technical Guidance (LAQM TG(16))[15]. Further details on legislation and policy can be found in Appendix 6.1.

6.2.2 Table 6-1 summarises key legislation and policy relevant to air quality.

Table 6-1:Relevant air quality legislation

Applicable Law	Description
Environmental Protection Act 1990 Part III	Provides statutory nuisance provisions for nuisance dust
Environment Act 1995, Part IV	Defines requirements for Local Air Quality Management
Air Quality (England) (Amendment) Regulations 2000 / 2002	Legislates for the limit values for pollutants set out in the 2007 Air Quality Strategy
The National Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland, 2007	Updates the 2000 Air Quality Strategy
The Air Quality Standards Regulations 2010, as amended (2016)	Transpose formalised limit values set out in the EU ambient air quality directive 2008/50/EC to UK law

Air Quality Strategy for England, Scotland, Wales and Northern Ireland

6.2.3 The National Air Quality Strategy for England, Scotland, Wales and Northern Ireland (the AQS) establishes Air Quality Objectives (AQO)s for a number of specific pollutants. The pollutants relevant to this assessment are nitrogen dioxide (NO_2), nitrogen oxides (NO_x), and PM_{10} (see Table 6-2). The dates were set out in the 2007 Strategy document, and remain valid.

Table 6-2: Air Quality Objectives (AQOs)

Pollutant	Description		Date to be achieved by
	Concentration	Measured as	
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times/yr (99.79th percentile)	1 hour mean	31-12-2005
	40 µg/m^3	Annual mean	31-12-2005
Nitrogen Oxides (NO_x)	30 µg/m^3	Annual mean	19-07-2001
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times/yr (90.41th percentile)	24 hour mean	31-12-2004
	40 µg/m^3	Annual mean	31-12-2004

6.2.4 More information on the terms used in relation to air quality, the science and the legislation, is given in the AQS documents and the supporting Defra LAQM.TG(16).

[14] Highways Agency (2015) Interim Advice Note 185/15 Updated traffic, air quality and noise advice on the assessment of link speeds and generation of vehicle data into 'speed-bands' for users of DMRB Volume 11, Section 3, Part 1 'Air Quality' and Volume 11, Section 3. Part 7 'Noise'

[15] Defra (2016) Local Air Quality Management Technical Guidance LAQM.TG(16)

6.2.5 AQOs are health-based standards that are set at a level to provide protection to the whole population. Local authorities are responsible for determining whether AQOs are complied with, within the system of Local Air Quality Management (LAQM). Local authorities are required to review and assess air quality within their districts, against the AQOs. Where the AQOs are not being met, they must declare an Air Quality Management Area (AQMA), and implement an Air Quality Action Plan (AQAP) to improve air quality within 18 months.

6.2.6 The AQS and LAQM TG(16) introduce measures to control exposure to $PM_{2.5}$ (i.e. particulate matter with an average aerodynamic diameter less than 2.5 µm). These are intended to be delivered at the national level, so they have not been incorporated into LAQM, and authorities have no obligation to address them. Impacts of road schemes on ambient $PM_{2.5}$ concentrations are typically insignificant, and accordingly DMRB does not require the assessment of $PM_{2.5}$.

Dust nuisance

6.2.7 The main concern regarding air quality impacts during construction is the creation of fugitive dust[16]. There are no nationally recognised criteria defining levels of dust that can cause an annoyance.

6.2.8 Fugitive dust effects can be controlled under the Statutory Nuisance provisions of Part III of the Environmental Protection Act, 1990.

Planning policy background

National Policy

6.2.9 National policy relevant to the scope of potential effects on air quality is outlined in Table 6-3.

Table 6-3: Relevant National Policies

National Policy	Relevant Paragraph	How the policy has been addressed
National Networks National Policy Statement (NNNPS) (Designated January 2015)	Air Quality, including carbon emissions, is referred to in **paragraphs 5.3 to 5.19** of the NNNPS.	The NNNPS sets out the Government's vision and policy against which the Secretary of State will make decisions on applications for development consent for nationally significant infrastructure projects on the strategic road and rail networks. A full review of the Scheme against the NNNPS is set out in Appendix A of the Planning Statement (DCO application reference TR010024_APP_7.1)
National Planning Policy Framework (NPPF) (July 2018)	Paragraph 170 of the NPPF references how policies and decisions should enhance and contribute to the natural environment by: "*preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information*."	The assessment undertaken considers the update to the NPPF, including the impact of the Scheme upon nearby residential receptors.
Planning Practice Guidance (PPG)	Planning Practice Guidance relating to NPPF policies of relevance are included under nine headings in the overall 'Air quality' heading.	The assessment undertaken considers relevant Planning Practice Guidance; for example, completion of a review of the impact and the development of potential mitigation measures.
Highways England Air Quality Strategy (2017)	Area of action 2 planning: ensure our schemes meet the legislative and policy requirements and we will introduce additional mitigation, if necessary, to achieve this.	The assessment undertaken is based on meeting air quality legislation requirements, and the development of potential mitigation measures as required.

Local Policy

6.2.10 Local planning policies for South Tyneside and Sunderland City Council, which are relevant to the scope of potential effects on air quality, are outlined in Tables 6-4 and 6-5. On review of the study area it was deemed that there are no relevant policies for Gateshead Council.

Table 6-4: Relevant Policies within the South Tyneside Local Development Framework

South Tyneside Local Development Framework	Relevant Policy	How the policy has been addressed
Core Strategy (June 2007)	**Objective 6:** "*To prevent deterioration and where possible improve local air quality levels for all*". Policy EA5 Environmental Protection	The assessment undertaken identifies deterioration and possible improvements in air quality at relevant receptor locations. The assessment seeks to identify potential

[16] i.e. Visible emissions of dust that does not come from definable point sources such as smokestacks. Typical sources would be storage piles of soil, dry bare earth on a construction site, haul roads, etc.

South Tyneside Local Development Framework	Relevant Policy	How the policy has been addressed
	"*To complement the regeneration of the Borough, the Council will control new development so that it:* *A: acts to reduce levels of pollution, environmental risk and nuisance throughout the Borough……* *D: ensures that the individual and cumulative effects of development do not breach noise, hazardous substances or pollution limits….*"	reductions in levels of air pollution and considers individual and cumulative effects of the Scheme against air pollution limits and objectives.
Development Management Policies (December 2011)	DM1 Management of Development …. "*the development does not adversely impact upon air pollution levels, particularly of nitrogen dioxide in the Boldon Lane/Stanhope Road and Leam Lane/Lindisfarne Roundabout Air Quality Management Area, or any other designated area where air quality objectives are not met or not likely to be met in the foreseeable future or a s a result of the proposed development……..*"	Boldon Lane and Stanhope Road are outside of the study area. The Leam Lane and Lindisfarne Roundabout AQMA was identified to be within the study area, and impacts were assessed as to whether air quality objectives were likely to be met or not met as a result of the Scheme.
Site-Specific Allocations and Proposals Map (April 2012)	No relevant policies.	N/A

Table 6-5: Relevant Policies within the Sunderland statutory Development Plan

Sunderland City Council	Relevant Policy	How the policy has been addressed
City of Sunderland Unitary Development Plan: Saved Policies (March 2007)	EN1 General Environmental Protection "*Improvement of the environment will be achieved by:* *Seeking to minimise all forms of pollution*".	This assessment has identified locations where the environment may be improved by reductions in levels of air pollution.

6.3 Assessment methodology

6.3.1 The assessment identifies the potential air quality effects by predicting the changes in air quality pollutant concentrations which would result from the combination of background concentrations and the contributions from the roads in the study area, including the Scheme.

6.3.2 This assessment conforms to the standard EIA practice whereby the baseline is established and then the situation with the Scheme in place (DoSomething, DS) is compared with the situation without it (Do Minimum, DM).

6.3.3 The potential air quality impacts of the Scheme have been assessed following HA207/07[17] and the associated Interim Advice Notes[18], and LAQM TG(16). Following the process set out in HA207/07, a detailed assessment has been carried out using the Air Dispersion Model Software (ADMS)-Roads (Version 4.1).

6.3.4 As described in Section 5.4 of this ES, the operational impacts assessment uses the 2021 and 2036 DM and DS traffic models TA1 and ES1 where the future baseline underlying the DM and DS scenarios include the different road network and traffic flow changes associated with the Testo's scheme and IAMP One and IAMP Two developments predicted for these years. The construction impact assessment assumes IAMP One has been built (and operational) and the Testo's scheme is under construction when the Scheme starts construction; cumulative construction effects with the IAMP Two development being built at the same time as the Scheme are considered in Chapter 15 (Cumulative Effects).

6.3.5 The assessment methodology is summarised below. Further details are provided in Appendices 6.2 to 6.4.

Study area

6.3.6 The air quality assessment comprises two sub-topics:

- Local air quality, which relates to pollutants with potential to affect human health and ecosystems at a local level; and
- Regional air quality, which relates to pollutants dispersing over a larger area, with potential to affect human health and ecosystems. Carbon emissions, which can influence the global issue of climate change, are included in the regional air quality assessment.

6.3.7 The study area for the assessment of local air quality has been defined by identifying all sensitive receptors 200 m from the affected road network (roads where changes in traffic meet criteria in line with the guidance contained in DMRB Volume 11, Section 3, Part 1 HA207/07 (referred to hereafter as 'HA207/07')). All roads within 200 m of the sensitive receptors were then included in the modelling and these roads define the study area.

6.3.8 'Affected roads' were identified by qualifying criteria published in HA207/07', based on changes between the DM and DS scenarios that would occur as a result of the Scheme being implemented, as follows:

- Road alignment will change by 5 m or more;
- Daily traffic flows will change by more than 1,000 Annual Average Daily Traffic (AADT);

[17] Highways Agency (2007) DMRB Volume 11 Section 3 Part 1 (HA 207/07) Environmental assessment. Environmental assessment techniques. Air quality.

[18] Highways Agency (2015) Interim Advice Note 185/15 Updated traffic, air quality and noise advice on the assessment of link speeds and generation of vehicle data into 'speed-bands' for users of DMRB Volume 11, Section 3, Part 1 'Air Quality' and Volume 11, Section 3. Part 7 'Noise'.

- Heavy Duty Vehicle (HDV) flows will change by more than 200 AADT;
- Daily average speed will change by more than 10 kilometres per hours (kph); or
- Peak hour speed will change by more than 20 kph.

6.3.9 Data from the opening year traffic models has been used to define the study area, in line with these qualifying criteria. Figure 6.1 illustrates the air quality study area and constraints. The study area covers the Downhill Lane junction, sections of the A19 and sections of the A1290. As explained in Section 5.4, in Chapter 5 of this ES, the traffic data and modelled network takes into account the A19 Testo's junction improvement, as well as the development of IAMP One and IAMP Two in the future.

Assessment scenarios

6.3.10 The prescribed scope of assessment covered different geographic scales, as detailed in Table 6-6. DMRB Guidance (DMRB, Vol 11 Section 3, Part 1 HA 207/07) suggests that for local air quality, the assessment should be done on the opening year and possibly a later year if more stringent air quality criteria come into effect at a later date. This is due to local air quality effects being greatest in the earlier years as vehicle emissions are set to decrease in the future due to increasingly stringent vehicle emissions legislation. No such change in air quality criteria was identified, so the future year assessment was not undertaken for local air quality.

Table 6-6: Assessment Scenarios

Scenario/ geographic level	Pollutants Assessed	Scenarios Assessed
Local Air Quality	NO_2 and PM_{10}	• Baseline Year 2012 • Without Scheme (DHL Do Minimum, 'DM') Opening Year 2021 • With Scheme (DHL Do Something, 'DS') Opening Year 2021
Regional Air Quality (15 years after opening)	NO_x, PM_{10} and carbon dioxide (CO_2) emissions.	• Opening Year 2021 – Without Scheme – DHL Do Minimum, 'DM' • Opening Year 2021 – With Scheme – DHL Do Something, 'DS' • Assessment Year 2036 – Without Scheme – DHL Do Minimum, 'DM' • Assessment Year 2036 – With Scheme – DHL Do Something, 'DS'
Site-specific (sites designated at international and European level within 200 m of the Scheme or affected roads)	NO_x concentrations	There are no relevant national or international designated sites within the study area (i.e. 200 m of the affected roads), so this element of the prescribed assessment scope is not required.

Traffic data

6.3.11 Traffic data for the modelling scenarios has been provided from the traffic model. The base year air quality modelling uses traffic data, pollution measurements and meteorological measurements from 2012 (meteorological data from Newcastle Airport was utilised); this is due to the traffic model using 2012 baseline data, as explained in Section 2.9 of this ES and demonstrated as valid for use in Section 5.4 within Chapter 5 of the ES. With reference to Chapter 5, traffic flow data from Scenario TA2 for 2021 and Scenario ES1 for 2036 (regional assessment only) has been used in this assessment to represent the worst-case traffic scenario for air quality.

6.3.12 Interim Advice Note (IAN 185/15) has been published by Highways England, providing supplementary guidance to HA207/07 regarding speed-band banding for vehicle emissions. For the purposes of this assessment, traffic data representing the average conditions in specific time periods with the corresponding speed-band has been utilised. The data was used to calculate emission rates (using IAN185/15 values), which predict vehicle fleet, vehicle type and EURO emission standards. Further details are provided in Appendix 6.2.

Local air quality assessment methodology

6.3.13 The ADMS-Roads Software has been developed by Cambridge Environmental Research Consultants Ltd (CERC). It is an atmospheric modelling system focusing on road traffic as a source of pollutant emissions, and is an industry-recognised tool for carrying out air quality impact assessments. It has been comprehensively validated, both by the manufacturers and independently of them. Version 4.1 (January 2018) was used for this assessment.

Receptors

6.3.14 Residential receptors and other sensitive receptors (e.g. schools, nursing homes) have been considered within the study area. A total of 55 receptors were identified within 200 m of the affected road network for modelling in the local air quality assessment. However, only those 10 receptors with the highest concentrations were selected for reporting, as these would be the worst case locations for local air quality.

6.3.15 Building usage was determined using the Ordnance Survey Address Layer dataset, and calculations made at the nearest façade to the busiest road. All 'receptors' were treated as being equally sensitive.

Background concentrations

6.3.16 For the purposes of this assessment, the background air quality represents the concentrations of pollutants that would be present if there were no emissions from the roads included in the dispersion modelling. The pollution derived from the existing road was added to the background pollution concentrations.

6.3.17 Defra provides national background maps at: http://www.laqm.defra.gov.uk. The most up to date information is held within the base year 2015 data, released in November 2017. However, the traffic model base scenario is 2012, so background concentrations for NO_x, NO_2 and PM_{10} have been calculated using data for the period 2013-2017 to allow the 2012 data to be factored into the air quality assessment, which is also in accordance with existing principals and tools from Highways England (see Section 6.4 of this ES). This approach also allows for a comparison with the Testo's scheme EIA.

6.3.18 To avoid double counting in the dispersion model, NO_x and PM_{10} background concentrations that have motorway and trunk road contributions were removed from the background annual

mean (known as 'sector removed'), and background annual mean NO_2 estimates were corrected using the Defra's Background NO_2 Calculator[19]. The predicted background pollutant concentrations in the study area are significantly below the AQOs (see Table 6.10).

Prediction of environmental concentrations

6.3.19 The model was used to predict the road traffic contributions to NO_x and PM_{10} concentrations at specified receptors. Adjustments were applied to the model predictions (based on a comparison against measured air quality concentrations, known as model verification and adjustment). The model was then used for predicting air quality concentrations in the future years.

6.3.20 A further adjustment step was undertaken to account for the observed long-term trends in ambient roadside NO_x and NO_2, using the Gap Analysis methodology prescribed in IAN170/12[20], to account for the Long-term Trends (LTT_{E6}) for NO_x and NO_2. This approach complements LAQM TG(16) to provide a more representative assessment of opening year impacts. The modelling, verification and adjustment processes are detailed further in Appendix 6.4.

Construction Assessment

6.3.21 Using available information, and in line with the Institute of Air Quality Management (IAQM) 2014 Guidance[21], a construction dust assessment has been carried out, providing a qualitative risk-based appraisal with reference to the proposed scheme in relation to sensitive locations, the planned construction process, and the local site characteristics.

Regional assessment

6.3.22 A HA207/07' regional air quality assessment has been undertaken to estimate the change in total emissions of PM_{10}, NO_x, carbon dioxide (CO_2) from all vehicles on the affected roads. As discussed in Section 6.4 of this ES, the assessment used the Defra Emissions Factor Toolkit (v7), using the traffic data provided for each link (and incorporating banded speed data), for both the modelled year of opening (2021) and assessment year (2036). Defra Emissions Factor Toolkit (v7) was the most up-to-date version of the tool available when the assessment was carried out.

Transport Analysis Guidance appraisal

6.3.23 In accordance with HA207/07, a Transport Analysis Guidance (TAG) appraisal (Department for Transport, 2012) has been undertaken. The appraisal identifies changes in NO_2 and PM_{10} at properties within the study area.

6.3.24 The local air quality TAG appraisal creates an overall 'score' for the Scheme, which is calculated on the basis of the number of residential properties within 200 m of affected roads (431 properties were included), and the overall sum of the changes in NO_2 and PM_{10} pollutant concentrations at these properties. As part of the TAG appraisal, annual mass emissions of NO_x and CO_2 have also been calculated. The appraisal is provided in Appendix 6.7, and is not discussed further within this chapter.

Impact assessment and significance

6.3.25 The significance of an environmental impact relates to the sensitivity of the receptor and the scale of the impact. Highways England's approach to evaluating significant air quality effects is set out in IANs 174/13[22] and 175/13[23].

6.3.26 The model results were used to identify receptors in exceedance of AQOs in either the DM or DS scenario; only those in exceedance were considered in the assessment of significance.

6.3.27 Where the difference in concentrations (between DM and DS scenario) at a receptor was less than 1% of the AQO (e.g. less than 0.4 µg/m³ for NO_2), it was considered to be imperceptible and was scoped out of the assessment of significance.

6.3.28 Highways England has developed a framework to provide guidance on the number of receptors for each of the magnitude of change categories that might result in a significant effect. These are guideline values only, and are to be used to inform professional judgement on significant effects of the Scheme. A judgement of significant effect was made in relation to the Scheme overall, and considered the aggregate of effect on all residential receptors' exposure to exceedances of AQOs, and the risk of exceedance of EU limit values, rather than in relation to individual receptors. The significance categories and guideline property numbers are summarised in Table 6-7 and more information on significance is provided in Appendix 6.2.

Table 6-7: Guideline to Number of Properties Constituting a Significant Effect

Magnitude of Change in NO_2	Number of Receptors with:	
	Worsening of AQO already above objective or creation of a new exceedance	Improvement of an AQO already above objective or the removal of an existing exceedance
Large (>4 µg/m³))	1 to 10	1 to 10
Medium (>2 µg/m³))	10 to 30	10 to 30
Small (>0.4 µg/m³))	30 to 60	30 to 60

6.4 Assessment assumptions and limitations

6.4.1 The assessment of operational air quality impacts was based on the outputs of a traffic model, so was subject to the assumptions applied to, and limitations of, the model (see Section 5.4 in Chapter 5 of this ES).

6.4.2 With any computer model that seeks to predict future conditions, there is inherent uncertainty in the predictions made. The dispersion models provide an estimate of concentrations arising from input emissions and historical meteorological data. The estimates produced, while appropriately representing the complex factors involved in atmospheric dispersion, are subject to uncertainty.

6.4.3 Whilst the predictions provided by the models should not be regarded as definitive statements of concentrations that will arise in the future, they are the most reasonable, robust and representative estimates available. Whilst being the best predictions available, elements of

19 Defra, NO2 Background Sector Tool - for Source Apportioned Background NOx v5.1
20 Highways Agency (2012) Interim Advice Note 170/12 Updated advice on the assessment of future NOx and NO2 projections for users of DMRB Volume 11, Section 3, Part 1, 'Air Quality' (HA207/07).
21 Institute for Air Quality Management (2014) Guidance on the assessment of dust from demolition and construction
22 Highways Agency (2013) Interim Advice Note 174/13 Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 'Air Quality' (HA207/07)
23 Highways Agency (2013) Interim Advice Note 175/13 Updated air quality advice on risk assessment related to compliance with the EU Directive on ambient air quality and on the production of Scheme Air Quality Action Plans for user of DMRB Volume 11, Section 3, Part 1 'Air Quality' (HA207/07)

impact prediction (such as the specific concentration of a given pollutant at a given property, or whether an exceedance of AQOs would or would not occur at a specific location), are not precise and are always subject to a margin for error. Further information on the modelling methodology can be found in Appendices 6.2 to 6.4.

6.4.4 Prior to the assessment's completion, Defra released an updated suite of air quality assessment tools (in November 2017). It was not possible to apply the updated tools to the assessment, as the earliest available year in the updated tools does not allow for 2012 calculations. In addition, in order to maintain consistency and aid like-for-like comparison with recent assessment work undertaken for the Testo's scheme Environmental Statement, Emission Factor Toolkit v7, 2013 Defra background mapping and associated tools were used. The use of IAN 170/12 is more conservative than utilising the new emission factors.

6.5 Baseline conditions

6.5.1 In order to provide an assessment of the significance of any new development proposal (in terms of air quality), it is necessary to identify and understand the baseline air quality conditions at and around the study area. This provides a reference level against which any potential changes in air quality could be assessed.

6.5.2 Baseline air quality conditions for the Scheme were identified through a review of information that included the latest local authority air quality reports, monitoring data and background concentration maps. This section presents the results of the review, with air quality constraints shown in Figure 6.1.

6.5.3 Baseline air quality is predicted to change into the future (mainly because vehicle emissions are changing due to improvements in engine technology). Therefore, the baseline situation was predicted forward to the opening year (2021). The DM scenario was the predicted future baseline for the opening year (and assumes the Testo's scheme and IAMP One development are operational, as provided in the traffic modelling data – see Section 2.9, in Chapter 2 of this ES, for justification). The DS scenario is the same as the DM, but with the inclusion of the effects of the Scheme.

Local air quality management summary

6.5.4 The Scheme is located within the jurisdiction of STC and SCC. Each council monitors air quality within their council area in order to identify any changes in air quality conditions. Monitoring data relevant to this Scheme has been identified only in the monitoring reports from STC[24].

6.5.5 The most up to date LAQM documents from these councils were reviewed; these were:

- South Tyneside Council 2017 Annual Status Report (ASR); and[25]
- Sunderland City Council 2017 Air Quality ASR[26].

6.5.6 SCC's 2017 report noted that air quality in Sunderland is below the AQO threshold, with a general decline in some of the pollutants measured. No AQMAs have been declared.

6.5.7 STC's 2017 ASR indicates that air quality across the area is generally good, air quality action plan measures continue to be implemented to improve air quality, as a result of road transport emissions[27]. The LAQM assessment process has resulted in the declaration of two AQMAs for NO_2; all other AQOs are being met within the area. STC NO_2 monitoring data has been used in the assessment, and is detailed in Table 6-8.

Air quality management areas

6.5.8 STC declared two AQMAs in 2006 due to exceedances of the NO_2 AQO at road junctions of Boldon Lane and Stanhope Road, South Shields (not within the air quality study area) and Leam Lane / Lindisfarne Roundabout (within the air quality study area for this project). Lindisfarne Roundabout is illustrated in Figure 6.1. There are no AQMAs in Sunderland.

6.5.9 There are no AQMAs for PM_{10} within the air quality study area or within the administrative areas of South Tyneside or Sunderland City Councils.

6.5.10 The STC Action Plan notes that dispersion modelling undertaken during the detailed assessment of both AQMA locations within South Tyneside indicated that the major contribution to the observed concentrations of air quality pollutants in both locations was made by existing road traffic.

6.5.11 The actions detailed within the plan to reduce pollutant concentrations are similar to others within the Tyne and Wear region, and are based around five themes, including: Managing the Highway Network, Emissions Management, Land Use Planning, Information and Education, and Promotion and Provision of Alternatives. The proposed actions include congestion charging, low emission zones, car sharing, and development control.

Monitoring data

6.5.12 Monitoring data from the relevant local authorities within the study area was obtained and reviewed. Monitoring locations (and data) from SCC were outside the assessment study area, and therefore not suitable for use in the assessment. Bias-adjusted annual mean data for 2012 from STC monitoring sites with suitable data capture has been used to inform the air quality assessment and to verify dispersion-modelling results. The NO_2 monitoring sites are shown on Figure 6.1, and are listed in Table 6-8. There are no PM_{10} monitoring sites within the study area.

Table 6-8: STC NO_2 Monitoring Data (2012)

ID	Monitoring Location	OS Co-ordinates		2012 Annual Mean NO_2 Conc ($\mu g/m^3$)	Data Capture %
		X	Y		
South Tyneside Council Diffusion Tube Monitoring					
STC_9	55 Cheltenham Drive on Lamppost	434006	562726	22.5	92%
STC_19	Fellgate Estate A19- end of Southerlands	433739	562070	34.8	42%
STC_23	Lindisfarne Roundabout - On Sign	433738	563559	40.6	75%
STC_24	Lindisfarne Road No 51	433709	563803	30.1	67%
STC_33	Hadrian Road No1 – Lamppost	433470	563394	19.8	100%
STC_34, 35, 36	Edinburgh Road - Monitoring Station (triplicate)	434068	563695	27.0	75%

[24] South Tyneside Council. (2014). *Air Quality*. Air Quality Monitoring Information. Accessed on 12 October 2014 from http://www.southtyneside.info/article/8244/air-quality.
[25] South Tyneside Council (2017), Annual Status Report
[26] Sunderland City Council, (2017), Air Quality Status Report
[27] South Tyneside Council. (2007). *South Tyneside Local Development Framework*. The new development plan for your borough. Core Strategy. June 2007. Page 16.

ID	Monitoring Location	OS Co-ordinates		2012 Annual Mean NO_2 Conc (µg/m^3)	Data Capture %
		X	Y		
STC_37	John Reid Road - lamppost near Stirling Avenue	434293	563746	24.7	100%
STC_39	Newcastle road - near JReid Road roundabout	434373	563955	30.7	100%
South Tyneside Council Continuous Analyser					
STC_CM	Edinburgh Road Continuous Monitor	434068	563695	25.7	99.6%

6.5.13 To supplement the available monitoring data, Highways England undertook a 12 month NO_2 monitoring survey around the Scheme area. The results provided 2012 annual mean concentrations to inform the air quality assessment and to verify dispersion modelling results, as shown in Table 6-9 and Figure 6.1.

Table 6-9: Highways England A19 NO_2 Diffusion Tube Survey (2012 Annual Mean)

ID	Monitoring Location	OS Co-ordinates		2012 Annual Mean NO_2 Conc (µg/m^3)	Data Capture %
		X	Y		
HA_001	Newcastle Road, A184	432552	561087	21.3	92%
HA_002	Unmarked road adjacent to Newcastle Road, A184	431486	561200	19.9	75%
HA_003	Laverick Hall Farm Cott adjacent to Newcastle Road, A184	431444	561256	24.9	92%
HA_004	Brayside	433786	562323	23.5	100%
HA_005	Romsey Drive	433931	561871	23.6	100%
HA_006	Henley Way (B1298)	434216	561584	31.4	100%
HA_007	Addison Road (A184)	434922	560994	37.0	100%
HA_008	Addison Road (A184)	435268	561133	24.6	100%
HA_009	Cinderford Close	434006	562494	19.9	92%
HA_010	Front Street, East Boldon.	436739	561254	27.9	100%
HA_011	Background Tube – Park Area off St. Nicholas View	435081	561217	22.6	92%
HA_012	Background Tube – green field, adjacent to Fieldway	433286	561984	20.2	67%
HA_013	Automatic Station, Lindisfarne Roundabout	434068	563695	29.3	100%
HA_016	A19	433938	562798	36.4	92%
HA_017	A19	433966	562812	44.5	83%
HA_018	A19 Lay-by	434680	558359	32.6	100%

6.5.14 The STC measurements show concentrations within the NO_2 annual mean objective (40 µg/m^3), with the exception of STC_23, which is located in the AQMA but is closer to the A19 than the surrounding residential properties. The Highways England monitoring shows an existing exceedance of the NO_2 AQO at one of the monitoring locations (HA_17), which is located close to the A19 carriageway. It should be noted that monitoring locations tend to be in worst-case locations, and may not be representative of actual public exposure, as residential properties and other receptors tend to be located further from the carriageway.

Modelled estimates of baseline 2012 concentrations at receptors

6.5.15 The air quality study area was defined by the traffic changes predicted to result from the Scheme. At the receptor locations, estimates were made by dispersion modelling of what the air quality situation was in the base year; this was taken to represent the current air quality situation at these locations. Dispersion models used meteorological data to represent the way that emissions from vehicles are transported through the atmosphere.

6.5.16 Of the 55 local air quality receptors assessed for the local air quality assessment, none were predicted to exceed the NO_2 annual mean AQO. Baseline 2012 concentrations are illustrated in Figure 6.2.

6.5.17 The results for representative receptors used later in the chapter to describe the spatial impacts of the Scheme are presented in Table 6-10. The receptors detailed consist of those with the highest concentrations, and the closest in proximity to the affected road links of the Scheme.

Table 6-10: Baseline Results (2012)

Receptor		Baseline Concentration 2012 Annual Mean NO_2 Conc (µg/m^3)			
		NO_2		PM_{10}	
		Bkgrd	Total	Bkgrd	Total
DHL_45	24 Baltimore Avenue, Sunderland, SR5 4RG	15.2	21.9	16.0	17.3
DHL_10	43 Boston Crescent, Sunderland, SR5 4QS	15.2	20.6	16.0	17.0
DHL_20	40 Boston Street, Sunderland, SR5 4QT	15.2	20.6	16.0	17.0
DHL_46	26 Baltimore Avenue, Sunderland, SR5 4RG	15.2	20.7	16.0	17.1
DHL_38	114 Baltimore Avenue, Sunderland, SR5 4QX	15.2	20.5	16.0	17.0
DHL_44	20 Baltimore Avenue, Sunderland, SR5 4RG	15.2	20.9	16.0	17.1
DHL_14	51 Boston Crescent, Sunderland, SR5 4QS	15.2	20.5	16.0	17.0
DHL_50	33 Ferryboat Lane, Sunderland, SR5 3RB	15.2	20.2	16.0	16.9
DHL_52	128 Baltimore Avenue, Sunderland, SR5 4QX	15.2	20.4	16.0	17.0
DHL_31	1 Ferryboat Lane, Sunderland, SR5 3RB	15.2	20.3	16.0	16.9

6.5.18 The highest concentrations within the study area were predicted approximately 900 m south of the Scheme, at Receptor 45 (24 Baltimore Avenue), with a concentration of 21.9 µg/m^3. However, the elevated concentrations are primarily a result of the greater background concentrations predicted by Defra for the specific 1 km x 1 km grid square within which the receptors are located, rather than specifically due to road traffic flow. Table 6-8 shows that background NO_2 concentrations at properties in this area are higher than other receptors. This

Defra predicted background concentration is not supported by HE monitoring data within this grid square (HA_018), which shows that total concentrations (i.e. including emissions from the nearby A19 road source) were similar to the receptor concentration. However, on a worst-case scenario basis, the Defra predicted background concentrations have been used for air quality modelling at this location, which therefore leads to a likely over-prediction of concentrations at these receptors. The remainder of the receptor concentrations are well below the NO_2 AQO.

6.5.19 None of the receptors within the study area approach the PM_{10} annual mean AQO of 40 µg/m^3, or are expected to exceed the 24 hours mean AQO because the modelled annual mean concentrations are less than 32 µg/m^3[28].

6.6 Potential impacts (without mitigation)

Construction impacts

6.6.1 Dust has the potential to cause nuisance to property, and very high levels of soiling can affect plants and ecosystems. There is the potential for dust nuisance on receptors within 200 m of construction sites and haulage routes associated with the Scheme. This nuisance, which is separate from adverse effects on health, can arise through annoyance caused by the soiling of windows, cars, washing and other property. The maximum distance at which dust nuisance is likely to be experienced is 200 m from the source.

6.6.2 There are 340 residential and two commercial receptors (one showroom and one car hire company) located within 200 m of the Scheme's alignments. Whilst there would be an increase in HDV vehicles to necessitate the construction, it is understood that construction deliveries would utilise the existing A19 and A1290 (avoiding local roads).

6.6.3 There are a number of receptors which could be directly affected by dust nuisance associated with the Scheme works or construction vehicle traffic, so there is potential for adverse impacts. It should be noted that any potential impacts would be temporary in nature; see Section 6.7 of this ES.

Operational impacts

6.6.4 This section presents the assessment of impacts with the Scheme in operation upon local air quality along affected roads in the study area. The results presented throughout this section are based on the values predicted using the Gap Analysis methodology, which takes account of long-term trends in NO_x and NO_2. More information on the gap analysis methodology is given in Appendix 6.4.

6.6.5 From the receptors assessed in the DM scenario, there are no predicted exceedances of the NO_2 annual mean AQO in either the DM or DS scenario. There are also no new exceedances as a result of the Scheme. Selected receptors, experiencing the highest concentrations or greatest increase or decrease due to the Scheme, have been presented in this section to inform the discussion (Table 6.10 provides the baseline data for these receptors and Table 6.11 provides the predicted changes in the DM and DS scenarios). A complete table of results for all the receptors assessed is provided in Appendix 6.5.

6.6.6 Figures 6.3 and 6.4 show the predicted DM and DS annual mean NO_2 concentrations in 2021, respectively. Figure 6.5 shows the difference in annual mean NO_2 concentrations in 2021, between the DM and DS scenario (i.e. without and with the Scheme in place), and therefore illustrates the effect of the Scheme.

6.6.7 PM_{10} concentrations are not predicted to exceed either the annual mean or 24-hour mean objectives in the DM or DS scenarios at any receptor locations. The maximum modelled concentration is at receptor 45 (24 Baltimore Avenue)) at 16.4µg/m^3 in the DS scenario. PM_{10} predictions for each representative receptor are included in the tables below, but are not discussed further and are not included within figures as there are no exceedances of the AQOs and impacts are lower than those predicted for NO_2.

Operational Results

6.6.8 The results of the modelling assessment identified no exceedance of the relevant AQOs at any of the modelled receptors in the DM or DS scenario. As shown in Table 6-11, the highest concentrations are within the AQOs. Therefore, pollutant concentrations at modelled receptors are not significant. The highest concentrations were predicted at receptors to the south of the Scheme, but concentrations levels relate to a higher background concentration, rather than an effect from the Scheme in place. Results showing the highest concentrations at receptors are provided in Table 6-11.

6.6.9 The selected receptors are predicted to experience an imperceptible (<=0.4 µg/m^3) change in annual mean concentrations, and all remain within the NO_2 AQO.

6.6.10 Properties on Boston Crescent and Baltimore Avenue are approximately 85 m from the A19 carriageway and approximately 280 m from the proposed Downhill Lane junction roundabout at its closest point. Therefore, the results reflect the main traffic changes that relate to queuing on the northbound slip road, west side of the A19 (approximately 130 m from the nearest receptor), and on Downhill Lane junction, outside the 200 m study area, during the limited timeframes around the IAMP and Nissan daily shift changes.

Table 6-11: Operational Impacts (2021): Highest Concentrations

Receptor		Annual Mean Concentration (µg/m^3)					
		NO_2			PM_{10}		
		DM	DS	DS-DM	DM	DS	DS-DM
DHL_45	24 Baltimore Avenue, Sunderland, SR5 4RG	16.7	16.7	0.0	16.4	16.4	0.0
DHL_10	43 Boston Crescent, Sunderland, SR5 4QS	16.1	16.1	0.0	16.3	16.2	-0.1
DHL_20	40 Boston Street, Sunderland, SR5 4QT	16.1	16.1	0.0	16.3	16.2	-0.1
DHL_46	26 Baltimore Avenue, Sunderland, SR5 4RG	16.1	16.1	0.0	16.3	16.3	0.0
DHL_38	114 Baltimore Avenue, Sunderland, SR5 4QX	16.0	16.0	0.0	16.3	16.2	-0.1
DHL_44	20 Baltimore Avenue, Sunderland, SR5 4RG	16.0	16.0	0.0	16.2	16.2	0.0
DHL_14	51 Boston Crescent, Sunderland, SR5 4QS	16.0	16.0	0.0	16.3	16.2	-0.1
DHL_50	33 Ferryboat Lane, Sunderland, SR5 3RB	16.0	16.0	0.0	16.3	16.3	0.0
DHL_52	128 Baltimore Avenue, Sunderland, SR5 4QX	16.0	16.0	0.0	16.3	16.2	-0.1
DHL_31	1 Ferryboat Lane, Sunderland, SR5 3RB	16.0	16.0	0.0	16.2	16.2	0.0

[28] TG (16)

Summary

6.6.11 In the comparison of the DM and DS 2021 (opening year) scenarios, there were no predicted exceedances of the NO_2 annual mean AQO at locations within the study area. No receptors were predicted to exceed the annual mean equivalent for the 1 hour mean AQO (See Appendix 6.1 in Volume 3 of the ES).

6.6.12 PM_{10} concentrations were not predicted to exceed the annual mean AQO, or the equivalent of the 24 hours mean AQO of 32 µg/m^3 at any receptors in the study area.

Summary of compliance risk assessment

6.6.13 There are no Pollution Climate Mapping model road links within the air quality study area.

Regional air quality

6.6.14 The regional emissions have been calculated for all modelled roads. The results for the regional assessment for Opening Year 2021 are shown in Table 6-12.

Table 6-12: Regional Air Quality Assessment (Opening Year 2021)

Pollutant		Annual Regional Emission in tonnes			
		Base 2012	DM 2021	DS 2021	Change With Scheme (DS-DM)
NO_x	tonnes/yr	7.2	4.2	4.9	0.6
PM_{10}	tonnes/yr	0.6	0.5	0.6	0.1
CO_2	tonnes/yr	2,640	3,068	3,581	513

6.6.15 The results for the opening year (2021) indicate an increase in NO_x emissions of approximately 0.6 tonnes/year; an increase of 15% with the Scheme in place. PM_{10} emissions are predicted to increase by approximately 0.1 tonnes/year, an increase of 14%, with CO_2 emissions predicted to increase by 513 tonnes/year, an increase of around 17% compared with the DM scenario.

6.6.16 The results for the regional assessment for the design year (2036) are shown in Table 6.-13.

Table 6-13: Regional Air Quality Assessment (Design Year 2036)

Pollutant		Annual Regional Emission in tonnes			
		Base 2012	DM 2036	DS 2036	Change With Scheme (DS-DM)
NO_x	tonnes/yr	7.2	4.2	4.6	0.4
PM_{10}	tonnes/yr	0.6	0.8	0.9	0.1
CO_2	tonnes/yr	2,640	4,960	5,375	415

6.6.17 The results for the design year (2036) indicate an increase in NO_x emissions of approximately 0.4 tonnes/year; an increase of 9% with the Scheme in place. PM_{10} emissions are predicted to increase by 0.1 tonnes/year, an increase of 8%. CO_2 emissions predicted to increase by approximately 415 tonnes/year, an increase of around 8% compared with the DM scenario. The 2036 calculations take account of the new roads in operation for the IAMP Two development at that time.

6.6.18 Emissions of NO_x increase more than the PM_{10} for the regional study area because the regional study area is different to the local air quality study area, and so are not directly comparable. In addition, changes in NO_x emissions cannot be used as a proxy for the level of change in NO_2. Concentrations of NO_2 were calculated at isolated locations (sensitive receptors) and were a result of the changes in NO_x on the roads closest to the location; whereas changes in emissions are calculated for a much larger area for a larger number of roads. In addition, the NO_2 concentrations are not directly proportional to changes in NO_x on the most local roads due to the atmospheric chemistry that converts total NO_x to NO_2; the chemistry tends to reduce the level of change in NO_2 compared to NO_x (i.e. the level of change for NO_2 is smaller than the level of change for NO_x).

6.7 Design, mitigation and enhancement measures

Mitigation for construction impacts

6.7.1 In order to minimise any potential emissions of fugitive dust during the construction phase (and hence minimise potential impacts), the Construction Environmental Management Plan (CEMP) would include best practice measures to control fugitive dust.

6.7.2 Appropriate construction-dust mitigation measures, based on those outlined by the Institute for Air Quality Management[29] are detailed within Appendix 6.6 and the CEMP. These were based on a Low risk site for on-site construction activities, and a High risk site for the creation of dust outside the site associated with construction vehicle traffic.

6.7.3 It was considered that with an appropriate CEMP implemented, there would be no significant effects on air quality during the construction phase of the Scheme.

Mitigation for operational impacts

6.7.4 The detailed air quality assessment, which includes the cumulative impact of both the Testo's scheme and IAMP (One and Two) developments, has concluded that no exceedances of air quality objectives at sensitive receptors would be likely with the Scheme in place. Therefore, the air quality impacts of the Scheme would not be significant. As such, and based on the guidance in IAN174/13, no mitigation measures would be required for the operational phase of the Scheme.

6.8 Assessment of effects

Construction

6.8.1 With best practice dust control measures in place, the construction phase of the Scheme was predicted to not cause any significant dust nuisance.

Local air quality

6.8.2 Receptors were only included in the overall judgement of significant effects where they exceed the AQOs. There were no receptors predicted to exceed the AQOs for NO_2 or PM_{10}, so it was not considered to be a significant effect on local air quality as a result of the Scheme.

6.8.3 For the Opening Year 2021, no exceedances of the NO_2 and PM_{10} AQOs were predicted.

[29] Institute for Air Quality Management (2014) *Guidance on the assessment of dust from* demolition and construction

6.8.4 It was predicted that the Scheme would lead to imperceptible changes in NO_2 concentrations at receptors, but would not be in exceedance of AQOs for these receptors.

6.8.5 It was not considered that the Scheme would alter UK's ability to comply with the EU Air Quality Directive, as reported by Defra.

6.8.6 Overall, based on Highways England's guidance[30] for evaluating significant effects, the Scheme was not considered to lead to a significant local air quality effect. This conclusion was reached using the Gap Analysis results adjusted for long-term trends (LLT_{E6}).

Regional and greenhouse gas emissions

6.8.7 There is no government guidance published for assessing the significance of the effects of individual highway schemes on regional or greenhouse gas emissions.

6.8.8 The Climate Change Act publishes budgets for the reduction of the emissions of greenhouse gases, with a view to substantial national reductions being achieved by 2050. The increase in the greenhouse gas emissions is included in the calculation of the WebTAG Benefit Cost Ratio of the Scheme as a financial cost (see Appendix 6.7).

6.8.9 The regional assessment results show small increases in NO_x, CO_2 and PM_{10} emissions as a result of the Scheme, with similar results for the opening and design year assessments.

Inter-relationship effects between topics

6.8.10 In relation to inter-relationship effects, no significant air quality impacts have been identified, either during construction or during operation. It was considered very unlikely that any of the insignificant changes in local air quality that have been identified at receptors would combine with other environmental changes (such as noise or visual effects) to result in more significant inter-relationship effects.

Shared use of the A19 Testo's scheme main site compound

6.8.11 As discussed in Section 1.5, in Chapter 1 of this ES, there is the potential that the Scheme could share use of the temporary main site compound for the Testo's scheme for the purpose of general storage, traffic management and office-based administrative purposes. If this was undertaken from the commencement of construction of the Scheme, the area of land take required for the Downhill Lane main site compound could be reduced. There would also be a period where both the Testo's and Downhill Lane junction schemes are being constructed at the same time, followed by a period where only the Scheme is under construction but still using the Testo's scheme main site compound.

6.8.12 Use by the Downhill Lane Scheme would not change the footprint of the Testo's main site compound, but there would be some additional potential Heavy Duty Vehicle (HDV) movements in and out the Testo's Scheme main site compound in excess of those assumed in the Testo's Scheme ES. However, the total HDV movements would not exceed 200 movements per day. Given the smaller scale of activity anticipated for the Scheme, for example no embankment construction and the fact that soil storage areas would be located adjacent to the Scheme works, it was anticipated that the additional vehicle movements would not cause any significant increases in fugitive dust emissions.

6.8.13 Though the extended use of the Testo's scheme main site compound would mean a longer duration of exposing the environment to air pollution risks from the Testo's compound, these would not be significant due to continued application of good construction practices (e.g. CEMP pollution controls) and the reduction of construction activity in the Testo's compound to mainly low risk general storage, traffic management and office-based administrative purposes.

6.8.14 The reduction in the temporary land take required by the Downhill Lane Scheme main site compound would not change the Scheme ES assessment due to the lack of sensitive receptors near the Scheme compound (especially the northern end where any land take reduction would most likely occur).

6.8.15 Therefore, there would be no significant change in the air quality effects (e.g. construction dust emissions) outlined in Chapter 6 of both the Scheme and Testo's scheme ESs as a result of the shared and extended use of the Testo's scheme main site compound.

Cumulative effects

6.8.16 As explained in Section 5.4, in Chapter 5 of this ES, the operational assessment within this chapter uses the 2021 and 2036 DM and DS traffic models where the future baseline includes the road network and traffic flow changes associated with other developments. Therefore, the operational air quality assessment of the Scheme includes the cumulative effects with other developments, including IAMP Two.

6.8.17 However, the operation of IAMP One and construction of the Testo's scheme form part of the baseline for the construction phase noise assessment; the construction phase air quality cumulative effects of the Scheme with other developments are assessed within Chapter 15 of this ES.

[30] HA, IAN 174/13 - Updated air quality advice on the application of the test for evaluating significant effects; for users of DMRB Volume 11, Section 3, Part 1 Air Quality, June 2013

CHAPTER 7 CULTURAL HERITAGE

Executive Summary

Potential effects on cultural heritage have been assessed based on the guidance provided in Design Manual for Roads and Bridges (DMRB). The assessment draws on information gained from desk-based sources, site inspections and specialist field surveys commissioned for the Scheme.

Archaeological remains (dating from the medieval to modern periods), non-designated historic buildings and seven Historic Landscape Types have been identified within a 200 m study area surrounding the Scheme. The potential for effects on the setting of designated cultural heritage assets within the Zone of Theoretical Visibility of the Scheme has also been assessed.

Direct effects on four archaeological sites have been identified, comprising: two agricultural features of medieval or later date; a disused railway; and the site of an associated level crossing. None of these effects are considered to be significant, with the assessment concluding a neutral residual significance of effect, and therefore no mitigation measures are proposed.

7.1 Introduction

7.1.1 This chapter presents the results of an assessment of the potential effects of the Scheme on cultural heritage, and has been prepared in accordance with guidance provided by DMRB *(Volume 11, Section 3 Part 2 'Cultural Heritage'* (HA 208/07)). Cultural Heritage has been considered under the sub-topics of 'Archaeological Remains', 'Historic Buildings' and 'Historic Landscape'. Individual archaeological sites, historic buildings and historic landscape types are known collectively as cultural heritage assets.

7.2 Legislative and policy framework

Legislative background

7.2.1 Scheduled Monuments are by definition of national importance and protected by law under the *Ancient Monuments and Archaeological Areas Act 1979*.

7.2.2 Listed buildings of special architectural or historic interest are protected under the Planning (Listed Buildings and Conservation Areas) Act 1990. Planning authorities are required to have special regard to the desirability of preserving a listed building, its setting, or any features of special architectural or historic interest that it possesses. Listed buildings are addressed in the sections of this chapter covering 'historic buildings'.

7.2.3 Historic hedgerows are covered by the Hedgerow Regulations 1997, which set out historic and archaeological criteria for the classification of Historic Hedgerows.

Policy background

7.2.4 National and local planning policy relevant to the assessment of potential effects on Cultural Heritage is outlined in Tables 7-1, 7-2 and 7.3.

Table 7-1: Relevant National Policies

National Policy	Relevant Paragraph	How the policy has been addressed
National Networks National Planning Policy Statement (NNNPS) (Designated January 2015)	The Historic Environment is referred to in **paragraphs 5.120 to 5.142** of the NNNPS.	The NNNPS sets out the Government's vision and policy against which the Secretary of State will make decisions on applications for development consent for nationally significant infrastructure projects on the strategic road and rail networks. A full review of the Scheme against the NNNPS is set out in Appendix A of the Planning Statement (DCO application reference TR010024/APP/7.1).
National Planning Policy Framework (NPPF) (July 2018)	**Section 16** of the NPPF addresses conserving and enhancing the historic environment. **In Paragraph 189** of the NPPF, applicants for planning permission are required to provide a description of the significance of any affected heritage assets, including any contribution made by their setting in sufficient detail to enable local planning authorities to understand the potential impact of the proposal on their significance. The paragraph goes on to describe the minimum information that should be provided in all cases, and the level of information that should be provided where a site on which development is proposed includes or has the potential to include heritage assets.	Section 7.5 of this ES chapter presents a description of the significance of cultural heritage assets including the contribution of their setting to that significance.
	Paragraph 193 states that *"when considering the impact of a proposed development on the significance of a designated heritage asset, great weight should be given to the asset's conservation (and the more important the asset, the greater the weight should be").* **Paragraph 194** goes on to state that *"Substantial harm to or loss of: a) grade II listed buildings, or grade II registered parks or gardens, should be exceptional; b) heritage assets of the*	Section 7.3 of this ES chapter addresses the assessment of the significance of the effect on cultural heritage assets including designated assets.

National Policy	Relevant Paragraph	How the policy has been addressed
	highest significance, notably scheduled monuments, protected wreck sites, battlefields, grade I and II listed buildings, grade I and II* registered parks and gardens, and World Heritage Sites, should be wholly exceptional".*	
National Planning Policy Framework (NPPF) (July 2018) (continued)	**Paragraph 195** states that "*where a proposed development will lead to substantial harm to (or total loss of significance of) a designated heritage asset, local planning authorities should refuse consent, unless it can be demonstrated that the substantial harm or loss is necessary to achieve substantial public benefits that outweigh that harm or loss, or all of the following apply:* *a) the nature of the heritage asset prevents all reasonable uses of the site; and* *b) no viable use of the heritage asset itself can be found in the medium term through appropriate marketing that will enable its conservation; and* *c) conservation by grant-funding or some form of charitable or public ownership is demonstrably not possible; and* **d)** *the harm or loss is outweighed by the benefit of bringing the site back into use."* **Paragraph 196** states that *"where a development proposal will lead to less than substantial harm to the significance of a designated heritage asset, this harm should be weighed against the public benefits of the proposal, including, where appropriate, securing its optimum viable use".* **Paragraph 197** states that "*the effect of an application on the significance of a non-designated heritage asset should be taken into account in determining the application. In weighing applications that directly or indirectly affect non-designated heritage assets, a balanced judgement will be required having regard to the scale of any harm or loss and the significance of the heritage asset".*	Section 7.3 of this chapter addresses the assessment of the significance of impact on cultural heritage assets including designated assets.
	Paragraph 200 asserts that *"Proposals that preserve those elements of the setting that make a positive contribution to the asset (or which better reveal its significance) should be treated favourably".*	Landscape mitigation proposals to help integrate the Scheme into the surrounding landscape are proposed in Section 8.7 of Chapter 8 of this ES.
	Paragraph 199 asserts that local planning authorities "*should require developers to record and advance understanding of the significance of any heritage assets to be lost (wholly or in part) in a manner proportionate to their importance and the impact, and to make this evidence (and any archive generated) publicly accessible. However, the ability to record evidence of our past should not be a factor in deciding whether such loss should be permitted".*	Mitigation measures are outlined in Section 7.7 of this ES chapter.
Planning Practice Guidance (PPG) 2014	Planning Practice Guidance relating to relevant NPPF policies are included under "*Conserving and enhancing the historic environment*"[31].	

[31] Paragraphs 008 to 020 can be found within the Planning Practice Guidance section within the NPPF policies relation to Decision-taking: historic environment, http://www.gov.uk/guidance/conserving-and-enhancing-the-historic-environment

National Policy	Relevant Paragraph	How the policy has been addressed
	Paragraph 008 states: "*In legislation and designation criteria, the terms 'special architectural or historic interest' of a listed building and the 'national importance' of a scheduled monument are used to describe all or part of the identified heritage asset's significance. Some of the more recent designation records are more helpful as they contain a fuller, although not exhaustive, explanation of the significance of the asset.*"	The concept of Significance of cultural heritage assets is addressed in Section 7.3 of this ES chapter, and in more detail in Appendix 7.1.
	Paragraph 009 states: "*Heritage assets may be affected by direct physical change or by change in their setting. Being able to properly assess the nature, extent and importance of the significance of a heritage asset, and the contribution of its setting, is very important to understanding the potential impact and acceptability of development proposals.*"	The concept of the effects of change on cultural heritage assets is addressed in Section 7.3 of this ES chapter, and in more detail in Appendix 7.1.
	Paragraph 011 states: "*Historic environment records are publicly-accessible and dynamic sources of information about the local historic environment. They provide core information for plan-making and designation decisions (such as information about designated and non-designated heritage assets, and information that helps predict the likelihood of current unrecorded assets being discovered during development) and will also assist in informing planning decisions by providing appropriate information about the historic environment to communities, owners and developers as set out in the National Planning Policy Framework. Details of how to access historic environment records can be found on Historic England's website.*"	The appropriate Historic Environment Record was a source of baseline data for this assessment. This is recorded in Section 7.4 of this ES chapter.

National Policy	Relevant Paragraph	How the policy has been addressed
Planning Practice Guidance (PPG) (continued)	**Paragraph 013** states: "*A thorough assessment of the impact on setting needs to take into account, and be proportionate to, the significance of the heritage asset under consideration and the degree to which proposed changes enhance or detract from that significance and the ability to appreciate it.*"	Setting and its contribution to the significance of cultural heritage assets is addressed in the detailed methodology presented in Appendix 7.1.
	Paragraph 017 states: "*What matters in assessing if a proposal causes substantial harm is the impact on the significance of the heritage asset. As the National Planning Policy Framework makes clear, significance derives not only from a heritage asset's physical presence, but also from its setting.*"	An assessment of the significance of effects during the construction and operation of the Scheme is presented in Section 7.6 of this ES chapter and Tables 7–8 and 7–9.
	Paragraph 019 states: "*A clear understanding of the significance of a heritage asset and its setting is necessary to develop proposals which avoid or minimise harm. Early appraisals, a conservation plan or targeted specialist investigation can help to identify constraints and opportunities arising from the asset at an early stage. Such studies can reveal alternative development options, for example more sensitive designs or different orientations, that will deliver public benefits in a more sustainable and appropriate way.*"	Desk-based studies and a specially commissioned geophysical survey were undertaken to improve understanding of significance of assets and inform the baseline (see Section 7.4 of this ES chapter). The results of the geophysical survey are presented in Appendix 7.2.

Table 7-2: Relevant Policies within the South Tyneside Local Development Framework

South Tyneside Local Development Framework	Relevant Policy	How the policy has been addressed
Development Management Policies (December 2011)	**Policy DM6 Heritage Assets and Archaeology** "*We will support development proposals that protect, preserve and where possible enhance the historic, cultural and architectural character and heritage, visual appearance and contextual importance of our heritage assets and their settings.*"	The ES chapter addresses effects on the settings of Listed Buildings, and on archaeological deposits, and on archaeological deposits and remains (DM6, C). Mitigation measures are presented in Section 7.7 and Tables 7–8 and 7–9 of this ES chapter.

Table 7-3: Relevant Saved Policies within the City of Sunderland Unitary Development Plan

City of Sunderland Unitary Development Plan (1998)	Relevant Policy	How the policy has been addressed
Built Environment Policies	**Policy B11 Archaeology** "*the City Council will promote measures to protect the archaeological heritage of Sunderland and ensure that any remains discovered will be either physically preserved or recorded.*"	The ES chapter addresses effects on archaeological remains.
	Policy B13 Excavation and Recording *"The City Council will seek to safeguard sites of local archaeological significance. When development affecting such is acceptable in principle, the Council will seek to ensure mitigation of damage through preservation of the remains in situ as a preferred solution. Where the physical preservation of remains in the original situation is not feasible, excavation for the purpose of recording will be required."*	Mitigation measures are presented in Section 7.7 and Tables 7–8 and 7–9 of this ES chapter.
	Policy B14 *"Where development proposals affect sites of known or potential archaeological importance, the City Council will require an archaeological assessment/evaluation to be submitted as part of the planning application. Planning permission will not be granted without adequate assessment of the nature, extent and significance of the remains present and the degree to which the proposed development is likely to affect them."*	The ES chapter assesses the significance of archaeological remains affected by the Scheme. Results of non-intrusive evaluation by geophysical survey is presented in Appendix 7.2 of this ES chapter.
	Policy B16 *"Where any historic sites and monuments are discovered provision will be made for an appropriate level of assessment, recording and preservation (in advance of or if necessary during construction) commensurate with the importance of the find."*	Mitigation measures are presented in Section 7.7 and Tables 7–8 and 7–9 of this ES chapter.

7.3 Assessment methodology

Data gathering and study area

7.3.1 In line with the guidance provided by DMRB, Vol. 11 Section 3, Part 2 'Cultural Heritage' hereafter referred to as HA208/07, a study area was defined to include the area of the permanent works for the Scheme and any temporary land-take required for construction plus an area extending 200 m in all directions from those areas. The study area is shown in Figure 7.1.

7.3.2 The study area was used to identify subjects from all three of the sub-topics used to define 'cultural heritage' within HA208/07. These sub-topics comprise:

- Archaeological remains – *'the material remains of human activity from the earliest periods of human evolution to the present. Archaeological remains may comprise the buried traces of human activities or visible monuments, or moveable artefacts'* (HA 208/07, Annex 5, para 5.1.1).
- Historic buildings – *'architectural or designated or other structures with a significant historical value'* (HA 208/07, Chapter 2, para 2.5); and

- Historic landscape – *'an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors'* (HA 208/07, Annex A, para 7.1.2).

7.3.3 The Zone of Theoretical Visibility, defined in Section 8.4 of Chapter 8 (Landscape and Visual Effects chapter) in this ES, was used to identify designated cultural heritage assets located outside of the 200 m study area and where the setting of which may be affected by construction and operation of the Scheme.

7.3.4 The following baseline data was used to inform this assessment:

- historic Ordnance Survey, tithe and enclosure maps held by the Tyne and Wear Archives and South Shields Local Studies Library;
- vertical and oblique aerial photographs held by the Historic England Archive; and
- published cultural heritage literature.

7.3.5 This was updated with current information from the following sources:

- the National Heritage List (NHL) for information on internationally and nationally designated cultural heritage assets (World Heritage Sites, Scheduled Monuments, Listed Buildings, Registered Parks and Gardens, Registered Battlefields and Protected Wrecks);
- the Tyne and Wear Historic Environment Record (TWHER) to identify any additional cultural heritage assets discovered since the previous stage of works, and to obtain Historic Landscape information;
- the Historic England Archive for information on undesignated cultural heritage assets; and
- a walkover survey of the study area undertaken in December 2014 (during development of a previous version of the Scheme).

7.3.6 In addition to the sources identified above, where possible a geophysical survey of the permanent and temporary land take was conducted between November 2017 and March 2018[32] (Headland Archaeology 2018); the results of the geophysical study are presented as Appendix 7.2.

7.3.7 This assessment meets the requirements of a Simple Assessment as defined by HA208/07.

Consultation

7.3.8 Consultation with the Tyne and Wear Archaeology Officer, the South Tyneside Historic Environment Officer and Historic England was undertaken on the methodology used in the preparation of this report, and to identify any specific concerns regarding the Scheme.

7.3.9 The Tyne and Wear Archaeology Officer, the South Tyneside Historic Environment Officer and Historic England confirmed they were content with the proposed scope of assessment. At the time of writing, a response had not been received from the County Historic Buildings Officer.

7.3.10 Following consultation on the results of the geophysical survey, the Tyne and Wear Archaeology Officer confirmed, in July 2018, that no further evaluation or mitigation was required for the archaeological remains sub-topic.

Assessment of the significance of effect on cultural heritage assets

7.3.11 For all three cultural heritage sub-topics, an assessment of the value of each asset was undertaken on a five-point scale of Very High, High, Medium, Low and Negligible. In some cases, the value may be recorded as 'unknown' because there is insufficient information available to make an assessment of value. The assessment of value was based on professional judgement informed by the criteria for the assessment of value provided in HA208/07. An assessment of the effect on the setting of cultural heritage assets was undertaken following a three-step approach in accordance with the guidance provided in *Historic Environment Good Practice Advice in Planning Note 3: The Setting of Heritage Assets* (Historic England 2015).

7.3.12 Magnitude of impact is the degree of change that would be experienced by an asset and its setting if the Scheme was completed, as compared with a 'do nothing' situation. For all three sub-topics, an assessment of the magnitude of impact from the Scheme was undertaken on a five-point scale of Major, Moderate, Minor, Negligible and No Change. Magnitude of impact is assessed without reference to the value of the receptor, and may include physical impacts upon the asset or impacts upon its setting or amenity value. Assessments of magnitude of impact were made using professional judgement guided by the methodology and criteria provided by HA208/07. Unless otherwise stated, all impacts would be adverse.

7.3.13 For all three sub-topics, an assessment of the significance of the effect was made on a five-point scale of Very Large, Large, Moderate, Slight or Neutral, which apply equally to Adverse and Beneficial effects. This is achieved using professional judgment informed by the guidance provided in HA208/07 and the matrix illustrated below in Table 7-4.

7.3.14 More detail on the assessment methodology can be found in Appendix 7.1.

Table 7-4: Matrix to assess the significance of impacts on cultural heritage assets

Value / sensitivity	Magnitude of impact				
	No change	Negligible	Minor	Moderate	Major
Very high	Neutral	Slight	Moderate or Large	Large or Very Large	Large or Very Large
High	Neutral	Slight	Moderate or Slight	Moderate or Large	Large or Very Large
Medium	Neutral	Neutral or Slight	Slight	Slight or Moderate	Moderate or Large
Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

[32] Weather conditions affected the soil during the initial survey in November 2017 and in response to the landowner's request completion of the survey was delayed until March 2018.

7.4 Assessment assumptions and limitations

7.4.1 It has been assumed that IAMP One will be fully built by January 2020, thus is treated as fully operational within the future baseline for the assessment of effects during construction and operation of the Scheme (as outlined in Section 5.4, in Chapter 5 of this ES).

7.5 Baseline conditions

Introduction

7.5.1 Baseline data was derived from the sources described under Section 7.3, above.

7.5.2 For consistency, and consideration in Chapter 15 of any cumulative effects, the numbering of cultural heritage assets reflects the sequence used in the Testo's Improvement Scheme Environmental Statement[33].

7.5.3 A total of 28 cultural heritage assets have been included in the baseline, comprising 10 archaeological sites, 12 historic buildings and six historic landscape types.

7.5.4 There are no World Heritage Sites, Scheduled Monuments, Listed Buildings, Registered Parks and Gardens, Registered Battlefields, or Conservation Areas within the study area.

7.5.5 There are no Important Hedgerows, meeting the required criteria covered by the Hedgerow Regulations 1997, within the study area.

7.5.6 One Grade II* Listed Building, nine Grade II Listed Buildings and one Conservation Area located outside the 200 m study area and within the Zone of Theoretical Visibility were included in the baseline due to the potential for the construction and/or operation of the Scheme to affect their setting.

7.5.7 Summary details of all cultural heritage assets are presented below in Tables 7-5, 7-6 and 7-7 and their locations are illustrated on Figures 7.1 and 7.2. Full details are presented in the Gazetteer, in Appendix 7.3.

Archaeological remains

7.5.8 Within the 200 m study area, a total of 10 archaeological sites have been identified from the sources identified at Section 7.3, above. Summary details of these assets are presented in Table 7-5 and the location of the cultural heritage shown on Figure 7.1.

Table 7-5: Summary of archaeological remains

Asset no.	Asset name	Designation	Value
44	Stone (Site of)	None	Negligible
46	Engine House	None	Negligible
47	West Boldon Dam	None	Negligible
49	Downhill Level Crossing	None	Negligible
58	Stanhope and Tyne Railway	None	Negligible
70	Ridge and Furrow 8	None	Negligible
72	Narrow Ridge and Furrow	None	Negligible
73	Ridge and Furrow 9	None	Negligible
74	Usworth, Sunderland Aerodrome (RAF Usworth)	None	Negligible
75	Usworth RAF, Searchlight Battery TT237	None	Negligible

7.5.9 No archaeological remains dating to the prehistoric period (before AD 43) or Roman period (AD 43 to 410) have been identified within the study area.

7.5.10 Archaeological remains within the study area predominantly date from the post-medieval period (AD1540 – AD1900) and comprise agricultural and transport-related features. These remains are either in poor condition or have been destroyed by modern development and farming methods, and as such are considered to be of negligible value.

7.5.11 Three areas of ridge and furrow (Assets 70, 72 and 73) have been identified within the study area, resulting from agricultural practice dating back to the medieval period and continuing onto the post-medieval period. The geophysical survey confirmed that evidence of these cultural heritage assets was present throughout the footprint of the Scheme (see Appendix 7.2). These cultural heritage assets were generally in poor condition or had been destroyed by modern development, so were considered to be of negligible value.

7.5.12 Development of the railway network in the 19th century is represented by four cultural heritage assets, including the route of the Stanhope and Tyne Railway (Asset 58) which was established in the 1830s to transport coal and lime to the coast. The railway is no longer extant and is delineated by the path of a private road; as such it was considered to be of negligible value.

7.5.13 Two cultural heritage assets dating to after AD 1900 are present within the study area. Sunderland Aerodrome (Asset 74) originated during the First World War, and became RAF Usworth during the Second World War. This site was redeveloped as an industrial site in the late 20th century. Related to the airfield is the former site of a searchlight battery (Asset 75), the location of which has since been redeveloped as a housing estate. Asset 74 is no longer extant and is within the site of a current Nissan motorcar factory, while Asset 75 is also no longer extant and within the site of a modern housing estate. As such both cultural heritage assets were considered to be of negligible value.

Potential for unknown archaeological remains

7.5.14 No known pre-medieval cultural heritage assets have been identified within the study area, and prehistoric and Roman archaeological remains are rare within 1 km of the Scheme. In the north of the study area, the presence of levelled medieval and later ridge and furrow ploughing could mask the presence of earlier archaeological remains, though the potential for this is considered to be low. A specially commissioned geophysical survey of the footprint of the Scheme identified only linear anomalies indicative of medieval and post-medieval ploughing, and disturbance from modern utilities, highway and housing development (Appendix 7.2).

[33] Available at: https://infrastructure.planninginspectorate.gov.uk/projects/north-east/a19-a184-testos-junction-improvement/?ipcsection=docs&stage=app&filter1=Environmental+Statement

Historic buildings

7.5.15 One historic building was identified within the study area (Asset 43). A further nine Grade II Listed Buildings (Assets 16, 20, 28, 30, 31, 33, 35, 51 and 80), one Grade II* Listed Building (Asset 21), and one Conservation Area (Asset 81) located outside the study area, but within the Zone of Theoretical Visibility, were included in the baseline due to the potential for effects on their setting. Summary details are presented in Table 7-6 and their locations are shown on Figure 7.1. Further information is contained in the Gazetteer presented in Appendix 7.3.

Table 7-6: Summary of historic buildings

Asset no.	Asset name	Designation	Value
16	Scot's House Gatehouse, Walls and Gate Piers	Grade II Listed Building	Medium
20	Scot's House Stables	Grade II Listed Building	Medium
21	Scot's House	Grade II* Listed Building	High
28	Downhill Farmhouse	Grade II Listed Building	Medium
30	Pair of Lodge Cottages at entrance to Downhill House	Grade II Listed Building	Medium
31	Barn and Gin-Gang south of Downhill Farmhouse	Grade II Listed Building	Medium
33	Limekiln to south-east of Downhill Farmhouse	Grade II Listed Building	Medium
35	Downhill House	Grade II Listed Building	Medium
43	Make-Me-Rich Farm	None	Low
51	Hylton Grove Bridge	Grade II Listed Building	Medium
80	Doorway to south of Rectory Green	Grade II Listed Building	Medium
81	West Boldon Conservation Area	Conservation Area	Medium

Assets of high and medium value

7.5.16 Scot's House Gatehouse, Walls and Gate Piers (Asset 16) and Scot's House Stables (Asset 20) are both Grade II Listed Buildings, and Scot's House (Asset 21) is a Grade II* Listed Building. Taking their designations into account, the value of Assets 16 and 20 were assessed to be Medium, and the value of Asset 21 assessed to be High. Scot's House is of 18th century date and is believed to have a medieval predecessor, although no evidence of this is known to survive. Scot's House Gatehouse, Walls and Gate Piers (Asset 16) and Scot's House Stables (Asset 20) are of 19th century date.

7.5.17 Despite their proximity to the busy A184 Newcastle Road, the immediate setting of Scot's House Gatehouse, Walls and Gate Piers (Asset 16), Scot's House Stables (Asset 20), and Scot's House (Asset 21) retain an enclosed feel due to the mature planting to the west and north of the house itself, and around the Stables (Asset 20). Although the Gatehouse (Asset 16) faces north towards the A184, dense planting behind it screens the house and other buildings from view. Views towards the existing A19 and West Boldon are filtered by mature trees and hedgerow planting within the garden and beyond, as well as the undulating topography and distant woodland blocks. Although the landscape planting and other features of the 19th century garden have been lost and the land returned to agriculture, its mature trees and hedges and modern plantation woodblocks beyond still filter distant views south particularly from ground level.

7.5.18 Downhill Farmhouse (Asset 28), the Barn and Gin-Gang south of Downhill Farmhouse (Asset 30), and Limekiln to south-east of Downhill Farmhouse (Asset 31) are all Grade II Listed Buildings, located on the south-west facing hillside north of the Scheme. These assets form an inward-looking functional group, and their setting is defined by their relationship with one another, and with the surrounding farmland. Taking their designation as Grade II Listed Buildings into account, the value of all three assets has been assessed to be Medium.

7.5.19 Downhill House (Asset 35) and its Pair of Lodge Cottages (Asset 30) are both Grade II Listed Buildings. The buildings are contemporary structures built in the 18th century located on the south-west facing slope of Boldon Hill. Downhill House itself faces west with views over rolling farmland towards Newcastle upon Tyne in the distance; the Lodge Cottages face north-west towards Downhill Lane and the village of West Boldon. Taking their designation as Grade II Listed Buildings into account, the value of both assets was assessed to be Medium.

7.5.20 Asset 51 is Hylton Grove Bridge, a Grade II Listed Building that carries Downhill Lane over the River Don. It would be located approximately 500 m west of the Scheme. Taking its designation as a Grade II Listed Building into account, the value of Asset 51 was assessed to be Medium.

7.5.21 The Doorway south of Rectory Green (Asset 80) is one of the last traces of a demolished 18th century rectory located south-west of Boldon, adjacent to the A184. It takes the form of a carved stone doorway opening into what was once a walled garden. Taking its designation as a Grade II Listed Building into account, the value of Asset 80 was assessed to be Medium.

7.5.22 West Boldon Conservation Area (Asset 81) would be located approximately 850 m north-east of the Scheme. Taking its designation as a Conservation Area into account, the value of Asset 81 was assessed to be Medium.

Assets of low value

7.5.23 Make-Me-Rich Farm (Asset 43) is a farmstead of post-medieval date and has been subject to extensive modern alteration and extension. Although it is still possible to appreciate the relationship between the building and agricultural fields to the west, this relationship has been severed by the modern A19 trunk road to the east. The value of this asset has been assessed to be Low.

Historic landscape

7.5.24 Baseline data for this sub-topic has been derived from GIS polygons supplied by the TWHER, and the *Tyne and Wear Historic Landscape Characterisation Final Report* (Collins 2014).

7.5.25 Within the study area, six Historic Landscape Types (HLTs) had been identified. Summary details of these assets are presented in Table 7-7 and shown on Figure 7.2. Further information about each type is contained in the Gazetteer presented in Appendix 7.3.

Table 7-7: Summary of historic landscape types

Asset no.	Asset name	Designation	Value
HLT1	20th Century Enclosure	None	Negligible
HLT3	Settlement	None	Negligible
HLT5	Modern Communications	None	Negligible
HLT9	20th century plantation	None	Negligible
HLT11	Recreation	None	Negligible
HLT12	Industrial	None	Negligible

7.5.26 All six HLTs are common within the area examined in the *Tyne and Wear Historic Landscape Characterisation Final Report;* most are relatively modern and have removed most traces of earlier landscape character resulting in poor time-depth. All six are also well understood in terms of their historical development and function, and are considered to have little or no historical interest. Taking this into account the value of all six HLTs was assessed to be Negligible.

7.6 Potential impacts (without mitigation)

Construction impacts on archaeological remains

7.6.1 The Scheme would cross the site of Downhill Lane Level Crossing (Asset 49). Archaeological remains associated with this asset are presumed to have been removed during construction of the existing A19 northbound merge slip-road. Taking this into account, the magnitude of the Scheme's impact was assessed to be No Change.

7.6.2 Part of the route of the Stanhope and Tyne Railway (Asset 58) would be removed by construction of the Scheme at the junction with Downhill Lane west of the A19. Taking the small proportion of the asset affected by the Scheme into account, the magnitude of this impact was assessed to be Negligible.

7.6.3 Construction of the Scheme would remove archaeological remains associated with two levelled ridge and furrow field systems identified by aerial photography (Assets 70 and 72). The magnitude of this impact was assessed to be Minor for both cultural heritage assets, owing to their poor state of preservation.

Construction impacts on historic buildings

7.6.4 The group of buildings comprising Scot's House Gatehouse, Walls and Gatepiers (Asset 16), Scot's House Stables (Asset 20) and Scot's House (Asset 21) would be located approximately 1.7 km north-west of the Scheme, and no physical impact was predicted. Mature trees immediately south of Scot's House, as well as further plantation woodland between the group and the Scheme would filter views to and from all three cultural heritage assets and reduce the visibility of construction activity. The magnitude of this impact on the setting of Assets 16, 20 and 21 was assessed to be No Change.

7.6.5 Make-Me-Rich Farm (Asset 43) would be located approximately 200 m north of the Scheme, and no physical impact is predicted. Construction of the Scheme including the northbound on slip road would have a temporary impact on its setting. Impacts would result from the presence of construction activity in the form of fixed and mobile plant machinery, topsoil storage bunds, formwork and other temporary structures. Construction would introduce a new temporary source of noise and visual intrusion into the setting of Asset 43. However, as traffic noise and visual intrusion form part of the setting of this asset, and its relationship with the fields to the west would not be affected, the magnitude of this impact was assessed to be Negligible.

7.6.6 Downhill Farmhouse (Asset 28), the Barn and Gin-Gang south of Downhill Farmhouse (Asset 31) and Limekiln to south-east of Downhill Farmhouse (Asset 33) form an inward looking group, and their setting is further confined by the presence of Downhill House (Asset 35) and dense mature vegetation to the south. No visual impact was predicted on the setting of Assets 28, 31 and 33. As a result, the magnitude of impact was assessed to be No Change for all three assets.

7.6.7 Despite its elevated position, it is unlikely that construction activity would be visible from the principal (west-facing) elevation of Downhill House (Asset 35) or its garden; nor are there views in this direction from the Lodge Cottages (Asset 30). Both assets would be further screened from the Scheme by mature dense vegetation to the south. The presence of mature dense vegetation to the south of Downhill House would likely reduce the visibility of construction works and the magnitude of impact on Assets 30 and 35 have been assessed to be No Change.

Construction impacts on the historic landscape

7.6.8 Construction of the Scheme including temporary and permanent works would result in removal of small sections of field boundaries and other elements associated with the 20th Century Enclosure (HLT1) and 20th Century Plantation (HLT9) types. In each case, the proportion of each type affected would be small in relation to their overall size, and would not affect the understanding of the type and its development and relationship with the surrounding landscape. The magnitude of this impact was assessed to be Negligible for both HLTs.

Operational impacts on archaeological remains

7.6.9 No impacts resulting from operation of the Scheme were predicted for archaeological remains.

Operational impacts on historic buildings

7.6.10 The setting of Make-Me-Rich Farm (Asset 43) is already dominated by the presence of the existing Downhill Lane junction, which forms a prominent modern presence to the east and south of the cultural heritage asset. The Scheme would result in a new junction of similar scale to the existing structure, and the relationship between Make-Me-Rich Farm and agricultural land to the west would be unaffected. The magnitude of this impact on Asset 43 was assessed to be Negligible.

Operational impacts on the historic landscape

7.6.11 Impacts on the historic landscape which commenced during the construction phase would continue during operation of the Scheme. The magnitude of this impact was assessed to be Negligible for HLT1 and HLT9.

7.7 Design, mitigation and enhancement measures

Mitigation for construction impacts

7.7.1 Impacts have been identified on four archaeological sites resulting from construction of the Scheme (Assets 49, 58, 70 and 72). The value of all four affected assets was assessed as Negligible. All four assets were well understood in terms of their function and date. Consequently, no mitigation was proposed for Assets 49, 58, 70 and 72.

7.7.2 The geophysical survey detected only the presence of medieval and post-medieval agricultural features. Following consultation with the Tyne and Wear Archaeology Officer in July 2018, it was agreed that no further evaluation or mitigation measures would be required.

7.7.3 No significant effect on Make-Me-Rich Farm (Asset 43) or on any of the HLTs considered as part of the baseline was predicted to result from the construction of the Scheme, therefore no specific mitigation measures were proposed.

Mitigation for operational impacts

7.7.4 While no significant effects are predicted upon Make-Me-Rich Farm (Asset 43) associated with operation of the Scheme that would warrant mitigation, general landscape planting would aid integration of the Scheme within the surrounding landscape.

7.7.5 As no significant effects during operation were predicted on archaeological remains or any of the HLTs considered as part of the baseline, no mitigation measures are proposed.

Monitoring and maintenance

7.7.6 Monitoring and maintenance would be conducted so that the landscape planting and remediation works to restore temporary land take to agricultural use are successful. More detail of this is given in Section 8.7.3 of Chapter 8 (Landscape and Visual Effects) of this ES.

7.8 Assessment of effects

7.8.1 The predicted residual significance of effects is presented in Tables 7-8 and 7-9 overleaf.

Inter-relationship effects between topics

7.8.2 Potential inter-relationships could occur between cultural heritage effects and the effects reported in other topic chapters, especially air quality and noise effects on the setting of cultural heritage assets (e.g. on Make-Me-Rich Farm). However, no significant inter-relationship effects were predicted due to the nature of the individual topic effects on the cultural heritage receptors.

Shared use of the A19 Testo's scheme main site compound

7.8.3 As discussed in Section 1.5, in Chapter 1 of this ES, there is the potential that the Scheme could share use of the temporary main site compound for the Testo's scheme for the purpose of general storage, traffic management and office-based administrative purposes. If this was undertaken from the commencement of construction of the Scheme, the area of land take required for the Downhill Lane main site compound could be reduced. There would also be a period where both the Testo's and Downhill Lane junction schemes are being constructed at the same time, followed by a period where only the Scheme is under construction but still using the Testo's scheme main site compound.

7.8.4 There would be no additional land take required for the Testo's main site compound to accommodate use by the Downhill Lane Scheme, and the Testo's compound is also to be screened from the only sensitive setting receptor (Scot's, House). In addition, there would be no archaeology, cultural heritage setting or historic landscape impacts from the Scheme main site compound.

7.8.5 Therefore, there would be no significant change in the cultural heritage effects outlined in Chapter 7 of both the Scheme and Testo's scheme ESs as a result of the shared and extended use of Testo's main site compound.

Cumulative effects

7.8.6 The cumulative effects of the Scheme with other developments are assessed within Chapter 15 of this ES.

Table 7-8: Residual effects on cultural heritage assets during construction

Asset Number	Asset Name	Value	Magnitude of impact	Mitigation	Magnitude of residual impact	Significance of residual effect
16	Scot's House Gatehouse, Walls and Gatepiers	Medium	No change	None proposed	No change	Neutral
20	Scot's House Stables	Medium	No change	None proposed	No change	Neutral
21	Scot's House	High	No change	None proposed	No change	Neutral
28	Downhill Farmhouse	Medium	No change	None proposed	No change	Neutral
30	Pair of Lodge Cottages at entrance to Downhill House	Medium	No change	None proposed	No change	Neutral
31	Barn and Gin-Gang south of Downhill Farmhouse	Medium	No change	None proposed	No change	Neutral
33	Limekiln to south-east of Downhill Farmhouse	Medium	No change	None proposed	No change	Neutral
35	Downhill House	Medium	No change	None proposed	No change	Neutral
43	Make-Me-Rich Farm	Low	Negligible	None proposed	Negligible	Neutral
44	Stone (Site of)	Negligible	No change	None proposed	No change	Neutral
46	Engine House	Negligible	No change	None proposed	No change	Neutral
47	West Boldon Dam	Negligible	No change	None proposed	No change	Neutral
49	Downhill Level Crossing	Negligible	No change	None proposed	No change	Neutral
51	Hylton Grove Bridge	Medium	No change	None proposed	No change	Neutral
58	Stanhope and Tyne Railway	Negligible	No change	None proposed	No change	Neutral
70	Ridge and Furrow 8	Negligible	Minor	None proposed	Minor	Neutral
72	Narrow Ridge and Furrow	Negligible	Minor	None proposed	Minor	Neutral
73	Ridge and Furrow 9	Negligible	No change	None proposed	No change	Neutral
74	Usworth, Sunderland Aerodrome (RAF Usworth)	Negligible	No change	None proposed	No change	Neutral
75	Usworth RAF, Searchlight Battery TT237	Negligible	No change	None proposed	No change	Neutral
80	Doorway to south of Rectory Green	Medium	No change	None proposed	No change	Neutral
81	West Boldon Conservation Area	Medium	No change	None proposed	No change	Neutral
HLT1	20TH century enclosure	Negligible	Minor	None proposed	Minor	Neutral
HLT3	Settlement	Negligible	No change	None proposed	No change	Neutral
HLT5	Modern Communications	Negligible	No change	None proposed	No change	Neutral
HLT9	20th century plantation	Negligible	No change	None proposed	No change	Neutral
HLT11	Recreation	Negligible	No change	None proposed	No change	Neutral
HLT12	Industrial	Negligible	No change	None proposed	No change	Neutral

Table 7-9: Residual effects on cultural heritage assets during operation

Asset Number	Asset Name	Value	Magnitude of impact	Mitigation	Magnitude of residual impact	Significance of residual effect
16	Scot's House Gatehouse, Walls and Gatepiers	Medium	No change	None proposed	No change	Neutral
20	Scot's House Stables	Medium	No change	None proposed	No change	Neutral
21	Scot's House	High	No change	None proposed	No change	Neutral
28	Downhill Farmhouse	Medium	No change	None proposed	No change	Neutral
30	Pair of Lodge Cottages at entrance to Downhill House	Medium	No change	None proposed	No change	Neutral
31	Barn and Gin-Gang south of Downhill Farmhouse	Medium	No change	None proposed	No change	Neutral
33	Limekiln to south-east of Downhill Farmhouse	Medium	No change	None proposed	No change	Neutral
35	Downhill House	Medium	No change	None proposed	No change	Neutral
43	Make-Me-Rich Farm	Low	Negligible	None proposed	Negligible	Neutral
44	Stone (Site of)	Negligible	No change	None proposed	No change	Neutral
46	Engine House	Negligible	No change	None proposed	No change	Neutral
47	West Boldon Dam	Negligible	No change	None proposed	No change	Neutral
49	Downhill Level Crossing	Negligible	No change	None proposed	No change	Neutral
51	Hylton Grove Bridge	Medium	No change	None proposed	No change	Neutral
58	Stanhope and Tyne Railway	Negligible	No change	None proposed	No change	Neutral
70	Ridge and Furrow 8	Negligible	Minor	None proposed	Minor	Neutral
72	Narrow Ridge and Furrow	Negligible	Minor	None proposed	Minor	Neutral
73	Ridge and Furrow 9	Negligible	No change	None proposed	No change	Neutral
74	Usworth, Sunderland Aerodrome (RAF Usworth)	Negligible	No change	None proposed	No change	Neutral
75	Usworth RAF, Searchlight Battery TT237	Negligible	No change	None proposed	No change	Neutral
80	Doorway to south of Rectory Green	Medium	No change	None proposed	No change	Neutral
81	West Boldon Conservation Area	Medium	No change	None proposed	No change	Neutral
HLT1	20th century enclosure	Negligible	Minor	None proposed	Minor	Neutral
HLT3	Settlement	Negligible	No change	None proposed	No change	Neutral
HLT5	Modern Communications	Negligible	No change	None proposed	No change	Neutral
HLT9	20th century plantation	Negligible	No change	None proposed	No change	Neutral
HLT11	Recreation	Negligible	No change	None proposed	No change	Neutral
HLT12	Industrial	Negligible	No change	None proposed	No change	Neutral

CHAPTER 8 LANDSCAPE AND VISUAL EFFECTS

Executive summary

There would be landscape effects predominantly caused by loss of vegetation on and around Downhill Lane junction and along the adjoining roads of Downhill Lane, the A1290 and Washington Road. These effects would be felt during construction and at the opening year, and would reduce over time between opening and future years (up to 15 years after the Scheme is completed) as mitigation planting and habitat creation establishes. Construction activity and the temporary main site compound, stockpiles and laydown areas within fields to the north, south and east of the Scheme would result in notable short-term effects on close range views from the north-western edge of Town End Farm, Usworth Cottages, The Chalet, the cycleway/footway using the Washington Road footbridge, the North East Land, Sea and Air Museums (NELSAM), football pitches to the north of the NELSAM and the buildings and pedestrian and cycle routes within the IAMP One development. For some visual receptors, construction works for Downhill Lane junction would be viewed in the context of construction works at Testo's junction.

There would also be adverse effects on visual receptors to the north-east (Downhill Farm complex, properties on Lawn Drive) due to views being elevated. In the opening year, these views would continue to have notable adverse effects due to the lack of mitigation planting establishment and the introduction of new structures in views, which would be more open due to vegetation loss along Washington Road and at Downhill Lane junction.

The redirection of multi-use cycleways and NMU routes during construction would take them near to the works leading to adverse effects on views. Some public rights of way (PRoWs) (Bridleways B46 and B28 and Footpath B27) would be closed due to construction works at Testo's junction. In the opening year, views from Bridleway B46 would be more open due to vegetation loss along Washington Road, resulting in adverse effects. Bridleway B28 and Footpath B27 would be diverted as a result of the Testo's scheme, with views towards the new bridge structures, earthworks and lighting at Downhill Lane junction. Views from the multi-use cycleways and NMU routes would be different in character as users would be diverted along the new NMU bridge and ramps. Views would extend to the Downhill Lane junction bridges and earthworks and the new attenuation pond to the south, resulting in very notable changes to views.

For visual receptors to the north (West Pastures Travelling Community Site and users of Footpath B29) and south (users of the multi-use cycleway on the A1290) with mid to long range views, the construction activities and construction of the taller elements of the Scheme (e.g. the NMU bridge and ramps) would be notable in the short-term. In the opening year, the removal of construction activity and temporary areas would reduce adverse effects. However, the introduction of the NMU bridge and ramps would result in part of the Scheme remaining visible.

Landscape and visual effects would be reduced or offset in the future year through the provision of woodland, linear tree and shrub planting and scrub planting along the new slip roads, Washington Road and the NMU route earthworks, as well as habitat creation around attenuation ponds. However, the NMU bridge and ramps would remain noticeable in views such as from the north-western edge of Town End Farm and Usworth Cottages.

8.1 Introduction

8.1.1 This chapter assesses the effects on landscape character, townscape character and visual amenity within the study area and has been informed through desk and field study and in line with the methodology identified below and in Appendix 8.1, and is in accordance with the approach to assessment outlined in Chapter 5 (Approach to the Assessment).

8.1.2 The European Landscape Convention (Council of Europe, 2004) describes landscape as "*an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors*". Landscape character results from the way different components, such as landform, water features, land use, landscape pattern, vegetation and cultural heritage influences, interact with each other and are perceived by people.

8.1.3 Townscape character is similar to landscape character, but results from more urban components. The *Guidelines for Landscape and Visual Impact Assessment Third Edition (GLVIA3)* (Landscape Institute and Institute of Environmental Management and Assessment, 2013) describe townscape as "*areas where the built environment is dominant… including the buildings, the relationships between them, the different types of urban spaces, including green spaces, and the relationship between buildings and open spaces".*

8.1.4 The assessment of visual effects deals with the change in views experienced by people and the overall pleasantness or character of views. It considers any changes in views due to the Scheme experienced by people at houses, farms and work and those using PRoWs and open spaces.

8.1.5 The following sections summarise the proposed study area, the planning-policy background of the Scheme and the methodology used for the assessment. These are followed by a description of the baseline conditions and a summary of potential effects.

Defining the study area

8.1.6 A single study area has been used for the assessment of both landscape and visual effects as informed by the Zone of Theoretical Visibility (ZTV), which is the zone from which the Scheme could theoretically be visible over 'bare earth' (for more information on the ZTV, see paragraph 8.5.31). The extent of visibility is predominantly located within an area of 2 km from the centre point of Downhill Lane junction and is shown on Figures 8.1 to 8.4. This approach allows for suitable assessment of landscape features, the wider landscape context of the area in relation to landscape character, as well as the extent of the visibility of the Scheme for visual effects assessment (in accordance with *Interim Advice Note 135/10*).

8.2 Legislative and policy framework

Legislative background

8.2.1 The *Infrastructure Planning (Environmental Impact Assessment (EIA)) Regulations* (2009) implement the requirements of the European Union Council Directive 85/337/EEC, as amended by Council Directive 97/11/EC; see Section 1.3 in Chapter 1 of this ES. They relate to the "*assessment of the effects of certain public and private projects on the environment"* and landscape is listed as a topic that requires assessment as part of an EIA.

8.2.2 The Acts of Parliament and Regulations listed below are relevant to the landscape and study area associated with the Scheme:

- *Planning Act* 2008 : much of the study area lies within the green belt as illustrated on Figure 8.1.
- *Planning (Listed Buildings and Conservation Areas) Act* (1990): West Boldon and East Boldon Conservation Areas are within or just outside of the study area to the east of the A19 and are illustrated on Figure 8.1. There are several Grade I, Grade II* and Grade II Listed Buildings within the study area and these are illustrated on Figure 8.1.
- *Town and Country Planning (Tree Preservation) (England) Regulations* (2012): several protected trees lie within the study area which are shown on Figure 8.1.

Planning policy background

8.2.3 Tables 8-1 to 8-3 summarise the national and local planning policies relevant to the scope of potential landscape and visual effects.

National Policy

Table 8-1: Relevant national policies

National Policy	Relevant Paragraph	How the policy has been addressed
National Networks National Planning Policy Statement (NNNPS) (Designated January 2015)	Landscape and visual impacts are referred to in **paragraphs 5.143 to 5.161** of the NNNPS. The NNNPS sets out the Government's vision and policy against which the Secretary of State will make decisions on applications for development consent for nationally significant infrastructure projects on the strategic road and rail networks.	A full review of the Scheme against the NNNPS is set out in Appendix A of the Planning Statement (DCO application reference TR010024/APP/7.1).
National Planning Policy Framework (NPPF) (July 2018)	Of relevance to landscape are sections within the NPPF covering Achieving well-designed places (Section 12), Green Belt (Section 13) and Conserving and enhancing the natural environment (section 15) **Paragraph 124** states that "*good design is a key aspect of sustainable development, creates better places in which to live and work and helps make development acceptable to communities*". **Section 13** addresses the protection of the Green Belt and **paragraph 143** advocates that "*inappropriate development is, by definition, harmful to the Green Belt and should not be approved except in very special circumstances*". **Paragraph 146** specifies that other forms of development are not considered inappropriate in the Green Belt "*provided they reserve the openness of the Green Belt and do not conflict with the purposes of including land in Green Belt".* These include "*engineering operations*" and *"local transport infrastructure which can demonstrate a requirement for a Green Belt location*". **Paragraph 144** asserts that "*when considering any planning application, local planning authorities should ensure that substantial weight is given to any harm to the Green Belt. 'Very special circumstances' will not exist unless the potential harm to the Green Belt by reason of inappropriateness, and any other harm, is clearly outweighed by other considerations*". **Paragraph 170 (b)** states that planning policies should contribute to and enhance the natural and local environment by: *"recognising the intrinsic character and beauty of the countryside…"* **Paragraph 180** aims to limit the effect of light pollution from artificial light.	These policy items have been taken into consideration during the assessment process (for example in terms of assessing the value of landscape and visual receptors) and during the identification of mitigation measures as described in Sections 8.6 to 8.8 of this chapter, plus Appendices 8.4 and 1.3 of this ES. Mitigation measures are also illustrated on the Environmental Masterplan, at the end of Volume 1 of this ES.
Planning Practice Guidance (PPG)	PPG policies of relevance are included under 'Natural environment', **paragraph 001** - landscape character, **paragraphs 002 to 005** - National Parks and AONBs and **paragraph 006** - Heritage Coasts, and also under 'Light pollution' **paragraphs 001 to 008**.	These policy items have been taken into consideration during the assessment process (for example in terms of assessing the value of landscape and visual receptors) and during the identification of mitigation measures as described in Sections 8.6 to 8.8 of this chapter, plus Appendices 8.4 and 1.3 of this ES. Mitigation measures are also illustrated on the Environmental Masterplan, at the end of Volume 1 of this ES. There are no National Parks, AONBs or Heritage Coast designations within the study area.

Local Planning Policy

Table 8-2: Relevant policies within the South Tyneside statutory Development Plan

South Tyneside Local Development Framework (LDF)	Relevant Policy	How the policy has been addressed
Core Strategy (June 2007)	**Objective 16:** *"To protect and enhance the quality and distinctiveness of the Borough's land and landscape"*. In addition to the traditional focus of preserving designated sites and Listed Buildings etc., the Core Strategy emphasises the need to protect the wider surroundings of the local authority's towns, villages and countryside. The strategy also identifies the character and distinctiveness of the local surrounds of South Tyneside as 'unique'. **Policy EA1 Local Character and Distinctiveness** "*To conserve the best qualities of South Tyneside's built and natural environment the Council will:* *A …* *B protect and enhance the openness of the Green Belt;* *C preserve the special and separate characters of the urban fringe villages of Boldon Colliery, West Boldon, East Boldon, Cleadon and Whitburn; and* *D implement the Great North Forest's strategies for access, education, enterprise and biodiversity in a forestry framework…*"	These policy items have been taken into consideration during the assessment process (for example in terms of assessing the value of landscape and visual receptors) and during the identification of mitigation measures as described in Sections 8.6 to 8.8 of this chapter, plus Appendices 8.4 and 1.3 of this ES. Mitigation measures are also illustrated on the Environmental Masterplan, at the end of Volume 1 of this ES. Note: The Great North Forest (GNF) Partnership has been disbanded and is no longer funded; however, the GNF Plan has been considered during the development of mitigation measures and environmental design principles as described in the sections identified above.
Development Management Policies (December 2011)	**Policy DM7 Biodiversity and Geodiversity Sites** *"…All proposals for development:* *A. must ensure that any individual or cumulative detrimental impacts on sites are avoided; and* *B. will only be permitted where they would not adversely affect the integrity, natural character or biodiversity and geodiversity value of:* *i) designated Sites of Special Scientific Interest;* *ii) designated Local Wildlife Sites;* *iii) designated Local Geodiversity Sites;* *iv) designated Local Nature Reserves;* *v) the Cleadon Hills, Boldon Downhill and South Boldon areas of high landscape value and significance;* *vi) Wildlife Corridors; and* vii) *other land that forms part of the borough's strategic green infrastructure; as shown on the Proposals Map…."*	These policy items have been taken into consideration during the assessment process (for example in terms of assessing the value of landscape and visual receptors) and during the identification of mitigation measures as described in Sections 8.6 to 8.8 of this chapter, plus Appendices 8.4 and 1.3 of this ES. Mitigation measures are also illustrated on the Environmental Masterplan, at the end of Volume 1 of this ES.
Site-Specific Allocations and Proposals Map (April 2012)	**Policy SA7 Green Infrastructure and Recreational Opportunities** "*We will seek to improve the quality of the public realm and the provision of publicly-accessible recreational open spaces throughout South Tyneside by:* *A) ensuring that all major and large-scale developments include high quality landscaping with a variety of public open spaces, in accordance with our adopted standards;* *B) protecting and enhancing the parks, recreational open spaces and playing fields in the borough, particularly as part of the linked open space system, in accordance with our adopted standards and other proposals in this document…*"	Environmental design principles are covered in Section 8.7 of this chapter, plus Section 2.16 of Chapter 2 and Appendix 1.3 of this ES. Environmental design is also shown on the Environmental Masterplan, at the end of Volume 1 of this ES.

Table 8-3: Relevant policies within the Sunderland statutory Development Plan

Sunderland City Council Unitary Development Plan (UDP)	Relevant Policy	How the policy has been addressed
Saved policies including Adopted Alteration No.2 (September 2007)	**Policy CN 1 Rural Areas** "*In the rural areas the City Council will:* *(i) protect and enhance as necessary buildings of character, other important structures and landscape features (including rivers, ponds, and watercourses), archaeological and scientific sites, significant wildlife habitats and strategic/ local wildlife corridors, trees and hedgerows;* *(ii) encourage the continuation of those activities and practices (e.g. farming, land management, forestry) which have contributed to the natural beauty and landscape diversity of the countryside;* *(iii) resist development that is inappropriate due to the land use concerned or because it would have a harmful impact on the landscape because of its siting, materials or design;* *(iv) minimise the adverse effects of developments which have a need for a particular rural location (e.g. dwellings essential for farm or forestry workers)*".	These policy items have been taken into consideration during the assessment process (for example in terms of assessing the value of landscape and visual receptors) and during the identification of mitigation measures as described in Sections 8.6 to 8.8 of this chapter, plus Appendices 8.4 and 1.3 of this ES. Mitigation measures are also illustrated on the Environmental Masterplan, at the end of Volume 1 of this ES.
	Policy CN 2-5 The Sunderland Green Belt "*A Green Belt will be maintained which will:* *… prevent the merging of Sunderland with Tyneside, Washington, Houghton-le-Spring and Seaham, and the merging of Shiney row with Washington, Chester-le-Street and Bournmoor* ".	Sections 8.6 and 8.8 of this ES chapter and Appendix 8.4 of the ES assess the visual effects of the Scheme on surrounding receptors. The views to be protected / enhanced look to the south towards Sunderland and not to the north-west where the Scheme would be.
	Policy CN 13 Views of the City "*The city council will protect and enhance important public views of townscape, landscape and other features of value (as identified in part ii), in particular as perceived from transport corridors and well used outdoor venues. New development should be located and designed so as not to unduly interrupt or prejudice views of recognised value; opportunities to enhance such views will also be taken into account when considering proposals*".	The GNF Partnership has been disbanded and is no longer funded; however, the GNF Plan has been considered during the development of mitigation measures and environmental design principles as described in Sections 8.6 to 8.8 of this chapter, plus Appendices 8.4 and 1.3 of this ES.
	Policy CN 15 Great North Forest "*The city council will permit developments, schemes and other initiatives which assist in creating the Great North Forest (on land between and around the main urban areas) and which are in accordance with other policies of this plan. Developments which would adversely affect the creation of the forest will be resisted*".	
	Policy CN 16 Trees and Woodland "*The city council will seek to retain and enhance existing woodlands, tree belts and field hedgerows. It will undertake and encourage planting of new tree belts and woodlands, in the main of native species, in order to:* *(i) emphasise and enhance the breaks between settlements in accordance with policy CN6;* *(ii) soften the hard visual edge of the urban areas;* *(iii) enhance the main transport corridors, employment areas and wildlife corridors (existing and proposed);* *(iv) further green the urban environment (where possible);* *(v) provide shelter belts to screen unattractive features, whilst retaining and enhancing panoramic views;* *(vi) assist in the creation of the Great North Forest, also the enhancement of the Green Belt*".	These policy items have been taken into consideration during the assessment process (for example in terms of assessing the value of landscape and visual receptors) and during the identification of mitigation measures as described in Sections 8.6 to 8.8 of this chapter, plus Appendices 8.4 and 1.3 of this ES. Mitigation measures are also illustrated on the Environmental Masterplan, at the end of Volume 1 of this ES.

Sunderland City Council Unitary Development Plan (UDP)	Relevant Policy	How the policy has been addressed
	Policy CN 23 Protection of wildlife corridors "*Within the wildlife corridors as indicated on the Proposals Map:* *(i) measures to conserve and improve the environment will be encouraged using suitable designs to overcome any potential user conflicts;* *(ii) development which would adversely affect the continuity of corridors will normally be refused;* *(iii) where, on balance, development is acceptable because of wider plan objectives, appropriate habitat creation measures will be required to minimise its detrimental impact*."	

8.3 Assessment methodology

8.3.1 The landscape and visual impact assessment (LVIA) has been undertaken in the light of relevant guidance[34;35]. The local character unit (LCU) assessment has been undertaken using Natural England (formerly Countryside Agency) guidelines[36;37]. A more detailed methodology for the LVIA is contained within Appendix 8.1 and further information supporting the LVIA is contained within Appendices 8.2 to 8.4.

Baseline data gathering

8.3.2 Baseline information on landscape elements, landscape and townscape character, and visual receptors was gathered in the first instance through a desk-top survey (see Appendix 8.2 for sources of information). This was supplemented by site surveys carried out in November 2015, September 2016, January 2017, September 2017, November 2017 and November 2018.

Consultations

8.3.3 Consultations were held with relevant statutory consultees (see Chapter 4 for details) and local stakeholders throughout the EIA process.

8.3.4 Specifically, in relation to this topic, South Tyneside Council and Sunderland City Council have both provided comment on the number and location of visual receptors, planning policy and Tree Preservation Orders. They have also provided data for GIS input into the figures that form part of this chapter.

8.3.5 Both Local Planning Authorities were consulted about the number and location of photomontages.

Identification and assessment of effects

8.3.6 Landscape and visual effects were identified in part by a desk-based comparison of the existing and proposed situations, supplemented by information from the site surveys. Computer-aided modelling was used to identify the ZTV taking account of the visibility of the tallest vehicles on the road as well as signs proposed over 5 m tall (refer to Appendix 8.1 for methodology). The bare earth approach used for the ZTV, which does not take account of screening features such as vegetation and buildings, is in accordance with *GLVIA3* guidance.

8.3.7 In line with the assessment framework described in Chapter 5 of this ES, the significance of effect has been assessed using a matrix (see Appendix 8.1 Table 8.1-c). The matrix works on the principle that the significance of effect is a function of the sensitivity of the receptor and the magnitude of impact as a result of the development proposals. The sensitivity of individual landscape and visual receptors was assessed using criteria described in Appendix 8.1, Table 8.1-a, and magnitude of impact was measured on the basis of criteria set out in Table 8.1-b.

8.3.8 The assessment considers the landscape and visual effects of the Scheme without mitigation and then with mitigation incorporated (residual effects) for the construction period (2020 to 2021), the opening year (2021) and future year (2036). The detailed outcome of the assessment on a receptor-by-receptor basis is set out in the Landscape and Visual Effects Schedules in Tables 8.4-a and 8.4-b within Appendix 8.4. The residual effects are those that would be experienced after application of mitigation to the Scheme as proposed in Section 8.7 of this chapter.

8.4 Assessment assumptions and limitations

8.4.1 The assumptions made, and limitations encountered during this assessment are listed below.

- The assessment of landscape and visual effects during the construction period of the Scheme has assumed a worst-case scenario whereby construction works for Testo's junction are both part of the Scheme's construction assessment baseline and also on-going within a proportion of the Scheme's construction phase.
- A high-level summary of how effects would differ when Testo's junction is operational with continued shared use of the Testo's main site construction compound has been provided in Section 8.8 of this ES.
- The assessment of landscape and visual effects during the opening year of the Scheme (2021) has assumed that Testo's junction is operational having opened in the same year.
- The assessment of landscape and visual effects in 2036 has assumed that mitigation vegetation at both the Testo's and Downhill Lane junctions has established.
- The local planning policies and designations shown on Figure 8.1 are based on published documentation as of October 2018, which has not yet been updated to take account of Testo's junction.
- Footpath B27 and Bridleway B46 would be closed during the construction of Testo's junction, with Bridleway B28 permanently closed. As the construction period for the Scheme would overlap with the construction period for Testo's junction, visual effects on these PRoWs have not been assessed within this LVIA during construction as there would be no users of these PRoWs.
- Footpath B27 and Bridleway B46 are proposed to be diverted as a result of improvements at Testo's junction, with a new bridleway route provided to replace Bridleway B28. These diverted routes have been shown on Figures 8.1 and 8.3C and assessed within this LVIA during the opening and future years.
- Effects on the new Bridleway B28 have been assessed in lieu of the route permanently closed during the Scheme's construction phase.
- The assessment of Bridleway B46 on completion of the Testo's scheme assumes the route will be aligned as existing and not along any current proposals within the Testo's scheme, in accordance with Appendix 1.2 of this ES.
- A new cycleway would be constructed along the A184 as part of the improvements at Testo's junction. Effects on this new route have not been assessed within this LVIA as the cycleway would not be existing within the baseline prior to the start of construction of the Scheme; however, a high-level summary of how effects would differ when Testo's junction is operational has been provided in Section 8.8 of this ES.

[34] Landscape Institute and Institute of Environmental Management and Assessment. 2013. *Guidelines for Landscape and Visual Impact Assessment Third Edition (GLVIA3)*. Abingdon: Routledge.

[35] Highways England (formerly Agency). 2010. *Interim Advice Note 135/10 Landscape and Visual Effects Assessment (IAN 135/10)*. [Online]. [Accessed: 16 January 2018]. Available from: http://www.standardsforhighways.co.uk/ians/pdfs/ian135.pdf

[36] Countryside Agency and Scottish Natural Heritage. 2002. *Landscape Character Assessment: Guidance for England and Scotland*. [Online]. [Accessed: 16 January 2018]. Available from: http://www.snh.org.uk/pdfs/publications/LCA/LCA.pdf

[37] Natural England. 2014. *An Approach to Landscape Character Assessment.* [Online]. [Accessed: 16 January 2018]. Available from: *https://www.gov.uk/government/publications/landscape-character-assessments-identify-and-describe-landscape-types*

- As part of the improvements at Testo's junction some of the pylon lines would be buried and pylons removed, with new ones constructed, prior to the commencement of construction works for the Scheme. This has been reflected on Figure 8.3C and within the assessment of landscape and visual effects.
- Vegetation would be removed, prior to the commencement of construction of the Scheme, as a result of the Testo's scheme. This has been reflected on Figure 8.3C and within the assessment of landscape and visual effects.
- Nine 25 m high buildings would be fully constructed within the IAMP One site prior to the commencement of construction works for Scheme. These buildings have been considered as established in the baseline for the assessment, against which effects on landscape, landscape and townscape character and views have been assessed.
- The nine buildings at IAMP One would have windows on their outer elevations, and have been considered together as one visual receptor.
- There would be a pedestrian and cycle route along the new internal road within IAMP One, which has been considered as one visual receptor.
- It was assumed that the assessment's baseline would include a new NMU route (pedestrian and cycle) within the central green corridor at IAMP One (the southern part of Follingsby Lane pre-IAMP One). This was considered as one visual receptor.
- It was considered that whilst the above NMU route would be available at the start of construction in 2020, NMU users would still be able to use Downhill Lane (West) from its junction with Follingsby Lane (at North Moor Farm) to the junction with the A1290 and therefore views would still be available from this point.
- Within the boundaries of the IAMP One development, Follingsby Lane (from North Moor Farm, heading south to the A1290) would be closed to vehicle traffic and used as a cycle, pedestrian and horse riding route, which has been considered as one visual receptor.
- Existing vegetation along Follingsby Lane would have been removed to accommodate the IAMP One development.
- Planting shown on the IAMP One 'Indicative Master Plan' drawing (see Illustration 1.2 in Chapter 1 of this ES) was assumed to be planted at a similar time to the planting proposed for the Scheme. It was assumed to be a native species mix with a similar growth rate to planting for the Scheme.
- Good establishment of mitigation planting would be achieved by the future year of 2036 (approximate assumed heights after 15 years: woodland 10 m; native trees and shrubs 8-10 m and woodland edge/linear belts of trees and shrubs 5 m).
- All surrounding properties would be retained during the construction of both IAMP One and Downhill Lane junction, apart from Elliscope Farm where it was assumed farm buildings would be unoccupied throughout the construction period and opening year of the Scheme. It is also assumed that the buildings within the farm complex would be converted to offices by the future year of 2036, therefore an assessment of effects on these receptors (indoor workers) at this time has been undertaken for this period. These assumptions have been based on information provided by the IAMP developers.
- There are properties and recreational routes where views towards the construction and operation of the Scheme have been described as being restricted by buildings and/or vegetation within the IAMP One development. Should the IAMP One development not go ahead as planned, these properties and recreational routes may have more open views towards the construction and operation of the Scheme. These receptors include: North Moor Farm [ref. 27], West Moor Farm [ref. 28] and the shared cycleway/ footway along A1290 from Washington Road to Cherry Blossom Way [ref. 30].
- The effects of using the Scheme's main site compound located to the north-east of the Downhill Lane junction is assessed assuming no shared use with the Testo's scheme's main site compound (albeit during the construction assessment, it is assumed the Testo's main site compound is present in the landscape up until completion of the Testo's scheme). The effects of the shared use of the Testo's main site compound, especially from its potential extended use by the Scheme post-completion of the Testo's improvement scheme, is considered in Section 8.8 at the end of this chapter.
- Limitations in the production of the ZTV:
  - Lighting: locations and heights have not been confirmed at the time of writing and therefore indicative locations have been used, with all columns a height of 12 m across the Scheme, assumed as a worst-case scenario.
  - Traffic Lights: locations and heights modelled based on an interim design (fixed in February 2018), but the engineers confirmed at the time of issue that these locations were still accurate.
  - Signage: locations and final heights have not been confirmed at the time of writing and therefore indicative locations have been used. Signage construction details have been provided; however, base heights are indicative at this stage therefore all base heights are assumed to be based on the centre of two post base levels and lifted to the highways design 3D surface model or existing topographical information as supplied. Signage heights have also not been confirmed and therefore a worst-case of 7 m above ground level for all has been used.

8.5 Baseline conditions

8.5.1 The existing landscape and visual baseline within the study area is summarised below. Key landscape-related designations referred to in the text are illustrated on Figure 8.1, while published landscape character areas and LCUs are shown on Figure 8.2, with LCUs described in more detail in Appendix 8.3. The ZTVs are shown on Figures 8.3A and 8.3B with the locations of visual receptors shown on Figure 8.3C. The locations of viewpoint photographs and photomontages referred to in the text (Figures 8.5 to 8.17) are shown on Figure 8.4.

Landscape baseline

Topography

8.5.2 The distant southern horizon is defined by Penshaw Hill at 136 m above ordnance datum (AOD) approximately 5 km to the south. The western horizon is defined by higher ground in Gateshead at 150 m AOD between 6 and 8 km to the west. West Boldon (60 m AOD) and the Boldon Hills (90 m AOD) form areas of higher ground to the eastern horizon. Contours within the study area have been shown on Figures 8.3A and 8.3B.

8.5.3 The topography of the study area to the west of the A19 is mainly flat, with rolling fields and localised valleys created by sunken streams such as the River Don. The topography is also relatively flat to the east until the land rises towards the Boldon Hills. Substantially modified

landforms in the study area include the embankments, bridges and cuttings of the A19. Other locally common landform features include restored former open-cast mines to the west and east. With the inclusion of the Testo's scheme into the baseline, temporary storage mounds associated with construction works at Testo's junction will be present in the fields near West Pastures Lane and to the west and east of the A19 during the Scheme's construction phase.

8.5.4 The presence of few locally designated features offset by the prominence of common and modified landform features means that the topography around the existing junction is considered to be of low sensitivity.

Hydrology

8.5.5 The main watercourses through the study area are the River Don and its smaller tributaries. The watercourses follow sinuous but generally north-south courses within noticeable local valleys in generally flat, low-lying land. There are also several disused local land drains amongst the fields. Open water within the study area can be found at Boldon Lake to the south of Boldon Business Park and in parts of Mount Pleasant Marsh.

8.5.6 These watercourses and waterbodies form part of the designated Local Wildlife Sites (LWSs)[38] shown on Figure 8.1 and are valuable for their ecological status (see Chapter 9 for more information on ecology). They also contribute to visual amenity and the landscape character of the study area. Mount Pleasant Marsh is accessible via a jetty for educational groups using the West Boldon Environmental Education Centre (WBEEC).

8.5.7 Hydrological features have been assessed as of moderate sensitivity due to their local distinctiveness, their local value for ecology and recreation and their low potential for substitution.

8.5.8 For further information on the water environment, please see Chapter 14 (Road Drainage and Water Environment).

Land use

8.5.9 Land use issues are addressed more fully in Chapter 13 (People and Communities), and are summarised here only so far as they are relevant to landscape character.

8.5.10 The study area is predominantly comprised of agricultural land enclosed by residential areas at Town End Farm to the south and West Boldon to the east, with Hedworth, Fellgate and Boldon Colliery further to the north. Individual farms and other isolated properties are scattered within the agricultural land including Scot's House, Make-Me-Rich Farm, Strother House Farm, Elliscope Farm, Hylton Grove Farm and Hylton Bridge Farm. The agricultural land is designated as green belt.[39] With the inclusion of the Testo's scheme into the baseline, construction works for Testo's junction and temporary compound and storage areas will be present on parts of the agricultural land to the east and west of the A19, north of Downhill Lane junction, during the Scheme's construction phase.

8.5.11 Commercial land is present in the study area at Boldon Business Park, which is to the east of the A19 and north of Testo's junction, and at the large Nissan Plant south of the A1290. Individual commercial properties include MyPetStore Kennels and Cattery on Follingsby Lane and the Three Horse Shoes public house on Washington Road. With the inclusion of IAMP One into the baseline, commercial land will be permanently present south-west of Downhill Lane junction and north-west of the A1290.

8.5.12 Community land use includes recreational spaces within Town End Farm and West Boldon as well as the WBEEC within Mount Pleasant Marsh LWS. These areas are valued by South Tyneside Council as important areas for recreation and population health. There are also some private football pitches off Washington Road near the Three Horse Shoes public house, located to the north of the NELSAM buildings.

8.5.13 There is a network of PRoWs within the agricultural land, which is fragmented by transport routes but with some intact links into urban fringe areas to the east. Bridleway B46 and the cycleway across Downhill Lane junction and along the A1290 are well used by cyclists, as is the footbridge across the A19 linking to Washington Road (although see Section 8.4 of this ES chapter on how Bridleway B46 is considered in the baseline). The NELSAMs are a visitor attraction off Washington Road.

8.5.14 Land use within the study area was assessed as being of low sensitivity due to the mix of land uses present and their low susceptibility to further change.

Land cover

8.5.15 Much of the study area comprises mixed arable and pastoral fields, bordered by gappy, moderately maintained hedgerows with some semi-mature trees. Several small to medium-sized deciduous woodland areas are found within the agricultural land, particularly near farmsteads, town edges and along river and stream banks, and these are illustrated on Figure 8.3C. Hawthorn and gorse scrub-blocks populate the edges of un-worked agricultural land either side of the A19, north-east and south-east of Make-Me-Rich Farm and along the River Don to the east of the road. Vegetation along the River Don is covered by a LWS designation.

8.5.16 The A19 has significant screening belts along its edge to the north of Testo's junction and south of Downhill Lane junction, and there is woodland planting in and around the slip roads of Downhill Lane junction. Vegetation belts are also present along the northern edge of the Nissan Plant, and within Mount Pleasant Marsh and Boldon Lake LWSs to the north.

8.5.17 With the inclusion of the Testo's scheme into the baseline, construction works for the Testo's scheme and temporary compound and storage areas will be present within some of the arable and pastoral fields to the east and west of the A19, north of Downhill Lane junction, during the Scheme's construction phase. Some hedgerows and woodland blocks will be removed within the construction footprint, including woodland at Mount Pleasant Marsh LWS and within the WBEEC. The vegetation changes have been reflected on Figure 8.3C.

8.5.18 Several groups of trees are protected by Tree Preservation Orders (TPOs) as illustrated on Figure 8.1, although none of these blocks would be affected by the Scheme; TPO 208 is reduced in size within the baseline on account of the improvement works at Testo's junction. The South Tyneside LDF designates a number of Wildlife Corridors[40] in the study area, which run north-south along river corridors and east-west across agricultural land, including to the east and west of Downhill Lane junction. A similar designation is included within the Sunderland

38 South Tyneside Council. 2007. *South Tyneside Local Development Framework*. *The new development plan for your borough. Core Strategy*. [Online]. [Accessed: 14 August 2017]. Available from: https://www.southtyneside.gov.uk/article/36015/Local-Development-Framework. Pages 33, 35 & 36 – Policy EA1, EA3

39 South Tyneside Council. 2007. *South Tyneside Local Development Framework*. *The new development plan for your borough. Core Strategy*. [Online]. [Accessed: 14 August 2017]. Available from: https://www.southtyneside.gov.uk/article/36015/Local-Development-Framework. Page 33 – Policy EA1

40 South Tyneside Council. 2007. *South Tyneside Local Development Framework*. *The new development plan for your borough. Core Strategy*. [Online]. [Accessed: 14 August 2017]. Available from: https://www.southtyneside.gov.uk/article/36015/Local-Development-Framework. Pages 35 & 36 – Policy EA3

City Council UDP. These designations reflect the importance of the agricultural land for wildlife links between the urban fringes of Fellgate and Hedworth, West Boldon, Boldon Colliery, Washington and Sunderland.

8.5.19 The study area lies within the former GNF, which was designated by the GNF Partnership. This is reflected in the local policies of the South Tyneside LDF[39] and Sunderland City Council UDP[41], which support and encourage the GNF Plan's aims and objectives. However, the GNF Partnership has now been disbanded and the policies relating to the GNF are not supported by any funding. All of the green belt area between South Tyneside and Sunderland is covered by the GNF policies of the two councils, but these policies are not shown on Figure 8.1.

8.5.20 The sensitivity of the land cover within the study area is assessed to be moderate. This was due to the presence of considerable amounts of vegetation along the A19 road corridor and the number of local designations in the near vicinity of Downhill Lane junction, as well as links to other areas within and outside of the study area.

Landscape pattern

8.5.21 The local landscape pattern comprises a corridor of agricultural land aligned east-west, linked to a similar corridor aligned north-south, separating the urban fringe settlements of Fellgate, Hedworth and Boldon Business Park to the north, West Boldon to the north-east and Town End Farm to the south-east. The designation of green belt along these corridors is to maintain the separation between nearby settlements. Within the future baseline, part of the green belt is replaced with the IAMP One development to the north-west of the A1290. In addition, construction works for Testo's scheme and temporary compound and storage areas will present to the east and west of the A19, north of Downhill Lane junction, during the Scheme's construction phase.

8.5.22 Fields within the agricultural land are medium to large in size and semi-regular to regular in shape. The field pattern is broken up by the A19, A184 and A1290 as well as several minor roads, and the River Don and its associated vegetation form a sinuous route through the agricultural land. The National Grid substation and vegetation within Mount Pleasant Marsh LWS and the former quarry site at the Boldon Hills also break up the field pattern. With the inclusion of the Testo's scheme into the baseline, the construction of the Testo's junction footprint would permanently alter the size and shape of some fields with a reduction in woodland at Mount Pleasant March LWS. The temporary compound and storage areas would further alter the size and shape of some fields temporarily.

8.5.23 The landscape pattern was considered to be of moderate sensitivity as, although the landscape pattern is already broken up by man-made features, it has an important function in maintaining the open character of the area.

Cultural influences

8.5.24 The cultural heritage of the study area is described in more detail in Chapter 7 (Cultural Heritage). Cultural heritage elements and characteristics that influence the landscape are listed below.

- Scot's House: Grade II* Listed Building and associated historic complex approximately 2 km north of Downhill Lane junction (illustrated on Figure 8.1).
- Downhill Farm: group of historic buildings, several of which are Grade II Listed, approximately 600 m north-east of Downhill Lane junction (illustrated on Figure 8.1).
- West Boldon: historic village with Conservation Area and Grade I Listed church approximately 1 km north-east of Downhill Lane junction (illustrated on Figure 8.1).
- East Boldon: Listed Buildings and Conservation Area approximately 2 km north-east of Downhill Lane junction (illustrated on Figure 8.1).
- Disused Stanhope and Tyne railway: aligned approximately north-south and intersected by the A19 north of Downhill Lane junction, now used as a bridleway. With the baseline, the alignment of this railway route is altered slightly by the Testo's scheme.
- The Penshaw Monument: a national Trust monument 5 km to the south of Downhill Lane junction.
- The 18th/19th century 'enclosure' period field system throughout the study area, superimposed on an earlier agricultural system with medieval origins. With the inclusion of the Testo's scheme into the baseline, the construction of the wider Testo's junction footprint would permanently reduce remnant hedgerow boundaries adjacent to the current A19 and Testo's junction, with further temporary alterations to hedgerows as a result of haul roads, compound and storage areas.

8.5.25 Cultural heritage influences in the landscape are assessed as being of low sensitivity due to the modern settlement and farming use of the study area, with only a few key historical locations identified in the area.

Landscape character assessment (see also Appendix 8.3)

8.5.26 The attributes of the landscape can be used to subdivide it into different landscape character areas, and this can be done at a variety of geographic scales. The following sections describe the key characteristics of published landscape character assessments at a regional and district level. This is followed by a description of the local landscape character assessment undertaken for the study area.

Regional-level landscape character assessment

8.5.27 At a regional-level, the site straddles two National Character Area (NCA) profiles: *NCA 14 Tyne and Wear Lowlands*[42], and the northernmost tip of *NCA 15 Durham Magnesian Limestone Plateau*[43]. Key regional characteristics that are relevant to the study area are identified below.

NCA 14: Tyne and Wear Lowlands:

- "*Undulating landform incised by the rivers of the Tyne and Wear and their tributaries*". This is locally evident in the landform around the River Don, which is a tributary of the Tyne, and low-lying topography.
- "*Widespread urban and industrial development with a dense network of major road and rail links*". This is locally represented by urban edges to the north, east and south and

41 Sunderland City Council. 2007. *Sunderland City Council Unitary Development Plan Adopted Alteration No. 2*. [Online]. [Accessed: 14 August 2017]. Available from: http://www.cartogold.co.uk/sunderland/text/00cont.htm – Policy CN 15.

42 Natural England. 2013. *National Character Area Profile 14: Tyne and Wear Lowlands*. [Online]. [Accessed: 16 January 2017]. Available from: http://publications.naturalengland.org.uk/publication/4683608954503168

43 Natural England. 2013. *National Character Area Profile 15: Durham Magnesian Limestone Plateau*. [Online]. [Accessed: 16 January 2017]. Available from: http://publications.naturalengland.org.uk/publication/8308038

urban fringe industrial/commercial land uses (Boldon Business Park, Nissan Plant), as well as by the A19 and A184.

- "*Between settlements, wide stretches of agricultural land with large, regular, arable fields bordered by hedgerows with few hedgerow trees, often with large farmsteads and urban fringe pasture land with pony and cattle grazing*". This is evident within the rural areas of land to either side of the A19.
- "*Strong legacy of mining, much restored to agriculture, forestry, industry, housing and amenity uses*". This is locally characterised by colliery restorations and colliery housing at Boldon Colliery to the north and opencast workings and restored spoil heaps at Wardley Colliery LWS to the west.
- "*Mixed woodland estates and plantations on restored spoil heaps provide woodland cover in some areas, although sparse elsewhere*". As seen throughout the study area, in the form of several small blocks of woodland separated by farmland, and highlighted by the GNF Plan.

NCA 15: Durham Magnesian Limestone Plateau:

- "*Striking west-facing limestone escarpment forming a series of spurs and vales, heavily quarried but still supporting a mosaic of limestone grassland, scrub and woodland*". This is noticeable at the former quarry within the Boldon Hills.
- "*Strong influence of historic mining industry on both local culture and the landscape, in the form of ex-coal mining towns and villages with distinctive surrounding areas of allotments and pony paddocks, reclaimed colliery sites, disused and existing railways, and industrial archaeology*".
- "*Small, fragmented patches of limestone grassland supporting unique combinations of rare plant and invertebrate species*". This is noticeable at the former quarry within the Boldon Hills and Downhill Meadow LWS.
- "*Historic villages subject to a high degree of 20th-century expansion*". This is evident to the north-east at West Boldon.
- "*Widespread urban and industrial development in the north and major transport corridors throughout*". This is noticeable in the presence of the A19, Downhill Lane junction and industrial areas to the south-west of the study area.

South Tyneside Landscape Character Study

8.5.28 The district-level *South Tyneside Landscape Character Study*[44] (see Figure 8.2) is used as Supplementary Planning Guidance. The key characteristics of the relevant landscape character areas are:

Character Area 24 (Urban): The Boldons

- Historic cores of West and East Boldon, and terraces of Boldon Colliery.
- Hilltop location of West Boldon, overlooking South Tyneside.
- River Don divides the area and provides open space.
- Landmark Quadrus office building at Boldon Business Park on the A19.

Character Area 31 (Urban Fringe): Boldon Fell

- Large scale arable fields with gappy hedges.
- Overhead power lines converging on the sub-station by the A19.
- Busy dual carriageways subdivide the area.
- Regenerating woodland and scrub on former extraction sites.
- Farms and country house with associated woodland.

Character Area 32 (Urban Fringe): Boldon Downhill

- Highest point in the borough, steeply sloping to the west.
- Limestone scarp slope with former quarries.
- Gentle slope with golf courses.
- Intermittent woodlands.

City of Sunderland Landscape Character Assessment

8.5.29 The district-level *City of Sunderland Landscape Character Assessment*[45] (see Figure 8.2) includes two landscape character areas which cover part of the study area, and the key characteristics are listed below.

Character Area 2a (Coalfield Lowland Terraces): Usworth Lowland

- Lowland transitional landscape of gently rolling or flat agricultural fields with more undulating topography in river valleys.
- Medium to large sized, semi-regularly shaped, predominantly arable fields bordered by hedgerows, with some recently planted woodland.
- Recently restored former colliery land.
- Urban fringe character due to fragmented industrial and residential land use interspersed with open space.

Character Area 9f (Urban Limestone Plateau): Hylton Castle, Downhill and Castleton

- Gently undulating land predominantly urban in character.
- Residential area of cul-de-sacs with wide roads, areas of recreational space and blocks of housing.
- Few street trees or mature vegetation.
- Corridor of recreational space along the north including the underused Downhill Outdoor Sports Complex.

[44] LUC on behalf of South Tyneside Council . 2012. *South Tyneside Landscape Character Study Part I: Landscape Character Assessment*. [Online]. [Accessed: 16 January 2017]. Available from:https://www.southtyneside.gov.uk/article/36020/Supporting-Documentation-and-Evidence-Base-Studies

[45] LUC on behalf of Sunderland City Council. 2015. *City of Sunderland Landscape Character Assessment*. [Online]. [Accessed: 16 January 2017]. Available from: https://www.sunderland.gov.uk/media/19068/Sunderland-Landscape-Character-Assessment-Report-2015-/pdf/30_Sunderland_Landscape_Character_Assessment_(2015)1.pdf

Identification of LCUs

8.5.30 Smaller-scale units than those found in the published landscape character assessments were needed to provide the degree of resolution required for this LVIA. The study area has therefore been subdivided into LCUs using the published landscape character assessments as a guide, along with information gained through desk study work and site surveys. A townscape character assessment that formed part of the *West Boldon Conservation Area Character Appraisal*[46] has informed the urban LCUs. The LCUs that have been identified are listed in Table 8-4 and described in Appendix 8.3. A summary of the landscape quality and sensitivity for each LCU has also been provided in the table, criteria for which are described in Appendix 8.1. The LCUs do not take account of the wider footprint at Testo's junction, which would still be under construction in the Scheme's construction phase baseline, and is unlikely to align with the key characteristics of LCU2 A19 vegetated corridor until establishment of mitigation vegetation. This would be at a similar time to the future year (2036) assessment for the Scheme.

Table 8-4: Local landscape character units

Local Character Unit	Description	Quality	Sensitivity
LCU1	Western lowland agricultural land (landscape)	Ordinary	Moderate
LCU2	A19 vegetated corridor (landscape)	Poor	Low
LCU3	Boldon Business Park complex (urban)	Ordinary	Low
LCU4	Boldon ecological wetlands (landscape)	Good	Moderate
LCU5	River Don scrubby farmland (landscape)	Ordinary	Moderate
LCU6	West Boldon elevated urban centre (urban)	Good	Moderate
LCU7	Downhill elevated farmland (landscape)	Very attractive	High
LCU8	Town End Farm residential edge (urban)	Ordinary	Low
LCU9a, b and c	Usworth lowland (landscape)	Ordinary	Moderate
LCU10	Nissan Plant and IAMP One (the latter within future baseline) (urban)	Poor	Low

Visual baseline

Extent and nature of existing views

8.5.31 As described earlier in the chapter, the ZTV illustrates the visibility of the Scheme over bare ground only, and does not take account of any potential screening by elements such as buildings or significant vegetation. It reflects a multiple point analysis approach, in accordance with current *GLVIA3* guidance[47].

8.5.32 Two ZTVs have been produced using computer modelling techniques in accordance with the methodology set out in Appendix 8.1, and are shown on Figures 8.3A and 8.3B. The ZTVs represent the following worst-case scenarios:

- Zones within the study area whereby a 4.5 m tall Heavy Goods Vehicle using the Scheme at opening year (2021) would be theoretically visible. The colour of the ZTV has been graded to illustrate the length of visible route.
- Zones within the study area whereby the taller permanent structures of highway lighting (12 m tall), traffic lights (4 m and 6 m tall), signage (7 m tall), NMU bridge (4.05 m truss height above deck construction level) and NMU ramps (1.8 m parapet above deck construction level) would be theoretically visible. The colour of the ZTV has been graded to illustrate the number of these target points visible from viewers within the 2 km study area.

8.5.33 Within the baseline, there will be less vegetation present in the landscape due to vegetation removal for construction works at the Testo's Junction. This includes hedgerows and scrub along the A19, vegetation in and around the existing Testo's roundabout, and woodland at Mount Pleasant Marsh LWS and within the WBEEC. Figure 8.3C illustrates potential visual barriers within the study area, taking into account features removed by the Testo's scheme.

8.5.34 Views from the north are largely contained by woodland along the A19 and A184, and at Boldon Lake and Mount Pleasant Marsh LWSs, although due to vegetation removal for the Testo's scheme some views will be available to the south along the A19. Large commercial buildings in Boldon Business Park screen views from residential areas at Boldon Colliery and New Town, and vegetation along Boldon Bridge (A184) provides some screening of views from West Boldon. Downhill Lane junction is not perceptible in views from the residential edges of Fellgate and Hedworth to the north due to the properties being located approximately 2 km away and due to screening by intervening vegetation.

8.5.35 Views from the east are more elevated and open, in particular from the high ground of Hylton Castle and new housing developments here, although beyond 1 km views become restricted by topography at the Boldon Hills. Views from the south are contained by vegetation along the A19 and by buildings in Town End Farm and at the Nissan Plant. Views from the west are more open; however, the flat topography in this area results in views being filtered by intervening hedgerow and scrub vegetation. Within the baseline, there will be some views from the west towards the A19 due to hedgerow removal by the Testo's scheme and the buildings within the IAMP One development will provide screening of views from the west.

[46] South Tyneside Council. 2006. *West Boldon Conservation Area Character Appraisal.* [Online]. [Accessed: 14 August 2017]. Available from: https://www.southtyneside.gov.uk/article/36256/Character-appraisals-and-management-plans

[47] Landscape Institute and Institute of Environmental Management and Assessment. 2013. *Guidelines for Landscape and Visual Impact Assessment Third Edition (GLVIA3)*. Abingdon: Routledge. Page 103 para 6.8.

8.5.36 There are a series of Important Panoramic Views designated within the Sunderland City Council UDP[48]. The majority of these locations would not have views towards Downhill Lane junction; apart from Hylton Castle and Penshaw Monument, approximately 5 km to the south. However, the designation identifies the views to be protected/enhanced are those directed to the south towards Sunderland and not to the north-west where the Scheme would be.

8.5.37 There are a large number of electricity pylons extending out from the substation at the WBEEC, although within the baseline there will be fewer pylons in the landscape due to the Testo's scheme burying several overhead power lines crossing the A19. Remaining and newly constructed pylons detract from the majority of views within and outside of the study area. The pylons vary in height from around 20 m to around 40 m. Also, within the Scheme's construction phase baseline, construction works for Testo's junction and temporary compound and storage areas will be present as detractors within fields to the east and west of the A19, north of Downhill Lane.

8.5.38 Night-time views from much of the surrounding area are dominated by light pollution, independent of the highway. However, vehicle headlights between Downhill Lane and Testo's junctions are prominent in existing west-facing night-time views from the high ground in Downhill/ Town End Farm, where the vehicle headlights are backed by dark areas of countryside.

8.5.39 Seven panoramic photographs representing significant views of the Scheme from visual receptors have been displayed on Figures 8.5 to 8.11. The location and direction of view for each photograph is identified.

Visual receptors

8.5.40 The locations of the visual receptors are shown on Figure 8.3C Visual Appraisal. Photographs representing significant views of the Scheme from visual receptors have been displayed on Figures 8.5 to 8.11. The location and direction of view for each photograph is identified on Figure 8.4. Potential visual receptors and their sensitivity are presented in Table 8-5 below.

Table 8-5: Visual receptors

Visual receptor reference	Visual receptor description	*Sensitivity*
01	West House Farm buildings and yard area	Moderate
02	West House Farmhouse	Moderate
03	Bridleway B28	High
04	WBEEC	Moderate
05	Scot's House – east wing	Moderate
06	Mansion House	Moderate
07	Footpath B29	High
08	West Pastures Travelling Community Site	Moderate
09	Footpath B27	High
10	Bridleway B46	High
11	Travelling Man public house	Moderate
12	Mount Pleasant Farm	High
13	West Boldon open space	Moderate
14	Properties at Glebe Farm Court, West Boldon	Moderate
15	Properties on Lawn Drive (also representative of users of Downhill Lane)	High
16	Downhill Farm complex (also representative of users of Downhill Lane)	High
17	Users of Downhill Lane	Moderate
18	Fellgate residential edge / open space	Moderate
19	North-western edge of Town End Farm	High
20	Make-Me-Rich Farm	High
21	Elliscope Farm	Moderate
22	Hylton Grove Farm	Moderate
22	Hylton Bridge Farm	Moderate
24	Western edge of Town End Farm	Moderate
25	Footpath B22	Moderate
26	My Pet Stop kennels and cattery, Follingsby Lane	Moderate
27	North Moor Farm	Moderate
28	West Moor Farm	Moderate
29	Shared cycleway/ footway along A1290 from Downhill Lane junction to Washington Road	High
30	Shared cycleway/ footway along A1290 from Washington Road to Cherry Blossom Way	Moderate
31	Usworth Cottages and The Chalet	High
32	Three Horse Shoes public house	Moderate
33	Gateshead College	Moderate
34	Nissan Plant	Low
35	North East Land, Sea and Air Museums	Moderate
36	Football pitches north of NELSAM	Low

[48] Sunderland City Council. 2007. *Sunderland City Council Unitary Development Plan Adopted Alteration No. 2*. [Online]. [Accessed: 14 August 2017]. Available from: http://www.cartogold.co.uk/sunderland/text/00cont.htm – Policy CN13.

Visual receptor reference	Visual receptor description	*Sensitivity*
37	Shared cycleway/ footway along Washington Road including footbridge across A19	High
38	Shared cycleway/ footway from Downhill Lane junction along Washington Road to Town End Farm	High
39	Swan Court, Hylton Castle	High
40	Penshaw Monument	High
41	IAMP One	Low
42	Pedestrian and cycle route along internal road at IAMP One	High
43	Pedestrian and cycle route through central green corridor at IAMP One	Moderate
44	Follingsby Lane cycle, pedestrian and horse riding route	Moderate

8.6 Potential impacts (without mitigation)

8.6.1 The identification of landscape and visual impacts as a result of the Scheme have been summarised below. For further information on the magnitude of impact refer to the Landscape and Visual Effects Schedules in Appendix 8.4 (Tables 8.4-a & 8.4-b). All impacts below are described in the absence of mitigation. Recommended measures to mitigate these impacts are described in Section 8.7 of this ES.

Construction impacts

Landscape and townscape impacts

8.6.2 Construction of the Scheme is likely to have an impact on the landscape as described below.

Topography and hydrology

- Short-term adverse impact on topography due to raised landform of temporary soil and spoil stockpiles within fields to the north, east and south of the Downhill Lane junction area, and movement of earth around the site to create new earthworks.
- Permanent adverse impact due to the creation of raised embankments for the new southern section of the Downhill Lane junction area and slip roads to the south, as well as along the new NMU route.
- Permanent adverse impact due to the creation of attenuation ponds to the north-east, south and south-west of Downhill Lane junction with associated outfall to local field drains.

Land use

- Short-term adverse impact due to the loss of agricultural land to the north, south and east of the Downhill Lane junction area / Washington Road to accommodate the main site compound, soil storage and laydown areas.
- Permanent adverse impact due to the loss of agricultural land for the Scheme footprint to the west of the junction and also to the east for the junction and slip road improvements and realignment of Washington Road.

Land cover

- Permanent adverse impact due to the loss of woodland belt vegetation between Downhill Lane junction and Washington Road.
- Permanent adverse impact as a result of the loss of trees and shrubs and scrub planting on the existing Downhill Lane junction area and along the slip roads.
- Permanent adverse impact due to the loss of established hedgerow and tree belts along the western edge of the A1290 and Downhill Lane, west of the Downhill Lane junction area.

Landscape pattern

- Permanent adverse impact on field pattern adjacent to Downhill Lane junction as a result of a reduction in field size and loss of hedgerow boundaries to the west of the A19, along the A1290, and along the edges of the junction to the east. There would also be an adverse effect on pattern due to loss of the mature tree belt to the north of Washington Road.

Cultural influences

- Permanent adverse impact on the old route of the Stanhope and Tyne railway as a result of construction for the A1290 realignment and the south-west section of the Downhill Lane junction area.

Landscape and townscape character

- Short-term adverse impact on the landscape character of LCU 1, LCU 2 and LCU 5 as a result of temporary construction activities, the main site compound and soil storage and laydown areas reducing the tranquillity and visual amenity during the works and having short-term impacts on landform and pattern.
- Short to medium-term adverse impact on the townscape character of LCU 8 as a result of reduction in visual amenity and tranquillity due to temporary construction activities, the construction of the NMU bridge and ramps and soil storage and laydown areas in the adjacent LCU 5 area.
- Long-term impact as a result of vegetation loss for the construction of the Scheme on the landscape character of LCU 1, LCU 2, LCU 5 and LCU 9a due to loss of land cover (LCU 2, LCU 5), which also would lead to reductions in visual amenity and tranquillity (LCU 9a).
- Permanent adverse impact on LCU 5 due to the creation of a new attenuation pond to the north-east of the Scheme, with associated loss of land cover for its outfall to a local ditch.
- Permanent adverse impact on LCU 9a due to the creation of a new attenuation pond to the eastern corner of the field marking the edge of the character unit area leading to a new landform feature to the field system and reducing visual amenity.
- Permanent adverse impact on LCU 1, LCU 2, LCU 5 and LCU 9a due to construction activity for the new road bridge, NMU bridge and ramps and wider Downhill Lane junction area, including the realigned northbound off and southbound on slip roads, Downhill Lane and A1290 Washington Road carriageways.

- Short-term impact on LCU10 due to construction activity at Downhill Lane junction and along the A1290 reducing tranquillity and increasing the perception of movement.

Visual impacts

8.6.3 Construction of the Scheme is likely to have an impact on views as described below.

- Short-term adverse visual impact on views from visual receptors in close proximity to the A1290, Washington Road, Downhill Lane, Downhill Lane junction area and fields adjacent to the Scheme, in particular along the north-western edge of Town End Farm, due to the proximity of the construction site, activity and temporary structures here (main site compound, storage piles and haul roads).
- Short-term adverse visual impact on mid to long range views where the A19, A1290, Washington Road, Downhill Lane and the Downhill Lane junction areas are visible, especially where the main site compound, temporary haul roads and storage piles would be also visible.
- Short-term adverse visual impact on views from the multi-use cycleways along the A1290 and Washington Road due to temporary redirection during the construction period with views to the works during this time.

Operational impacts

Landscape impacts

8.6.4 Operation of the Scheme is likely to have an impact on the landscape as described below.

Topography and hydrology

- Permanent adverse impact on topography due to the introduction of new junction embankments and northbound off/ southbound on slip road embankments.
- Permanent adverse impact due to earthworks at the new road bridge structure south of the existing bridge at Downhill Lane junction and along the NMU route.
- Permanent adverse impact on hydrological landscape features due to the introduction of three new engineered attenuation ponds and localised changes to a tributary of the River Don as a result of creating a new outfall from one of the attenuation ponds.

Land use, land cover, landscape pattern and cultural influences

- All medium-term to permanent impacts created during construction would still remain (loss of vegetation, reduction of land and changes to landscape pattern); however, short-term impacts from temporary storage areas, the main site compound and activity would have ceased on completion of the Scheme construction.

Landscape and townscape character

- Permanent adverse impact on the landscape character of LCUs 1, 2, 5 and 9a due to changes in landform, reduction in field size and pattern (LCU 5 and LCU 9a), loss of vegetation / land cover and minor reductions in visual amenity (LCU 5 and 9a) as a result of NMU bridge and ramps being perceptible in views across the LCUs.
- Medium-term impacts on townscape character of LCU 8 due to presence of the new NMU bridge and eastern ramps as noticeable new features in the visual amenity of the north-western corner of the character unit area.

Visual impacts

8.6.5 Operation of the Scheme is likely to have impacts on views as described below.

- Permanent adverse impact on views from cycleway routes between the A1290 and Washington Road as a result of the redirection over the NMU bridge to the south of Downhill Lane junction leading to new views over the A19 towards the junction area to the north and to the Nissan Plant and Washington Road footbridge to the south whilst on the footbridge.
- Permanent adverse impact on views from the NMU users of Downhill Lane (GNFHT) between Downhill Lane and the A1290 as a result of the redirection along the realigned Washington Road and over the NMU bridge to the south of the Downhill Lane junction.
- Permanent adverse impact on views from Bridleway B46 as a result of a new attenuation pond located at the south-eastern end of the route near Downhill Lane junction.
- Permanent adverse impact on views for NMU users of the Washington Road footbridge as a result of a new attenuation pond located in the foreground field to the south of Downhill Lane junction.
- Permanent adverse visual impact on mid-range views from the east (Downhill Farm complex, properties on Lawn Drive and the GNFHT on Downhill Lane) due to vegetation loss and the presence of new junction features, attenuation pond and realigned Washington Road in the views.
- Permanent adverse visual impact on mid-range views from the north (Footpath B27, Bridgeway B46) due to vegetation loss and the presence of new junction features, attenuation pond and realigned Washington Road in the views.
- Permanent adverse visual impact on views from the north-western edge of Town End Farm as a result of vegetation loss during construction and views to the newly constructed junction and realigned Washington Road.
- Permanent adverse visual impact on views from the northern edge of the IAMP One development due to vegetation removal at the A1290 and Downhill Lane junction, and views towards the new NMU bridge.

8.7 Design, mitigation and enhancement measures

8.7.1 In order to avoid, reduce or offset adverse effects on landscape and visual receptors identified above, as well as to respond to local planning policy, the following mitigation measures have been incorporated into the Scheme design, and are shown on the Environmental Masterplan.

Mitigation for construction impacts

- Minimise effects on land use, landscape pattern, landscape character and views by making good all temporary haul roads, storage areas and the main site compound to their previous original state.
- Retain and protect all existing tree, shrub and scrub vegetation to the north of Downhill Lane junction (northbound on and southbound off-slip roads) to provide screening for views from the north during the construction period.

- Minimise visual effects of temporary storage piles, the main site compound and any construction lighting by providing phased storage of materials so that the easternmost edges of storage areas are maintained until last, in order to help to screen operations further west from views to the north-western edge of Town End Farm.

Mitigation for operational impacts

8.7.2 Landscape mitigation has been designed in collaboration with other disciplines, in particular the drainage and highways designers and ecologists, to maximise the efficiency of land use and to achieve maximum cross-disciplinary benefits where possible.

- Provide tree belt planting on embankment slopes between the Downhill Lane junction northbound off and southbound on slip road as well as the realigned Washington Road to screen and or filter views towards the layout and lighting of the Washington Road and new road and NMU bridge, and integrate the embankments into the landscape. Maintain planting by controlling weed growth, replacing dead trees and ensuring adequate space for healthy tree growth.
- Provide tree, shrub and scrub planting along the Downhill Lane junction northbound off and southbound on slip roads and provide woodland planting within the circulatory area of the junction to replace lost vegetation and integrate the Scheme into the surrounding landscape character.
- Provide linear tree and shrub planting to the outer edge of Washington Road, Downhill Lane and A1290 to integrate the realigned roads and provide filtered screening of lighting from adjacent housing areas.
- Provide tree and shrub planting to the outer edges of the new NMU route east of the realigned Washington Road, and also to the foot of the approach ramps on both sides of the bridge to aid in screening and/or integrating the structures.
- Provide habitat creation to the extents of the attenuation pond area to the north of the Downhill Lane junction area.
- Provide linear tree and shrub planting and species rich grassland around the attenuation pond to the south of Downhill Lane junction to help integrate it into the landscape.
- Provide linear tree and shrub planting, scrub and species rich grassland around the attenuation pond to the south-west of Downhill Lane junction adjacent to the A1290 to help integrate it into the landscape and provide some screening for views towards the NMU bridge area.

Monitoring and maintenance

8.7.3 Planting and seeding, proposed as mitigation for landscape and visual effects, would be maintained in order to achieve their full establishment throughout the construction contract, and then handed over for a landscape-establishment maintenance period of two years, prior to handover to the future maintaining authority for on-going highway maintenance.

8.8 Assessment of effects

8.8.1 Tables 8-6 and 8-7 at the end of this section summarise the most notable landscape and visual effects of the Scheme (refer to Tables 8.4-a and 8.4-b within Appendix 8.4 for the full assessment of effects). These effects have been separately assessed for the construction period (2020-2021), the year of opening (2021) and the future year (2036) and have been summarised in the following section. Where relevant, the visual receptor reference numbers have been identified for ease of cross reference with Table 8.4-b within Appendix 8.4 and their locations are shown on Figure 8.3C.

8.8.2 The assessment of significance of effect takes account of committed mitigation outlined in Section 8.7 of this ES (refer to Appendix 8.1, in Volume 3 of this ES, for the full methodology).

Construction effects

Landscape effects

Topography and hydrology

8.8.3 There would be a **slight adverse effect** on topography in the short-term due to the deposition of soil and materials within agricultural land to the north, south, and east of the Downhill Lane junction. These would be additional to the storage mounds for the Testo's scheme in the fields near West Pastures Lane and to the east and west of the A19, north of Downhill Lane. Impacts on the hydrological landscape elements (outfall to existing ditches for the northern attenuation pond) would be negligible (neutral effect).

Land use

8.8.4 There would be a permanent **slight adverse effect** on agricultural land adjacent to the Scheme to the north, east and south of Downhill Lane junction as a result of the reduction of land due to the larger Scheme footprint and also the short-term slight adverse effect from loss of land required for temporary works and stockpiling of materials during the construction period.

Land cover

8.8.5 There would be a long-term **moderate adverse effect** as a result of the loss of woodland and mature tree belts between the southbound on slip road and Washington Road to accommodate the Scheme. Further tree, shrub and scrub loss would be required for the construction of the new northbound off slip road, new junction circulatory area and realigned Washington Road to the east and A1290/ Downhill Lane to the west.

Landscape pattern

8.8.6 There would be a long-term **slight adverse effect** on the field pattern adjacent to Downhill Lane junction as a result of a reduction in field size and loss of hedgerow boundaries to the west of the A19, along the A1290, and along the edges of the junction to the east. There would also be a long-term adverse effect on field pattern and loss of hedgerow field boundaries to the east of Washington Road and at Downhill Lane to the east of the junction as a result of the realignment of Washington Road.

Landscape and townscape character

8.8.7 The most significant effects on landscape character would be short-term **moderate adverse effects** on LCU 2 A19 vegetated corridor, LCU 5 River Don scrubby farmland and LCU9a Usworth lowland, due to extensive disruption in visual amenity and tranquillity throughout the construction period and introduction of new features into the LCUs.

8.8.8 Within LCU 2, there would be significant vegetation removal, the redirection of traffic via traffic management and the introduction of two new bridges between Downhill Lane junction and Washington Road footbridge. Within LCU 5, there would be the loss of vegetation along Downhill Lane and Washington Road, at Downhill Lane junction and around a new attenuation

pond. Further effects would be due to the temporary use of land to the north (main site compound), south and east (materials storage and laydown areas) of the junction area, adjacent to Town End Farm. Construction of the new NMU bridge and ramp structures would also result in changes to visual amenity and tranquillity within LCU 5. The construction works for the Scheme would be additional to the construction works for the Testo's scheme to the north.

8.8.9 Within LCU9a, construction works for Downhill Lane junction and the realignment of the A1290 and A19 northbound off slip road would reduce tranquillity and increase the perception of movement. There would also be the removal of vegetation along the A1290 and loss of arable land. Vegetation removal within Downhill Lane junction and along the A19 northbound off slip road would also be apparent in the adjacent LCU.

8.8.10 There would be a short-term, localised **slight adverse effect** on LCU 1 Western lowland agricultural land due to adverse changes in visual amenity and tranquillity at the very southern edge of the LCU as a result of the construction of parts of the Scheme. There would also be short-term effects on topography and landform and loss of field boundary vegetation as a result of the construction of the western part of the junction and the realignment of Downhill Lane and the A1290.These construction works for the Scheme would be in the context of construction works for the adjacent Testo's scheme to the north, including storage mounds and the Testo's main site compound near West Pastures Lane and west of the A19.

8.8.11 There would be a short to medium-term, localised **slight adverse effect** on the townscape of LCU 8 Town End Farm residential edge due to adverse changes in visual amenity and tranquillity at the very north-western edge of the LCU as a result of the construction of the Downhill Lane junction, realignment of Washington Road and the new NMU route, drainage and bridge and ramp structures. There would also be short-term effects on LCU 8 due to the temporary storage and laydown areas in the adjacent fields to the east of the Scheme.

8.8.12 There would be a short-term, localised **slight adverse effect** on the townscape character of LCU10, as construction works for the realignment of the A1290 would be in close proximity and would result in a reduction in tranquillity and an increase in the perception of movement.

Visual effects

8.8.13 There would be a short-term **very large adverse effect** on views experienced by walkers and cyclists using the shared cycleway/ footway along Washington Road [ref 38] which would be diverted during the construction period. There would be views towards works to realign part of Washington Road and construction works at Downhill Lane junction. The construction of the NMU bridge and ramp structures would also be prominent in views from the diverted route.

8.8.14 There would be a short-term **large adverse effect** on residents with close range views from the north-western edge of Town End Farm [ref.19], as well as users of the shared cycleway/ footway on both approaches to the Downhill Lane junction (A1290 [ref. 29] and Washington Road [ref. 37]). This would be as a result of receptors having views towards the temporary storage and main site compound areas to the north, south and east of the Scheme. Views would also be possible towards construction works for Downhill Lane junction, the northern attenuation pond, the Washington Road realignment, new slip roads and the attenuation ponds to the south of the junction and adjacent to the A1290. The construction of the NMU bridge and ramp structures would also be prominent in views.

8.8.15 There would be a short-term **large adverse effect** on close range views experienced by users of Downhill Lane and the GNFHT [ref. 17] to the eastern and western approaches of the Scheme, as a result of focused views towards the construction works at Downhill Lane junction and for the new attenuation pond, plus temporary areas located to the north and east of the Scheme (e.g. the main site compound, storage and laydown areas).

8.8.16 There would also be a short-term **large adverse effect** on mid-range views from a property within the Downhill Farm complex and users of Downhill Lane/GNFHT [ref. 16], where views would extend towards the temporary storage and main site compound to the north and east of the Scheme. Views would also extend towards construction activity at the junction and for the NMU bridge and ramp structures. Views would be more open due to the loss of mature tree belt vegetation along Washington Road and at Downhill Lane southbound on slip road.

8.8.17 There would be medium term **moderate adverse effects** on residents at properties with either oblique, upper floor window views, or filtered views or mid to long-range views towards construction works for the Scheme and main site compound, storage and laydown areas to the north, south and east of the junction area. The construction of the NMU bridge and ramp structures would also be noticeable in these views. These receptors include properties on Lawn Drive/ Downhill Lane [ref. 15], Make-Me-Rich Farm [ref. 20], and Usworth Cottages and The Chalet [ref. 31].

8.8.18 There would be medium term **moderate adverse effects** on mid-range, elevated views obtained by users of Downhill Lane/ GNFHT [ref.15] to the east. There would be views towards the construction of the Scheme at Downhill Lane junction, the northern attenuation pond and Washington Road realignment as well as the new NMU bridge and ramp structures. There would also be views towards the temporary storage and laydown area adjacent to the edge of Town End Farm to the east of the Scheme and also the main site compound area north-east of Downhill Lane junction.

8.8.19 There would be medium term **moderate adverse effect** on views from the northern and eastern outdoor areas of the NELSAMs [ref. 35] due to there being views towards construction works at the slip roads and Downhill Lane junction area as well as at the attenuation pond to the south of Downhill Lane junction. The construction of the NMU bridge and ramp structures would also be visible.

8.8.20 There would be a short-term **moderate adverse effect** on close-range views from the northern edge of the IAMP One development [ref.41] and the pedestrian route and cycleway along the internal road [ref. 42] due to construction works for the realignment of the A1290, the new NMU bridge and Downhill Lane junction. Vegetation removal would result in views of construction works being more open.

8.8.21 A short-term **slight adverse effect** would be experienced by users of the outdoor teaching areas (eastern / southern edges only) of the WBEEC [ref. 04] where views would be filtered and mid-range and would look towards the taller elements of construction works at Downhill Lane junction and the associated loss of mature tree belts along Washington Road.

8.8.22 The other close-range views with short-term slight adverse effects would be those of users of the football pitches north of the NELSAM [ref. 36]. Whilst these impacts would be moderate in nature, the users would only experience them temporarily when using the pitches.

8.8.23 Residents at the western edge of Town End Farm [ref. 24] would experience a short-term **slight adverse effect** on views as mature boundary vegetation would filter views towards the construction works at the Washington Road realignment, NMU bridge and ramp structures. There would also be filtered views towards the temporary areas within the fields to the north and adjacent to the northern end of Washington Road.

8.8.24 There would also be a short-term **slight adverse effect** on elevated, panoramic but long-range views from properties at the edge of Swan Court in Hylton Castle [ref. 39] as a result of vegetation loss, construction activity for the Scheme (Downhill Lane junction, NMU bridge and ramps and Washington Road realignment) and the temporary laydown and main site compound areas to the north and east of the Scheme.

8.8.25 Receptors further afield would also experience a short-term **slight adverse effect** as there would be long range views towards construction works for the Scheme and associated vegetation loss at the junction area/ Washington Road. Views would be filtered or restricted by intervening topography, vegetation, and/or buildings. These receptors would include walkers on Footpath B29 [ref. 07] and B22 [ref. 25], residents of West Pastures Travelling Community Site [ref. 08], users of the Travelling Man public house [ref. 11], and users of the shared cycleway/ footway on the A1290 between Washington Road and Cherry Blossom Way [ref. 30]

8.8.26 There would be short to medium term **slight adverse effects** on mid to long range views from farm buildings and properties with oblique and/or upper floor views towards construction works for the Scheme and main site compound, storage and laydown areas to the north, south and east of the junction. These receptors include tenants and workers at Mount Pleasant Farm [ref. 12].

8.8.27 There would be a short-term **slight adverse effect** on views from the pedestrian and cycle route in the green corridor within the IAMP One development [ref. 43] and the pedestrian, cyclist and horse riding route along Follingsby Lane [ref. 44]. There would be views towards construction works for the realignment of the A1290, the new NMU bridge and Downhill Lane junction; however, views would be glimpsed due to intervening buildings.

8.8.28 For many of the views described above, construction works for the Scheme would be in the context of construction works associated with the Testo's scheme. This would include temporary storage areas and the Testo's main site compound near West Pastures lane, and temporary storage areas to the east and west of the A19, north of Downhill Lane junction.

8.8.29 The Testo's junction improvement scheme would be operational before completion of the Scheme and during this period the footpaths and bridleways closed during construction of the Testo's scheme would re-open, some on different alignments. Additionally, a brand new cycleway facility along the A184 would be introduced as part of the Testo's scheme. The construction activity and all temporary works would have ceased (note: refer to Section 8.8.59 of this ES for shared use of the Testo's main site compound scenario), but effects from vegetation clearance would remain. Therefore, the assessment of landscape effects would be as described above, except construction activity and the associated reduction in visual amenity and tranquillity would now be concentrated at Downhill Lane junction.

8.8.30 Similarly, the assessment of visual effects would be as described above, except for the following:

- Construction activity would now be concentrated at Downhill Lane junction, changing the character of views for some receptors and reducing the amount of visible construction works.
- Receptors north of Testo's junction [ref. 01, 02 and 18] would have views towards the operational flyover and associated embankments at Testo's junction, resulting in only glimpsed views beyond to construction works at Downhill Lane junction.
- Bridleway B46 and B28 and Footpath B27 would be open, some along diverted routes. There would be views south towards construction works for Downhill Lane junction, with views more open in character due to vegetation removal.
- A new cycleway route would be provided along the alignment of the A184 running through the new Testo's junction. Views from users would be directed along the route east / west and focussed on the Testo's junction. Views to the south, towards the Scheme, would be screened or filtered by intervening vegetation and the landform and structures at the Testo's junction itself.

Operational effects

Landscape effects

Topography and hydrology

8.8.31 Temporary storage and soil piles would be removed on completion of construction. However, a permanent **slight adverse effect** would remain on topography due to new raised landform features at Downhill Lane junction and along the NMU route. Effects would not be greater due to the presence of existing man-made landform in the area. The earthworks would be in the context of similar earthworks at Testo's junction to the north.

8.8.32 There would be a permanent **slight beneficial effect** on hydrological landscape features in the future year following establishment of habitat planting around the new attenuation ponds and local ditches, which were disturbed for a new outfall. The new water features would be in keeping with local landscape character.

Land use

8.8.33 Agricultural land used for temporary construction works would be returned to agriculture by the opening year. However, permanent **slight adverse effects** would remain as there would be a reduction of useable agricultural land as a result of the Scheme footprint.

Land cover

8.8.34 A medium-term **moderate adverse effect** on land cover would remain due to the loss of vegetation at Downhill Lane junction and along Washington Road as a result of the Scheme. Mitigation vegetation would not reach functional establishment until the future year (2036).

8.8.35 By the future year, effects on land cover would reduce to long-term **slight adverse** due to the establishment of replacement tree, shrub and scrub planting at Downhill Lane junction, along the slip roads and along the Washington Road realignment, and of linear belts of trees and shrubs along Downhill Lane, Washington Road and the A1290. There would be a slight reduction in the width of woodland and tree belts along Washington Road due to the realignment of the road and the requirements for visibility splays at the new junction.

Landscape pattern

8.8.36 The loss of hedgerow field boundaries during construction would result in a medium-term **slight adverse effect** on the field pattern in the opening year (2021). By the future year, the establishment of linear tree and shrub planting and woodland blocks would have established to help restore the field pattern, resulting in a **neutral effect**. The slight reduction in field size due to the wider Scheme footprint would be barely perceptible within the wider landscape.

Landscape and townscape character

8.8.37 Where adverse effects on landscape character during construction were predominantly due to temporary works such as the main site compound, laydown and soil storage areas, effects would generally reduce on completion of construction as these elements would be removed from the landscape and areas returned to agricultural use.

8.8.38 Mitigation planting would not yet have established on the new road embankments within the LCU 2's A19 vegetated corridor, resulting in a medium-term **moderate adverse effect** in the opening year. However, these man-made features would be in the context of those at Testo's junction to the north. By the future year, there would be a permanent **slight adverse effect** on LCU 2 as new tree and shrub belts and woodland would have established to help replace vegetation lost during construction and restore the sense of enclosure. Adverse effects would remain due to the presence of permanent additional bridge structures at Downhill Lane junction and the NMU bridge, as well as the presence of ramp structures along the NMU route.

8.8.39 Similarly, the lack of establishment of mitigation planting in the opening year would result in medium-term **slight adverse effects** on the landscape character of LCU1, LCU 5 and LCU9a, as additional bridge structures, ramps and earthworks and vegetation loss would alter the landscape character of these areas. For LCU1 and LCU5, these man-made features would be in the context of those at Testo's junction to the north. Effects would remain until the future year, whereby the establishment of planting would integrate the Scheme into the surrounding landscape and replace vegetation lost during construction, reducing effects to **neutral**.

8.8.40 There would be medium-term **slight adverse effects** on the townscape character of LCU 8 Town End Farm as a result of reduction in visual amenity to the north western edge due to the presence of the NMU bridge and ramps present. As above, these effects would remain until the future year, whereby the establishment of planting would integrate the structures, reducing effects to **neutral**.

Visual effects

8.8.41 Where adverse effects on views during construction were predominantly due to construction activities or the presence of temporary storage, laydown and main site compound areas, effects would generally reduce on completion of construction as these elements would be removed from views. This would be noticeable along Footpath B22 [ref. 25] and from the WBEEC [ref. 04] resulting in a **neutral effect** in the opening and future years. Additional lighting would blend in with existing visual clutter and lighting in views obtained during the day and at night.

8.8.42 Adverse effects would remain in the opening year on visual receptors with views towards additional bridge structures, ramps and earthworks and where vegetation loss would result in more open views towards the Scheme. Mitigation vegetation would not reach functional establishment until the future year (2036). Adverse effects would reduce over the medium to long-term as vegetation establishes to provide both integration and screening functions.

8.8.43 Effects on views obtained by users of the shared cycleway/ footway along Washington Road [ref. 38] would reduce from very large adverse, due to the completion of construction. However, the character of views would alter as the route would be diverted along the realigned Washington Road and the NMU bridge and ramps. Views would extend to the north towards the new Downhill Lane junction bridge and earthworks, and south towards the new attenuation pond in the field next to the Nissan Plant. Therefore, there would be a medium-term **large adverse effect** on views in the opening year. This would reduce to a long-term **moderate adverse effect** by the future year, as the establishment of mitigation planting would integrate the new junction slip roads and bridge structures and provide replacement tree belt planting along the realigned Washington Road. Mitigation would also provide screening of the junction area in views to the west.

8.8.44 Residents along the north-western edge of Town End Farm [ref. 19] would continue to experience medium to long-term **large adverse effects** on views on completion of construction, as whilst temporary storage and laydown areas in the foreground of views would have been removed, the loss of vegetation along Washington Road and the new alignment of Washington Road and additional structures and earthworks at the Downhill Lane junction area would remain visible in the medium term. On establishment of tree and shrub planting along Washington Road and the NMU bridge earthworks by the future year, effects would reduce to permanent **slight adverse**, as whilst mitigation planting would provide screening of the junction area and integrate the earthworks, the most elevated section of the new NMU bridge and eastern ramp would be still remain partially visible above this.

8.8.45 Effects on views obtained by users of the shared cycleway/ footway along the A1290 and across Downhill Lane junction towards Washington Road [ref. 29] would reduce from short-term large to long-term **moderate adverse** in the opening year as construction activity would no longer be present. However, the character of views would be altered as the route would be diverted along the realigned A1290 and NMU bridge and ramps, from where views would become elevated and would be focused north towards the new road bridge and slip roads of Downhill Lane junction and south towards the new attenuation pond. The moderate adverse effect would remain until the future year whereby mitigation planting along the A1290, Downhill Lane slip roads and Washington Road would have established to replace lost vegetation and integrate the road into the landscape, reducing the visual effect to a permanent **slight adverse** effect by the future year. Views from further south-west on the A1290 would remain mostly as existing due to filtering by existing vegetation, although the uppermost parts of the NMU bridge would be slightly perceptible above mitigation vegetation.

8.8.46 Effects on views obtained by users of Downhill Lane and the GNFHT [ref. 17] would be long-term **large adverse** on completion of construction. NMU users would be diverted along the new NMU bridge and ramps instead of using the old Downhill Lane junction road bridge as described above for ref. 29. Users would experience similar effects on views during operation as those at ref. 29, with long-term effects reducing to permanent **slight adverse** by the future year as a result of mitigation planting having established to replace lost tree belts along Washington Road and also help to integrate the earthworks and structures in the views.

8.8.47 North of the Scheme, effects on views obtained by users of Bridleway B46 [ref. 10] would be long-term **large adverse** (once re-opened after construction), as views would extend to the new Downhill Lane junction area with new earthworks and structures, and noticeable loss of tree belt vegetation. There would also be views towards the new attenuation pond to the north. These effects would remain until the future year whereby mitigation planting around the attenuation pond and along the realigned section of Washington Road would establish to replace much of the vegetation lost during construction and integrate the earthworks and attenuation pond into the landscape. This would result in effects reducing to permanent **slight adverse**.

8.8.48 Further to the north, effects on mid-range views experienced by users of the eastern section of Footpath B27 [ref. 09] and Bridleway B28 [ref. 03] would be long-term **moderate adverse** (once re-opened after construction). The loss of tree belts along Washington Road would be noticeable as would the new NMU bridge and ramps and parts of the junction area. The

establishment of mitigation planting over the operational period would reduce these effects to a permanent **slight adverse** effect by the future year as vegetation would be replaced to enclose views and integrate Downhill Lane junction and new structures into the landscape.

8.8.49 There would be long-term **moderate adverse effects** on views experienced by a number of other visual receptors in the opening year. These receptors would include residents at Usworth Cottages and The Chalet [ref. 31], properties on Lawn Drive [ref. 15], the Downhill Farm complex [ref. 16] and Make-Me-Rich Farm [ref. 20], as well as visitors and workers at the NELSAMs [ref.35]. Changes in views would include the new Downhill Lane junction road bridge and earthworks and the new NMU bridge and ramp structures. Views towards these features would be open as mitigation vegetation would not yet have established. The loss of vegetation along Washington Road would also still be noticeable. Once mitigation vegetation has established at Downhill Lane junction and along Washington Road, effects on these visual receptors would reduce to permanent **slight adverse** in the future year. The NMU bridge and ramps would still form a visible addition to views.

8.8.50 Users of the shared cycleway/footway along Washington Road and over the existing Washington Road footbridge [ref. 37] would have close-range views from the footbridge towards the new Downhill Lane junction area, slip roads, NMU bridge and associated lighting. Views from the western part of this route would also extend towards the attenuation ponds south of Downhill Lane junction and adjacent to the A1290. The new bridge structures, junction and earthworks would lead to a permanent **moderate adverse** visual effect from the opening year onwards.

8.8.51 There would be a permanent **slight adverse effect** on views obtained by users of the football pitches to the north of the NELSAM [ref. 36] as a result of the presence of the new NMU bridge and ramps in filtered, close range views to the east.

8.8.52 Users of Footpath B29 [ref. 07], residents at the West Pastures Travelling Community Site [ref. 08], visitors to the Travelling Man public house [ref. 11], and residents at Mount Pleasant Farm [ref.12] would experience a **slight adverse effect** on views in the medium term due to there being views towards the new road bridge and NMU bridge and ramps. By the future year, mitigation planting would reduce these effects to **neutral** as the structures would be screened or integrated into the views and lost vegetation would be replaced. Effects on views from Elliscope Farm [ref. 21], re-occupied after 2021, would also be **neutral** in the future year due to screening of structures at Downhill Lane junction by mitigation vegetation.

8.8.53 Residents of properties along the western edge of Swan Court in Hylton Castle [ref. 39] would experience long-term **slight adverse effects** until the future year when effects would reduce to **neutral** following establishment of woodland-belt and tree and shrub planting along Washington Road and at Downhill Lane junction. Planting would replace vegetation lost during construction and would integrate the junction area back into the landscape, leaving only the uppermost elements of the NMU bridge visible through gaps in the tree belt at Town End Farm. The NMU bridge would also be viewed in the context of existing visual clutter in the expansive view (Nissan Plant, wind turbines and electricity pylons).

8.8.54 There would be a **slight adverse effect** on views from receptors within the IAMP One development including indoor workers [ref. 41], users of the internal road [ref. 42] and users of Follingsby Lane [ref. 44]. The new NMU bridge and additional lighting columns and signage at Downhill Lane junction would be apparent, and views towards moving traffic would be more open due to vegetation loss. On establishment of vegetation along the A1290, at Downhill Lane junction and within the IAMP One development, these features would become filtered in views. The top of the new NMU bridge would be perceptible, but viewed against a backdrop of housing and rising topography in Town End Farm. Effects would reduce to **neutral** for the buildings [ref. 41] and pedestrian, cycle and horse riding route along Follingsby Lane [ref. 44]. However, views would remain slightly more open from the pedestrian and cycle route along the internal road [ref. 42] with a **slight adverse residual effect**.

8.8.55 Night-time effects on visual receptors would predominantly reduce to **neutral** by the future year as additional lighting at Downhill Lane junction would not exacerbate existing light pollution already present at the junction area.

Table 8-6: Summary table of landscape effects (moderate and above)

Receptor	Sensitivity	Magnitude (without mitigation)	Magnitude (with mitigation)	Residual Landscape Effects Significance
Land cover	Moderate	2020/21: Mod(A) 2021: Mod(A) 2036: Mod(A)	2020/21: Mod (A) 2021: Mod (A) 2036: Neg (A)	Construction (2020/21): Moderate (A) Opening year (2021): Moderate (A) Future year (2036): Slight (A)
LCU2 A19 Vegetated Corridor	Low	2020/21: Mod(A) 2021: Mod(A) 2036: Mod(A)	2020/21: Mod(A) 2021: Mod(A) 2036: Min(A)	Construction (2020/21): Moderate (A) Opening year (2021): Moderate (A) Future year (2036): Slight (A)
LCU5 River Don Scrubby Farmland	Moderate	2020/21: Mod(A) 2021: Min A) 2036: Min (A)	2020/21: Mod(A) 2021: Min A) 2036: Neg (A)	Construction (2020/21): Moderate (A) Opening year (2021): Slight (A) Future year (2036): Neutral
LCU9a Usworth Lowland	Moderate	2020/21: Mod(A) 2021: Min A) 2036: Min (A)	2020/21: Mod(A) 2021: Min A) 2036: Neg (A)	Construction (2020/21): Moderate (A) Opening year (2021): Slight (A) Future year (2036): Neutral
KEY: Maj = Major Mod=Moderate Min=Minor Neg=Negligible (A)=Adverse (B)=Beneficial				

Table 8-7: Summary table of visual effects (moderate and above)

Receptor	Sensitivity	Magnitude (without mitigation)	Magnitude after Mitigation	Residual Visual Effects Significance
03. Bridleway B28	High	2020/21: Not assessed* 2021: Maj (A) 2036: Maj (A)	2020/21: Not assessed* 2021: Mod(A) 2036: Min (A)	Construction (2020-21): Not assessed* Opening year (2021): Moderate (A) Future Yr (summer 2036): Slight (A) Future Yr (winter 2036): Slight (A)
09. Footpath B27 (Fig. 8.08)	High	2020/21: Not assessed* 2021: Maj (A) 2036: Maj (A)	2020/21: Not assessed* 2021: Mod(A) 2036: Min (A)	Construction (2020-21): Not assessed* Opening year (2021): Moderate (A) Future Yr (summer 2036): Slight (A)

Receptor	Sensitivity	Magnitude (without mitigation)	Magnitude after Mitigation	Residual Visual Effects Significance
				Future Yr (winter 2036): Slight (A)
10. Bridleway B46 / old railway route (Fig. 8.09)	High	2020/21: Not assessed* 2021: Maj (A) 2036: Maj (A)	2020/21: Not assessed* 2021: Maj (A) 2036: Min (A)	Construction (2020-21): Not assessed* Opening year (2021): Large (A) Future Yr (summer 2036): Slight (A) Future Yr (winter 2036): Slight (A)
15. Properties on Lawn Drive (Downhill Lane / GNFHT) (Fig 8.10)	High	2020/21: Mod(A) 2021: Mod(A) 2036: Mod(A)	2020/21: Mod (A) 2021: Mod (A) 2036: Min (A)	Construction (2020-21): Moderate (A) Opening year (2021): Moderate (A) Future Yr (summer 2036): Slight (A) Future Yr (winter 2036): Slight (A)
16. Downhill Farm complex (Downhill Lane / GNFHT)	High	2020/21: Mod(A) 2021: Mod(A) 2036: Mod(A)	2020/21: Mod (A) 2021: Mod (A) 2036: Min (A)	Construction (2020-21): Large (A) Opening year (2021): Moderate (A) Future Yr (summer 2036): Slight (A) Future Yr (winter 2036): Slight (A)
17. Users of Downhill Lane / GNFHT (Fig. 8.14 & 8.15)	Moderate	2020/21: Maj(A) 2021: Maj (A) 2036: Maj (A)	2020/21: Maj (A) 2021: Maj (A) 2036: Min (A)	Construction (2020-21): Large (A) Opening year (2021): Large (A) Future Yr (summer 2036): Slight (A) Future Yr (winter 2036): Slight (A)
19. North-western edge of Town End Farm (Fig. 8.16 & 8.17)	High	2020/21: Maj(A) 2021: Maj (A) 2036: Maj (A)	2020/21: Maj (A) 2021: Maj (A) 2036: Min (A)	Construction (2020-21): Large (A) Opening year (2021): Large (A) Future Yr (summer 2036): Slight (A) Future Yr (winter 2036): Slight (A)
20. Make-Me-Rich Farm	High	2020/21: Mod(A) 2021: Mod(A) 2036: Mod (A)	2020/21: Mod (A) 2021: Mod (A) 2036: Min (A)	Construction (2020-21): Moderate (A) Opening year (2021): Moderate (A) Future Yr (summer 2036): Slight (A) Future Yr (winter 2036): Slight (A)
29 Shared cycleway/ footway along A1290 from Downhill Lane junction to Washington Road	High	2020/21: Maj(A) 2021: Maj (A) 2036: Maj (A)	2020/21: Maj (A) 2021: Mod (A) 2036: Min (A)	Construction (2020-21): Large (A) Opening year (2021): Moderate (A) Future Yr (summer 2036): Slight (A) Future Yr (winter 2036): Slight (A)
(Fig. 8.06)				
31 Usworth Cottages and The Chalet	High	2020/21: Mod(A) 2021: Mod(A) 2036: Mod (A)	2020/21: Mod (A) 2021: Mod (A) 2036: Min (A)	Construction (2020-21): Moderate (A) Opening year (2021): Moderate (A) Future Yr (summer 2036): Slight (A) Future Yr (winter 2036): Slight (A)
35 North East Land, Sea and Air Museums (NELSAM)	Moderate	2020/21: Mod(A) 2021: Mod(A) 2036: Mod (A)	2020/21: Mod (A) 2021: Mod (A) 2036: Min (A)	Construction (2020-21): Moderate (A) Opening year (2021): Moderate (A) Future Yr (summer 2036): Slight (A) Future Yr (winter 2036): Slight (A)
37 Shared cycleway/ footway (Washington Road incl. footbridge over A19) (Fig. 8.12 & 8.13)	High	2020/21: Maj(A) 2021: Maj (A) 2036: Maj (A)	2020/21: Maj (A) 2021: Mod (A) 2036: Mod (A)	Construction (2020-21): Large (A) Opening year (2021): Moderate (A) Future Yr (summer 2036): Mod (A) Future Yr (winter 2036): Mod (A)
38 Shared cycleway/ footway from Downhill Lane junction along Washington Road to Town End Farm	High	2020/21: Maj(A) 2021: Maj (A) 2036: Maj (A)	2020/21: Maj (A) 2021: Maj (A) 2036: Min (A)	Construction (2020-21): Very Large (A) Opening year (2021): Large (A) Future Yr (summer 2036): Mod (A) Future Yr (winter 2036): Mod (A)
41 IAMP One	Low	2020/21: Maj(A) 2021: Mod (A) 2036: Mod (A)	2020/21: Maj (A) 2021: Mod (A) 2036: Min (A)	Construction (2020-21): Mod (A) Opening year (2021): Slight (A) Future Yr (summer 2036): Neutral (A) Future Yr (winter 2036): Neutral(A)
42 Pedestrian and cycle route along internal road at IAMP One	High	2020/21: Mod (A) 2021: Min (A) 2036: Min (A)	2020/21: Mod (A) 2021: Min (A) 2036: Neg (A)	Construction (2020-21): Mod (A) Opening year (2021): Slight (A) Future Yr (summer 2036): Slight (A) Future Yr (winter 2036): Slight (A)

KEY: Maj= Major Mod=Moderate Min=Minor Neg=Negligible (A)=Adverse (B)=Beneficial

** = Refer to Section 8.4.1 Assessment Assumptions and Limitations (bullet 6)*

Inter-relationship effects between topics

8.8.56 During construction and operation, there are unlikely to be any inter-relationship effects between effects reported in this and other topic chapters leading to adverse effects on landscape receptors. Changes in noise levels are considered as part of the landscape assessment when determining effects on the tranquillity of the landscape character.

8.8.57 During construction, potential short-term adverse effects on visual receptors closest to the Scheme, as a result of the inter-relationship effects between visual and noise and vibration, were not deemed to be likely assuming all best practice mitigation is adopted and suitable notification to residents is provided for short-term vibration effects.

8.8.58 During operation, no significant adverse effects were anticipated on air quality or noise, so inter-relationships with effects reported in other chapters are not likely.

Shared use of the A19 Testo's scheme main site compound

8.8.59 As discussed in Section 1.5, in Chapter 1 of this ES, there is the potential that the Scheme could share use of the temporary main site compound for the Testo's scheme for the purpose of general storage, traffic management and office-based administrative purposes. If this was undertaken from the commencement of construction of the Scheme, the area of land take required for the Downhill Lane main site compound could be reduced. There would also be a period where both the Testo's and Downhill Lane junction schemes are being constructed at the same time, followed by a period where only the Scheme is under construction but still using the Testo's scheme main site compound.

8.8.60 Chapter 8 of the Testo's scheme ES identifies a temporary adverse effect on receptors close to the location of the Testo's main site compound (e.g. West Pastures Travellers Site). Mitigation in the form of phasing soil storage was proposed to minimise disruption during the construction period. This conclusion would not be changed by the Scheme sharing the Testo's scheme main site compound as there would be no additional land take at the site of the Testo's main site compound.

8.8.61 The presence of the Testo's main site compound and its proposed mitigation has been considered as part of the future baseline and its presence has been taken into account when determining the change in views due to the construction of the Scheme. A high-level summary of how the Scheme effects would differ in the period when Testo's junction is operational but the Scheme is still in construction has been provided in Paragraphs 8.8.29-30 of this ES, assuming all construction activity and temporary works and structures have ceased / been removed. The following bullets provide a high-level review of likely effects on receptors if the Testo's main site compound were retained for use by the Scheme after Testo's scheme ceases construction, but ahead of the Scheme completing construction works:

- Landscape effects would be as described above, except construction activity and the associated reduction in visual amenity and tranquillity would continue up until the end of the Scheme's construction period due to construction activity and presence of the Testo's main site compound and haul roads along the western edge of the new operation scheme.
- Visual impacts on receptors north-west of Testo's junction [ref. 01, 02, 05, 06, 07, 08 and 18] would also include the presence of the Testo's main site compound and haul roads along the western edge of the new operation scheme up until completion of the Scheme works.
- Bridleway B28 [ref. 03] and Footpath B27 [ref. 09] would be open along their diverted routes which would also include close range views of the continued use of the Testo's main site compound and haul roads.
- The new cycleway route provided along the alignment of the A184 running through the new Testo's junction would have glimpsed views of the Testo's main site compound in views to the south from the eastern end of the route.

8.8.62 The above adverse effects would be partly offset by the reduction in land take needed for the Scheme' main site compound, north of Downhill Lane (East), if there is a shared use of the Testo's main site compound from commencement of construction for the Scheme. This would reduce the scale of the impact on the landscape and views of the area between the River Don and Downhill Lane (East). Therefore, though the extended duration of the Testo's compound would create some extended and new adverse visual effects, these would be temporary and partly offset by the benefits of the reduced footprint for the Scheme's main compound.

Cumulative effects

8.8.63 The cumulative effects of the Scheme with other developments are assessed within Chapter 15 of this ES.

CHAPTER 9 ECOLOGY AND NATURE CONSERVATION

Executive summary

Ecology and nature conservation have been assessed in accordance with the relevant sections of the Design Manual for Roads and Bridges (DMRB), as updated by Interim Advice Note 130/10. Information was obtained from previous studies at earlier stages of the project, biological records, consultation with relevant organisations and field surveys completed from 2014 to 2018.

Important ecological features in the study area include designated nature conservation sites and other important habitats including: woodlands (Elliscope Farm East / Hylton Bridge Local Wildlife Site (LWS)), scrub, semi-improved grassland (Make-me-rich Meadow Local Wildlife Site) and connecting habitats, such as species poor hedgerows (especially west of the A19), watercourses (River Don) and ditches. Legally protected species present in the study area include water vole, otter, bats and wintering and breeding birds, including barn owl.

The Scheme would result in some loss of habitats which currently provide connectivity and dispersal routes for species (faunal and floral), including arable, scrub, semi-improved grassland, species poor hedgerows, watercourses and ditches. Wildlife would be at risk of disturbance, direct mortality and pollution, as well as fragmentation and severance of their habitat.

The adverse effects of the Scheme would be mitigated through: the replacement of lost habitat; timing of construction works to avoid the most sensitive times of year; relocation/displacement of relevant protected species before the start of works which affect them; landscape planting, designed, for example, to discourage barn owls from hunting within the road corridor; and pollution control measures to prevent damage and degradation to habitats. Once mitigation is taken into account, there would be no significant long-term effects persisting into the operational period. Some construction effects were considered to remain significant at a local level only, but would be short-term and would cease at the end of the construction period in 2021.

9.1 Introduction

9.1.1 This chapter describes existing habitats and species present in the study area, how they would be affected by the construction and operation of the Scheme, and the measures proposed to avoid or reduce the impacts. In addition, opportunities to provide improvements to the existing ecological baseline have also been considered. The assessment supporting this chapter has been undertaken in accordance with the most recently published Highways England guidance[49], good practice published by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2016) and with cognisance of the outcome of consultation with statutory and non-statutory Nature Conservation Organisations, in particular, Natural England.

9.1.2 This chapter draws on surveys carried out and information gathered by Jacobs UK Ltd in 2017 and 2018 with reference to previous studies and surveys of the study area completed by Jacobs UK Ltd during 2007-2016 on behalf of Highways England.

9.1.3 In addition, where available, ecological baseline information from surveys undertaken as part of the IAMP development in 2014/2015 has been used to inform this chapter.

9.1.4 The key findings of all the surveys are described in this chapter, supported by the full survey reports reproduced in Appendix 9.1.

9.1.5 Section 9.9 of this chapter summarises the potential impacts associated with the proposals and assesses the significance of the effects at the construction stage and operational stage.

9.1.6 The significant adverse effects of the Scheme are considered to be those arising from the permanent loss, severance and fragmentation of existing habitats. Consequently, these impacts would also adversely affect faunal species through direct mortality, loss of their habitat, and severance of existing territories affecting their movement and dispersal opportunities.

9.1.7 To assist in this assessment and to provide a semi-quantitative basis for the impact assessment, habitat losses and gains have been calculated by reference to a GIS model and a summary of the main findings are given in Table 9-8 (in Section 9.8 of this chapter).

9.2 Legislative and policy framework

Legislative context

9.2.1 Many habitats and species are protected to varying degrees through national and European legislation. Advice relating to wildlife is also given in various planning policy documents. The main pieces of legislation relevant to this chapter are listed below and a summary is provided in Appendix 9.2.

- Council Directive 92/43/EEC (Habitats Directive, 1992) on the Conservation of natural habitats and of wild fauna and flora;
- Directive 2009/147/EC (Birds Directive, 2009) on the conservation of wild birds (the codified version of Council Directive 79/409/EEC as amended);
- The Conservation of Habitats and Species Regulations 2017;
- Wildlife and Countryside Act (WCA) 1981(as amended);
- Natural Environment and Rural Communities (NERC) Act 2006 (Habitats and Species of Principal Importance on Section 41 List);
- Protection of Badgers Act 1992;
- Countryside and Rights of Way Act 2000;
- Weeds Act 1959;
- The Hedgerows Regulations 1997;
- The Environment Act 1995; and
- Wild Mammals (Protection) Act 1996.

9.2.2 In addition to the above statutory instruments, nature conservation priorities for species and habitats are also informed by the:

- Durham Local Biodiversity Action Plan (LBAP);
- Highways England's 'Our plan to protect and increase biodiversity', 2015; and
- Joint Nature Conservation Committee (JNCC) Birds of Conservation Concern (BoCC) 2015 ('Green', 'Amber' and 'Red' list species).

[49] DMRB, Volume 11, Section 3, Part 4 'Ecology and Nature Conservation' (June 1993), as amended by Interim Advice Note 130/10, 'Ecology and Nature Conservation: Criteria for Impact Assessment', September 2010.

National, regional and local planning policy

9.2.3 National policy relevant to the scope of potential effects on ecology and nature conservation is outlined in Table 9.1.

Table 9-1: Relevant National Policies

National Policy	Relevant Paragraph	How the policy has been addressed
National Networks National Planning Policy Statement (NNNPS) (Designated January 2015)	Biodiversity and ecological conservation are referred to in **paragraphs 5.20 to 5.38** of the NNNPS. The NNNPS sets out the Government's vision and policy against which the Secretary of State will make decisions on applications for development consent for nationally significant infrastructure projects on the strategic road and rail networks.	A full review of the Scheme against the NNNPS is set out in **Appendix A** of the Planning Statement (DCO application reference **TR010024/APP/7.1)**
National Planning Policy Framework (NPPF) (July 2018)	**Paragraph 170** states that the planning system should "*contribute to and enhance the natural and local environment by…recognising the wider benefits of natural capital and ecosystem services…including the economic and other benefits of….trees and woodland; minimising impacts on and providing net gains for biodiversity including by establishing coherent ecological networks that are more resilient to current and future pressures*". **Paragraph 175** states that "*when determining planning applications, local planning authorities should apply the following principles...* *if significant harm to biodiversity resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused;* *development whose primary objective is to conserve or enhance biodiversity should be supported, while opportunities to incorporate biodiversity improvements in and around developments should be encouraged, especially where this can secure measurable net gains for biodiversity;* *development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons and a suitable compensation strategy exists."*	NPPF Paragraphs 109 and 118 are addressed in Section 9.9 of this chapter. Essentially these sections detail specific measures for avoiding and mitigating adverse impacts on designated sites and protected/notable habitats or species and the mechanisms by which their success would be monitored.
Planning Practice Guidance (PPG)	Planning Practice Guidance relating to NPPF policies of relevance are included under 'biodiversity and ecosystems' within Natural Environment paragraphs 007 – 023 and 'light pollution' paragraph 007.	PPG – paragraphs 007-023 are addressed in Section 9.9 of this chapter. This section details specific measures for avoiding/offsetting/mitigating adverse impacts on designated sites and protected/notable habitats or species and the mechanisms by which their success would be monitored. Specific measures have been identified in Section 9.9 in relation to light sensitive species such as bats and barn owls.

9.2.4 This chapter has been prepared with reference to DEFRA's published biodiversity strategy for England[50] and consideration has been given to the four main objectives of this strategy. These are:

- a more integrated large-scale approach to conservation on land and at sea;
- putting people at the heart of biodiversity policy;
- reducing environmental pressures; and
- improving our knowledge.

9.2.5 In considering Natural England's scoping response in relation to the Scheme, specific points raised, such as climate change effects on biodiversity, are addressed in the measures outlined in this chapter.

9.2.6 Local planning policies relevant to the scope of potential effects on Ecology and Nature Conservation are outlined in Tables 9-2 and 9-3.

[50] DEFRA, (2011) Biodiversity 2020: A strategy for England's wildlife and ecosystem services

Table 9-2: Relevant Policies within the City of Sunderland Unitary Development Plan

Sunderland City Council	Relevant Paragraph	How the policy has been addressed
City of Sunderland Unitary Development Plan: Saved Policies (March 2007)	**CN18 - Nature Conservation** *"The promotion of the interests of nature conservation will be sought throughout the city; the council will work together with neighbouring authorities and other agencies in regard to aspects affecting the wider area. Areas of nature conservation interest, particularly those of national importance, will be protected and enhanced; measures will include:* *i) The appropriate management of city council owned land;* *ii) Encouraging landowners and occupiers to adopt management regimes sympathetic to nature conservation, especially in wildlife corridors;* *iii) Making provision in development proposals for preservation of habitats or creation of compensatory habitats;* *iv) Seeking opportunities in development proposals or other schemes for new habitat creation on both public and private land;* *v) Improving access and providing interpretation to appropriate sites of wildlife interest; and* *vi) Refusing inappropriate development."* **CN21 - Nature Conservation** *"Development which will adversely affect a designated or proposed local nature reserve, site of nature conservation importance or regionally important geological/ geomorphological site either directly or indirectly will not be permitted unless:* *(I) No alternative site is reasonably available and the benefits of the proposed development would outweigh the regional or local value of the site; or* *(II) Any loss of nature conservation or earth science interest can be fully compensated elsewhere within the site or in its immediate environs through the use of planning conditions and, where appropriate, planning obligations.* *Also, in the case of an LNR, the effects of a proposal will be considered against the need to protect the following:* *(I) The ecological integrity of the LNR* *(II) The contribution the LNR makes to education about or enjoyment of wildlife and nature conservation; and* *(III) The proper management of the LNR".* **CN23 – Wildlife Corridors** *"Within the wildlife corridors as indicated on the proposals map:* *(I) Measures to conserve and improve the environment will be encouraged using suitable designs to overcome any potential user conflicts;* *(II) Development which would adversely affect the continuity of corridors will normally be refused;* *(III) Where, on balance, development is acceptable because of wider plan objectives, appropriate habitat creation measures will be required to minimise its detrimental impact".*	Policies CN18, CN21 and CN23 have been considered in Section 9.9 of this chapter. Specific measures relating to habitat creation and enhancement of designated sites are outlined in Section 9.9 of this chapter. In addition, measures are proposed in Section 9.9 to maintain connectivity of habitat features that act as wildlife corridors. Measures for creating or enhancing priority habitats are illustrated in the Environmental Masterplan.

Table 9-3: Relevant Policies within the South Tyneside Statutory Development Plan

South Tyneside Local Development Framework	Relevant Paragraph	How the policy has been addressed
Core Strategy (June 2007)	**Policy ST2 Sustainable Urban Living** *"High quality in sustainable urban living will be promoted by ensuring that:* *…all new development is encouraged to incorporate biodiversity and geological features at the design stage."*	Policy ST2 is addressed in Section 9.9 of this chapter through proposals that have incorporated in to the design of the Scheme. This is illustrated in the Environmental Masterplan.
	Policy EA3 Biodiversity and Geodiversity *"To optimise conditions for wildlife, implement the Durham Biodiversity Action Plan and tackle habitat fragmentation the council will:*	Policy EA3 has been considered in in Section 9.9 of this chapter. Specific measures relating to priority habitat creation and enhancement of designated

South Tyneside Local Development Framework	Relevant Paragraph	How the policy has been addressed
	A – secure and enhance the integrity of designated sites; *B – maintain, enhance, restore and add to biodiversity and geological conservation interests;* *C - ensure that new development would result in no loss of biodiversity values of the following Priority Habitats:* *i) magnesium limestone grassland;* *ii) coastal sand dunes;* *iii) maritime cliffs and slopes;* *iv) mudflats;* *v) rivers and wetlands;* *vi) species rich neutral grasslands;* *vii) rocky shores;* *D - reduce the fragmentation of, improve or extend existing Priority Habitats;* *E – create new Priority Habitats, especially in the Habitat Creation Zones of:* *i) Cleadon Hills,* *ii) Downhill,* *iii) River Don Valley,* *iv) Wardley Colliery;* *F - protect and strengthen populations of Priority or other protected species;* *G - enhance the biodiversity value of wildlife corridors; and* *H - where appropriate, restrict access and usage in order to conserve an area's biodiversity value".*	sites are outlined in Tables 9-10 and 9-15 in this chapter. Measures for creating or enhancing priority habitats and designated sites, such as Make-Me-Rich Meadow LWS and Elliscope Farm East / Hylton Bridge LWS, are illustrated in the Environmental Masterplan.
Development Management Policies (December 2011)	Policy DM7 Biodiversity and Geodiversity Sites *"We will protect and enhance the important environmental assets of the borough, including part of the most northerly outcrops of magnesium limestone in the country. We will promote and support high quality schemes that enhance nature conservation and management, preserve and restore historic and natural environmental character, and maximise benefits for geological conservation and the enhancement of biodiversity in line with the Durham Biodiversity Action Plan targets.* *All proposals for development:* *A) must ensure that any individual or cumulative detrimental impacts on sites are avoided; and* *B) will only be permitted where they would not adversely affect the integrity, natural character or biodiversity and geodiversity value of:* *i) designated Sites of Special Scientific Interest;* *ii) designated Local Wildlife Sites;* *iii) designated Local Geodiversity Sites;* *iv) designated Local Nature Reserves;* *v) the Cleadon Hills, Boldon Downhill and South Boldon areas of high landscape value and significance;* *vi) Wildlife Corridors; and* *vii) other land that forms part of the borough's strategic green infrastructure; as shown on the Proposals Map.* *Development within or outside these designations will only be approved where the benefits of development clearly outweigh any adverse impact on the site, and any broader impacts on the national network of Sites of Special Scientific Interest. Exceptions will only be made where no reasonable alternatives are available. In such cases, we will use planning conditions and/or planning obligations to mitigate or compensate for the harmful effects of the development, and through good design seek opportunities to incorporate biodiversity and geodiversity features into the development."*	Policy DM7 has been considered in in Section 9.9 of this chapter. Specific measures relating to priority habitat creation and enhancement of designated sites are outlined in Tables 9-10 and 9-15 of this chapter. Measures for creating or enhancing priority habitats and designated sites, such as Make-Me-Rich Meadow LWS and Elliscope Farm East / Hylton Bridge LWS, are illustrated on the Environmental Masterplan.

9.3 Assessment methodology

9.3.1 Information on baseline conditions for ecology and nature conservation was obtained through a desk-based study and a suite of field surveys.

Study area

9.3.2 The definition of the study area took account of the Scheme and any temporary construction areas that may be required, as detailed in Chapter 2 of this ES. The study area for the desk-based study was a 2 km radius from the extents of the Scheme DCO boundary for species records and non-statutory designated sites. International and European designated sites were identified over a wider study area (generally a 5 km buffer or 30 km to identify European designations where bats are the qualifying feature).

9.3.3 The spatial extent of each field survey was defined in accordance with guidance published in the DMRB or other recommended specialist survey techniques/good practice documentation (CIEEM) and varied according to the nature of the habitats or species concerned. The surveys were undertaken in accordance with recognised published survey methodologies; including Natural England standing advice where applicable (refer to the technical reports in Appendix 9.1 for details).

Desk study

9.3.4 The desk-based study involved reviewing reports from previous data gathering and surveys at earlier stages of the development of the A19 Downhill Lane and nearby A19/A184 Testo's junction improvement scheme, since 2006, and reviewing historic records of species and habitats and of sites designated for their nature conservation importance at international, national and local levels.

9.3.5 Information was obtained from a range of sources including online resources, and through consultation with relevant statutory and non-statutory bodies.

9.3.6 The following online sources were used to inform the desk-based assessment of the proposals.

- National Biodiversity Network (NBN) - https://data.nbn.org.uk/;
- Multi-Agency Geographic Information for the Countryside (MAGIC) - http://www.magic.gov.uk/; and
- Durham Biodiversity Action Plan - http://www.durhambiodiversity.org.uk/biodiversity-action-plan.

9.3.7 In addition, data gathering was undertaken with the following organisations in 2016 regarding existing records of any designated sites, protected species or other resources of nature conservation interest within the 2 km study area:

- the Environmental Records Information Centre North East (ERIC North East);
- Durham County Badger Group;
- Durham Bat Group;
- Durham Bird Club;
- Durham Local RSPB group; and
- North East Reptile and Amphibian Group (NERAG).

9.3.8 ERIC North East, provided historical protected species records from their database within a 2 km buffer from the construction boundary of the Scheme to account for the permanent and temporary footprint of the proposals. In general, for the purposes of this assessment, and to inform the scope of baseline surveys, only records up to 10 years old were considered relevant and suitably contemporaneous.

9.3.9 The NERAG, the Durham County Badger Group, the Durham Wildlife Trust, South Tyneside Council and Durham Bat Group all provided species records or confirmed that all their records had been passed to the ERIC North East. The Durham Local RSPB group did not hold records and the Durham Bird Club did not respond to a data request.

9.3.10 In 2017 the desk study records were obtained from the following organisations:

- ERIC North East;
- Durham County Badger Group; and
- Durham Bat Group.

9.3.11 The baseline presented in this chapter reflects all additional desk study records that have been received.

Field survey

9.3.12 The presence or likely presence of a habitat and/or species in the study area was identified by desk study (as described above), consultation and walkover survey. Field surveys (mostly undertaken in 2016 unless otherwise stated) were undertaken for the habitats and species likely to be present in the survey area and affected by the Scheme, as follows:

- Habitats (including an Extended Phase 1 Habitat Survey - validation surveys undertaken in 2017 and 2018 to identify any changes to habitat types since the previous survey undertaken in 2016)[51];
- Amphibians (including great crested newt (GCN) surveys);
- Breeding birds (surveys undertaken in 2014 – report updated to reflect changes to conservation status of UK birds)[52];
- Wintering birds (surveys undertaken in 2014 / 2015 – report updated to reflect changes to conservation status of UK birds)[53];
- Barn owl;
- Badger;
- Bats;
- Water vole; and

[51] The validation survey undertaken in 2017 was considered sufficient to inform the assessment when reviewed in conjunction with baseline data for the Survey Area collated since 2007 to date in relation to the Scheme. In addition, the desk study data has been updated to identify any additional potential changes to the baseline.

[52] The baseline breeding bird data gathered in 2014 is considered sufficient for this assessment based on updated habitat mapping and species records obtained in 2017.

[53] The baseline wintering bird data gathered in 2014 is considered sufficient for this study based on updated habitat mapping and species records obtained in 2017.

- Otter.

9.3.13 The field surveys are described in full in the stand-alone survey reports presented in Appendix 9.1. In general, the survey area for the above features was considered to be a 500 m buffer from the Scheme. Survey reports provided in Appendix 9.1 cover a survey area that includes a combined buffer of 500 m from both the Downhill Lane junction and Testo's junction improvement schemes. The baseline information contained in this chapter has been updated to be specific to the Scheme.

9.3.14 Specific field surveys were not carried out for the following species/species groups: reptiles, brown hare, hedgehog, harvest mouse, deer, polecat, dormouse, freshwater fish and white-clawed crayfish. This is due to the low likelihood of their presence, based on the desk-based information obtained in 2017 and field surveys undertaken by Jacobs from 2007 to 2016, and therefore a low chance of these species being affected by the Scheme. These species were not considered further in the assessment. However, it is important to note that the proposed mitigation and enhancement measures that would be implemented as part of the Scheme to address specific adverse effects on other species would also benefit biodiversity in general.

9.3.15 The range of surveys to be undertaken, their spatial and temporal scope and the survey methods to be applied were consulted upon with Natural England, Durham Wildlife Trust and the Local Planning Authority as part of the formal EIA scoping process.

Ecological impact assessment method

9.3.16 The method used for ecological impact assessment is in line with the most recently published Highways England guidance[54], with reference to the existing Chartered Institute of Ecology and Environmental Management (CIEEM) guidelines[55]. These methods conform to the principles of the generic assessment methods described in Chapter 5 of this ES, but vary from them in detail.

9.3.17 The ecological impact assessment comprises six key stages:

- description of baseline conditions (i.e. the ecology of the study area);
- valuation of each identified important ecological feature;
- identification of scheme related activities that may affect important ecological features at the value threshold identified in the foregoing tasks;
- characterisation of ecological impacts and their effects, taking account of likelihood, reversibility, duration, timing and frequency;
- identification of appropriate mitigation measures and enhancement measures, where appropriate; and
- determination of the significance of the residual effects on each important feature, after mitigation is taken into account, at the following times: during the construction period; immediately after the Scheme opens; and in a 'future operational year', after the mitigation works have matured.

9.3.18 For the purposes of this impact assessment, the following dates have been assumed (refer to Chapter 2 of this ES):

- construction to start in 2020;
- the Scheme to open in 2021; and
- the future operational year is 2036 (15 years after the Scheme opens).

9.3.19 The construction works would be undertaken as a rolling programme of activity over a period of approximately 18 months. Subject to a Development Consent Order being granted, construction work could start in 2020 and complete in 2021.

9.3.20 Detailed Impact Assessment Tables (derived from IAN 130/10) are provided in Appendix 9.4 and summarised in Table 9-17 in this chapter. The assessment has been completed for each important ecological feature for construction effects (where relevant with reference to the end of construction in the year of opening, 2021) and for operational effects (with reference to year 2036, when mitigation measures would be mature). It has also been assumed that Testo's scheme's construction phase and operational opening and future years would broadly align with the Scheme's programme, while IAMP One would be fully built and operational before the Scheme starts construction. Therefore, these scenarios have been incorporated within the respective future construction phase and operational opening and future year baselines for the assessment of construction and operational effects.

9.3.21 The importance of the ecological and nature conservation features is identified by using a framework linked to a geographical scale at which the importance of the feature has been identified (i.e. international, national, regional, county, local or at site level). This allows the inherent importance of a species or habitat to be assessed without the influence afforded to it by its legal protection or the level of any potential impact on it. This process requires professional judgement and consultation with the appropriate statutory environmental bodies (in line with DMRB guidance; as supplemented by IAN 130/10).

9.3.22 Appendix 9.3 sets out the detailed approach to ecological feature valuation and the assessment of the potential significant impacts on the nature conservation features/resources in the Study Area.

Mitigation measures and the significance of effects

9.3.23 This chapter describes the impacts of the Scheme in the first instance without application of any mitigation measures that are not an inherent part of the Scheme's design. This is followed by the identification of appropriate mitigation measures and an assessment of the significance of the effects taking those mitigation measures into account. Significant effects are qualified with reference to an appropriate geographic scale. For example, a significant effect on a Site of Special Scientific Interest (SSSI) is often of national significance (not because of the designation, but because the SSSI is likely to contain nature conservation features of importance on a national scale). However, effects may be significant at a smaller geographical scale than that at which the feature has been assessed to be important.

9.3.24 When seeking mitigation or compensation solutions, efforts should be consistent with the geographical scale at which an effect is significant. For example, mitigation and compensation for effects on a species population significant at a county scale should achieve no net loss of the population at a county scale. The relative geographical scale at which the effect is significant will have a bearing on the required outcome which should be achieved.

[54] DMRB, Volume 11, Section 3, Part 4 'Ecology and Nature Conservation' (June 1993), as amended by Interim Advice Note 130/10, 'Ecology and Nature Conservation: Criteria for Impact Assessment', September 2010.

[55] CIEEM (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition. Chartered Institute of Ecology and Environmental Management, Winchester.

9.3.25 An overall assessment of the effect of the Scheme on ecology and nature conservation as a whole is given using terminology specified in IAN 130/10.

9.3.26 It is important to note that the Scheme design incorporates mitigation in the form of design changes that have been made to avoid or reduce potential ecological (and other environmental) impacts that were identified early in the assessment process. Section 9.9 of this chapter provides more information on the approach to mitigation, and types of mitigation and enhancement measures.

9.4 Assessment assumptions and limitations

9.4.1 Any field survey limitations are stated in the individual technical reports (reproduced in Appendix 9.1). However, none of the field survey limitations were considered to present a barrier to the understanding of the use of the survey area by the species / species groups in question.

9.4.2 Some details of the permanent design and the temporary construction works may be subject to change at the detailed design stage. However, these outstanding design details would be minor and would not result in significant adverse ecological impacts, as the potential minor design changes under consideration would tend to reduce further and/or avoid some of the impacts identified in this chapter, rather than to increase them. That being the case, the impact assessment has taken account of the worst-case scenarios, and mitigation measures are included within the outline design accordingly.

9.4.3 Ecological information on species and habitats presented in this chapter relates to the baseline conditions as they were at the time of each of the surveys undertaken by Jacobs in 2016 or 2018. The breeding and wintering bird surveys were undertaken in 2014 with the baseline reports updated to reflect any changes to conservation status of UK birds in the intervening years up to the present. Baseline breeding/wintering bird data gathered in 2014 is considered sufficient for this assessment based on updated habitat mapping and species records obtained in 2017 and 2018.

9.4.4 The distribution and composition of habitats and species can change over time; based on the habitat types and the species recorded in the study area/survey area no significant change is anticipated to the current baseline conditions before the construction of the Scheme. Therefore, it was assumed that sufficient information had been gathered upon which a robust assessment of potential effects could be undertaken for the construction year (2020) and the operational year (2021) of the Scheme. It has also been assumed that IAMP One will be fully built by January 2020, thus is treated as fully operational within the future baseline for the assessment of construction and operational impacts. Under IAMP One, Elliscope Farm will cease to be used for commercial or residential purposes by 2020, but the buildings would be retained and deemed to be empty in 2021 then converted to Estate offices by 2036. In addition, the future baseline was assumed to reflect that the Testo's scheme is under construction in 2020 and opening in 2021, with a future year of 2036 (i.e. same as for the Scheme, thereby presenting a worst-case assessment scenario).

9.4.5 Ecological mitigation measures are described in this chapter and shown in the Environmental Masterplan (EMP). The detailed design of some aspects of mitigation (such as habitat creation) would be developed during the detailed design phase to take account of any ecological status changes at the pre-construction stage. It was acknowledged that there would be a transitional period between the implementation of some mitigation measures and their reaching maturity, as with tree and hedgerow planting. However, this was anticipated to be short-term with the planting rapidly offering wildlife connectivity and biodiversity benefits. Additionally, the short-term delay in maturation was not considered significant due to the existing generally low quality habitat in the area.

9.5 Baseline conditions

Statutory designated nature conservation sites

9.5.1 All statutory designated sites within the 2 km Study Area are shown on Figure 9.1.

9.5.2 There are two Sites of Special Scientific Interest (SSSIs) located within 2 km of the Scheme. Specifically, Hylton Castle Cutting SSSI which is located 1470 m east of the proposals and Wear River Bank SSSI is located 1880 m south of the Scheme.

9.5.3 There are two Local Nature Reserves (LNRs) located within 2 km of the Scheme. Specifically, Hylton Dene LNR 1075 m east of the Scheme and Barmston Pond LNR 1994 m west of the Scheme.

9.5.4 The potential need for a Habitats Regulations Assessment (HRA) has been considered separately from the EIA. HRA addresses the potential for 'likely significant effects' on sites designated for their nature conservation importance at European or international level, collectively known as Natura 2000 sites[56]. The details of this consideration are set out in Appendix 1.4 of the ES ('Other Regulatory Regimes') and separately in DCO application document reference TR010024/APP/6.10 'Habitats Regulations Assessment'.

9.5.5 The conclusion reached was that no screening for potential effects on Natura 2000 sites was necessary as there was no potential for the Scheme to have significant effects on any Natura 2000 site; a conclusion confirmed by Natural England. In general, this is based on Natura 2000 sites being over 2 km from the nearest extent of the Scheme (approx. 6.5 km). In addition, there were no Special Areas of Conservation (SAC) within 30 km of the Scheme that noted bats as one of the qualifying interests. Therefore, there is no pathway for adverse significant effects to occur as part of the Scheme.

9.5.6 Taking this into account the assessment of potential significant effects on Natura 2000 sites was not considered further in this chapter.

Non-statutory designated nature conservation sites

9.5.7 All non-statutory designated sites within 2 km of the Scheme are shown on Figure 9.1.

9.5.8 There is a total of 21 Local Wildlife Sites (LWSs) located within 2 km of the Scheme that span two local authorities (South Tyneside Council and Sunderland City Council). Each site is listed in Table 9-4 with a brief summary of its designated features and its distance to the Scheme.

[56] i.e. sites designated under the international Ramsar Convention, or sites designated under European Union Habitats Directive and Birds Directive, including Special Areas of Conservation and Special Protection Areas.

Table 9-4: Local Wildlife Sites

Site Name	Description / Reason for Designation	Distance from the proposals
Make-Me-Rich Meadow	The site is made up of an area of species-rich, damp, unimproved grassland together with a section of the River Don between the A19 and the A184. The meadow was formerly grazed but has not been intensively managed for some years.	24 m
Elliscope Farm East / Hylton Bridge	The site consists of two small woodlands and the linking section of the River Don, leading east from Hylton Bridge Farm. Elliscope Farm East is a linear, mature broad-leaved plantation.	120 m
Downhill Old Quarry	Downhill is a magnesian limestone 'outlier' which forms a prominent domed hill overlooking the low lying open land north of the Nissan Plant. Downhill Old Quarry LWS is a former quarry base and paddock. The site has a range of species-rich grassland types grading from magnesian limestone grassland communities through to more neutral grasslands.	320 m
Downhill Meadows	The site incorporates large areas of calcareous grassland with areas of tree planting, rank neutral grassland and small amounts of scattered scrub.	470 m
River Don East House	The site consists of a section of the River Don between East House Farm and Hylton Bridge Farm. This stretch of the River Don has mostly unmodified riverbank with features such as meanders, eroding earth cliffs, riffles and pools, and dead wood.	820 m
Mount Pleasant Marsh	Located south-east of Testo's junction, comprising open water, reed beds, marshy grassland scrub and woodland habitat (also hosting West Boldon Environmental Education Centre).	910 m
Boldon Lake	The site comprises a man-made lake (the largest body of open fresh water in the borough) adjacent to the Quadrus building in West Boldon, together with species-rich damp grassland. The lake was created in 1986 and has developed substantial areas of marginal vegetation including: large stands of reedmace and common reed, and an area dominated by hard rush.	950 m
River Don North Road	The site consists of a section of the River Don between North Road and Newcastle Road. In this stretch, the River Don has mostly unmodified riverbank with features such as meanders, eroding earth cliffs, riffles and pools, and dead wood.	960 m
Tilesheds	A varied site with a wooded area, wetlands and an area of open magnesian limestone grassland. Covers part of the same area as Hylton Dene LNR.	970 m
Hylton Castle Grassland	Hylton Castle Grassland displays magnesian limestone grassland and scrub adjacent to geological exposures of Ford Formation (reef fascias) at Hylton Castle Cutting SSSI.	1150 m
Hylton Dene	A mosaic of broad-leaved woodland, calcareous grassland and marshy grassland.	1300 m
Turner's Hill	Turner's Hill is an area of grassland on a small circular hillock within Boldon Golf Course, south-east of Boldon Cemetery.	1330 m
Strother House Farm	The site is situated to the north of Strother House Farm. It comprises an area of marshy ground approximately 0.3 ha in extent, bounded by a ditch to the south and east.	1400 m
River Don West Boldon	This is a linear site and covers the banks of the River Don as it flows through West Boldon between North Road and New Road. At this location, the River Don has mostly unmodified riverbank with features such as meanders, eroding earth cliffs, riffles and pools, and dead wood.	1490 m
Peepy Plantation	A mature plantation with interesting woodland flora and fauna is also notable for invertebrate assemblage and woodland birds.	1550 m
Hylton Plantation	A mixed plantation dominated by coniferous trees with scattered broad-leaved trees. Trees and scrub which provide shelter for a thriving woodland bird community.	1600 m
Black Plantation	Black Plantation is a small, rectangular area of mature even-aged, broadleaved plantation woodland lying to the south of West Boldon.	1670 m
Calf Close Burn	Calf Close Burn is a linear site following the course of a small burn as it flows north across agricultural land passing between Fellgate and Headworth.	1700 m

Site Name	Description / Reason for Designation	Distance from the proposals
Barons Quay Wood	Mixed deciduous woodland and hawthorn scrub are of particular botanical interest, with extensive areas of rough grassland of high nature conservation value. An important and integral part of the salt marsh complex along the River Wear.	1785 m
Severn Houses	The site includes an elongated subsidence pond located within old ridge and furrow pasture locally dominated by gorse scrub, and particularly notable for a population of GCN which is present together with other amphibians (smooth newt and common frog).	1846 m
Barmston Pond	A large subsidence pond located in grassland with extensive rush dominated marshy border and diverse submerged aquatic vegetation. The pond is noted for attracting migrant wading birds, while its population of GCNs is also of particular feature of interest.	1994 m

9.5.9 All LWSs listed in Table 9-4 are considered to be of **County Importance (Medium Value)** for nature conservation.

Habitats

9.5.10 Habitats recorded within the study area comprised the following (JNCC alphanumeric reference codes in parenthesis):

- Arable (J1.1);
- Amenity grassland (J1.2);
- Bare ground (J4);
- Broad-leaved semi-natural woodland (A1.1);
- Broad-leaved plantation woodland (A1.1.2);
- Dense/continuous scrub (A2.1);
- Dry ditch (J2.6);
- Fence (J2.4);
- Improved Grassland (B.4);
- Marshy grassland (B5);
- Mixed plantation woodland (A1.3.2);
- Native species-poor intact hedge (J2.1.2);
- Native species-rich intact hedge (J2.1.1);
- Neutral semi-improved grassland (B2.2);
- Poor semi-improved grassland (B6);
- Running water (G2);
- Scattered broad-leaved trees (A3.1);
- Scattered scrub (A2.2);
- Species-poor defunct hedge (J2.2.2);
- Species-poor hedge and trees (J2.3.2);
- Standing water (G1)
- Swamp (F1); and
- Tall ruderal (C3.1).

9.5.11 Habitat types recorded during the 2017 validation survey are mapped on Figure 9.2, in Volume 2 of this ES. Detailed descriptions of each habitat type and target notes can be found in the Extended Phase 1 Habitat report (Document No. B0140301/OD/198, Jacobs, 2017) included in Appendix 9.1 within Volume 3 of this ES.

Resource evaluation

9.5.12 Table 9-5 sets out the nature conservation importance of habitat types relevant to the assessment recorded in the survey area with reference to published list of national and local priority habitats on Section 41 of the NERC Act 2006 or Durham BAP.

Table 9-5: Habitats Summary

Habitat	Habitats of Principal Importance (HoPI) - Section 41. NERC Act 2006	Durham Local BAP?	Nature Conservation Importance	
			Geographic Scale	Value
Arable (J1.1)	✓ Arable Field Margins HoPI.	-	Local – very few field margins or headlands in survey area.	Low
Amenity grassland (J1.2)	-	-	Local	Low
Bare ground (J4)	-	-	Less than Local	Negligible
Broad-leaved semi-natural woodland (A1.1)	✓ Lowland Mixed Deciduous Woodland HoPI.	✓ Woodland and Scrub Action Plan.	Regional	Medium
Broad-leaved plantation woodland (A1.1.2)	-	✓ Woodland and Scrub Action Plan.	County	Medium

Habitat	Habitats of Principal Importance (HoPI) - Section 41. NERC Act 2006	Durham Local BAP?	Nature Conservation Importance	
			Geographic Scale	Value
Dense/ continuous scrub (A2.1)	-	-	Local	Low
Dry ditch (J2.6)	-	-	Local	Low
Improved Grassland (B.4)	-	-	Local	Low
Marshy grassland (B5)	-	✓ Lowland Meadows and Pasture Action Plan.	County	Medium
Mixed plantation woodland (A1.3.2)	-	-	Local	Low
Native species-poor intact hedge (J2.1.2)	✓ Hedgerow HoPI.	✓ Native Hedgerows Action Plan.	County	Medium
Native species-rich intact hedge (J2.1.1)	✓ Hedgerow HoPI.	✓ Native Hedgerows Action Plan.	County	Medium
Neutral semi-improved grassland (B2.2)	-	✓ Lowland Meadows and Pasture Action Plan.	County	Medium
Poor semi-improved grassland (B6)	-	-	County	Medium
Running water (G2)	✓ Rivers HoPI.	✓ Rivers and Streams Action Plan.	County	Medium
Scattered broad-leaved trees (A3.1)	-	-	Local	Low
Scattered scrub (A2.2)	-	-	Local	Low
Species-poor defunct hedge (J2.2.2)	✓ Hedgerows HoPI.	✓ Native Hedgerows Action Plan	Local	Low
Species-poor hedge and trees (J2.3.2)	✓ Hedgerows HoPI.	✓ Native Hedgerows Action Plan	County	Medium
Standing water (G1)	-	-	Less than local	Negligible
Swamp (F1)	-	✓ Lowland Fen Action Plan – this habitat type does not occur in isolation in the survey area but is mainly associated with ponds.	County	Medium
Tall ruderal (C3.1)	-	-	Less than Local	Negligible

Important hedgerows

9.5.13 The hedgerows within the survey area were surveyed to determine if any met the criteria to qualify as 'ecologically important' under The Hedgerows Regulations 1997 wildlife criteria[57] (HMSO 1997). This involved identifying woody species and ground flora and other significant features that form part of the criteria (i.e. connectivity, ditches and banks etc.).

9.5.14 No 'ecologically important' hedgerows were identified during surveys undertaken as part of this Scheme. Native, species-rich hedgerows were identified north of the A120 Washington Road, but these would not be directly affected by the Scheme so were excluded from further assessment in this chapter.

Amphibians

9.5.15 The details of the amphibian surveys undertaken in the survey area (i.e. methodology, pond locations and detailed survey results) are provided in the Great Crested Newt Environmental DNA and Habitat Suitability Index Survey Report (document no. B0140301/OD/196, Jacobs,

[57] The Hedgerows Regulations 1997 - http://www.legislation.gov.uk/uksi/1997/1160/contents/made

2017) included in Appendix 9.1 of this ES. The following paragraphs summarise the findings from the amphibian report.

Desk study

9.5.16 Records received from ERIC North East covering the past ten years, and from amphibian surveys undertaken for the IAMP project in 2016, revealed that the following amphibian species have been recorded in the 2 km study area:

- Great crested newt (GCN) (*Triturus cristatus*);
- Palmate newt (*Lissotriton helveticus*);
- Smooth newt (*Lissotriton vulgaris*);
- Common toad (*Bufo bufo*); and
- Common frog (*Rana temporaria*).

9.5.17 ERIC North East also provided records for a non-native amphibian species, Alpine newt (*Ichthyosaura alpestris),* in the study area.

9.5.18 For the purposes of this assessment it was assumed that all areas of open water within the survey area had the potential to support GCN populations.

Field survey

9.5.19 Amphibian surveys were undertaken by Jacobs in 2014, in accordance with the standards set out in the 'Great Crested Newt Mitigation Guidelines'[58], to ascertain GCN presence/absence at an earlier stage of the Scheme. These surveys did not record the presence of GCN in any of the ponds within the survey area. The combination of this field data and the desk study results collated at this time indicated that GCN were likely to be absent from the survey area. These results were consistent with surveys previously carried out by others on behalf of South Tyneside Council, not connected with this Scheme, in 2006. Other amphibian species recorded in 2014 included smooth newt, common toad and common frog. Of note was the presence of common toad which is listed as a 'Species of Principal Importance' (SoPI) under Section 41 of the NERC Act 2006.

9.5.20 In 2016, GCN environmental DNA (eDNA) sampling was undertaken to provide an update as to whether GCN were present or absent from ponds within the survey area. A negative result was returned for all ponds sampled, indicating that GCN are likely to be absent from the survey area, and GCN are therefore not discussed further in this assessment.

Resource evaluation

9.5.21 In the main, the survey area is characterised by an intensive arable/pastoral landscape with isolated patches of suitable aquatic/terrestrial habitat for amphibians. Suitable habitat in the survey area generally lacks connectivity to other areas of habitat, due to significant barriers such as: roads (A19 and A1290) and industrial/residential developments.

9.5.22 Common toad have been recorded in the survey area and this species is listed as a SoPI under Section 41 of the NERC Act 2006. The NERC Act places a duty of care on public authorities to protect important habitats and species, and to actively seek opportunities to enhance biodiversity through development proposals, where appropriate.

9.5.23 Taking into consideration the range and distribution of amphibian species recorded in the survey area, amphibians were assessed as being of **Local Importance (Low Value).**

Breeding birds

9.5.24 Details of the breeding bird survey can be found in the Breeding Bird Report included in Appendix 9.1 of this ES (document no. B0140301/OD/200, Jacobs 2017). The breeding bird survey focused on land within 500 m of the Scheme. Large industrial areas of land and residential areas were not included in the survey as these areas were considered to be unlikely to support a diverse range of bird species, given the lack of suitable habitat, and the Scheme being not anticipated to directly affect these excluded areas.

Desk study

9.5.25 Previous desk studies carried out in 2007 and 2014 were updated with new data searches in November 2017. The desk study identified records of a total of 105 bird species within the 2 km study area. These records included 62 species listed on at least one of the following: Red List (25), Amber UK (36), NERC Act 2006 (SoPI) (18), species specifically listed on Schedule 1 of the WCA 1981 (as amended) (10). The records provided by ERIC North East were not supplied with a complete grid reference or a specific record date; however, general location information was given, with Downhill Lane junction itself being listed as one of the locations. On this basis, species recorded within, or in the near vicinity of, the Scheme have been determined. These records were not date specific, so these records were not necessarily specific to the breeding period and may include wintering birds.

Field survey

9.5.26 Breeding bird surveys were undertaken within the survey area between April and June 2014. The survey methodology was based on the breeding bird survey (BBS) methodology devised jointly by British Trust for Ornithology (BTO), the Royal Society for the Protection of Birds (RSPB) and the Joint Nature Conservancy Council (JNCC) (Gilbert et al 1998). This methodology requires three visits to be made between late March and early July.

9.5.27 The three survey visits took place on the following dates under suitable weather conditions:

- Site Visit 1 – 21st, 23rd and 24th April 2014;
- Site Visit 2 – 13th, 14th and 15th May 2014; and
- Site Visit 3 – 10th, 11th and 12th June 2014.

9.5.28 The 2014 breeding bird surveys undertaken by Jacobs in 2014 identified 102 individual species, with the following species of conservation interest:

- 2 species listed under Schedule 1 (Part 1) of the WCA (as amended) – barn owl (*Tyto alba*) and kingfisher (*Alcedo atthis*);
- 13 SoPI, Section 41, NERC Act 2006;
- 8 species on the Red List of Birds of Conservation Concern (BoCC) 4 (2015); and
- 11 species on the Amber List of the BoCC 4 (2015).

9.5.29 Three species classified in the Amber list during the 2014 breeding bird surveys were moved from Amber to Green listed according to the BoCC 4 (2015). Specifically, these were: barn owl,

[58] English Nature (2001): Great Crested Newt Mitigation Guidelines.

barn swallow (*Hirundo rustica*) and whitethroat (*Sylvia communis*). These changes were reflected in the baseline report in Appendix 9.1.

9.5.30 Given their sensitivity to disturbance and impacts from direct mortality due to road proposals, barn owl are assessed separately in this chapter.

9.5.31 It should be noted that the bird species recorded can be listed on one or more of the relevant schedules of the regulatory frameworks.

Resource evaluation

9.5.32 The majority of the bird species recorded during the breeding bird surveys were those commonly associated with farmland (notably skylark and lapwing). This reflects the dominant habitat type across the survey area of open arable and pastoral farmland, with hedgerows and ditches as field margins. Isolated habitat features occur in the survey area, such as: Make-Me-Rich Meadow LWS and Elliscope Farm East/ Hylton Bridge LWS. These sites provide alternative nesting and foraging resources for species that prefer scrub/woodland habitats. Kingfishers were noted along the River Don and are likely breeders in the survey area.

9.5.33 It should be noted that the habitats in the survey area are subject to a degree of disturbance from the existing road network (notably the A19 and A1290) and human interference in areas of public access that would affect the range and abundance of species recorded.

9.5.34 Based on habitats present and the range of species recorded, the survey area was assessed as being of **County Importance (Medium Value)** for breeding birds.

Wintering birds

9.5.35 Details of the wintering bird survey can be found in the Wintering Bird Report (Document No. B0140300/OD/201, Jacobs 2017) included in Appendix 9.1 of this ES. As for breeding birds, large industrial areas of land and residential areas were not included in the survey.

Desk study

9.5.36 Previous desk studies carried out in 2007 and 2014 were updated with new data searches in November 2017. The bird records provided during the desk study were not date specific; therefore, an analysis or differentiation could not be made between wintering and breeding bird data. Taking this into consideration, the records detailed in paragraph 9.5.25 were considered to be relevant to the wintering bird baseline and representative of the species that would be in the study area in winter as well as in the summer breeding period.

Field survey

9.5.37 The survey methodology was based on the BTO's Wintering Farmland Bird Survey methodology and generic wintering bird monitoring methods (Gilbert et al., 1998). All surveys were undertaken during suitable weather conditions, with each visit being carried out in daylight hours between 8 am and 4 pm. Starting points for the walked transects and route direction were varied throughout the visits, to reduce survey bias.

9.5.38 Previous field surveys had been carried out in 2007. Information was also drawn from the field surveys carried out for the neighbouring IAMP development in 2014. Field surveys were undertaken on the following dates:

- Survey 1 – 28th to 30th October 2014;
- Survey 2 – 24th to 26th November 2014;
- Survey 3 – 8th to 9th December 2014; and
- Survey 4 – 8th to 9th January 2015.

9.5.39 The 2014-15 wintering bird surveys undertaken by Jacobs identified the following species of conservation interest:

- 2 species listed on Schedule 1 (Part 1) of the WCA (as amended);
- 11 'SoPI', Section 41, NERC Act 2006;
- 13 species on the Red List of BoCC 4 (2015);
- 11 species on the Amber List of the BoCC 4 (2015);
- 8 Durham Biodiversity Action Plan Species; and
- 22 common undesignated species.

9.5.40 Two of the Amber species identified during the wintering bird surveys in 2014-2015 were moved from Amber to Red in the updated BoCC 4 (2015) – grey wagtail (*Motacilla cinerea*) and woodcock (*Scolopax rusticola*); and one species moved from Green to Amber – mute swan (*Cygnus olor*).

9.5.41 It should be noted that the bird species recorded can be listed on one or more of the relevant schedules of the regulatory frameworks.

9.5.42 Large flocks of between 80 to 100 lapwings were identified in flight during the wintering bird surveys and observed utilising recently cultivated farmland in the north-west of the survey area. In addition, lapwings were observed in significant numbers within the confines of West House Farm land holdings (western section of the survey area). The presence of this species is also notable under the Section 41 of the NERC Act 2006 and Durham BAP. However, sightings only occurred during Survey 1 (in October 2014) and could be sporadic occurrences related to the availability of food in recently cultivated farmland.

9.5.43 Over-wintering migratory fieldfare and redwing were widespread in the survey area and their occurrence was predominantly related to less intensively managed hedgerows, with berry producing scrub present as a food resource. Both species are listed under Schedule 1 (Part 1) of the WCA 1981.

9.5.44 It should be noted that the habitats in the survey area are subject to a degree of disturbance from the existing road network (notably the A19 and A1290) and human interference in areas of public access (i.e. Boldon Lake LWS) that would affect the range and abundance of species recorded.

Resource evaluation

9.5.45 The majority of the bird species recorded during the wintering bird surveys were those commonly associated with farmland (most notably lapwing and winter migrants such as: fieldfare and redwing). This reflects the dominant habitat type across the survey area of open arable and pastoral farmland, with hedgerows and ditches as field margins.

9.5.46 Based on habitats present and the range of species recorded the survey area was assessed as being of **County Importance (Medium Value)** for wintering birds.

Barn Owl

9.5.47 Barn owls are subject to persecution (mainly through illegal egg collection or the falconry trade), so the desk study and field survey records are confidential. The following section provides baseline details for barn owl collated as part of this Scheme, but specific location details are omitted.

9.5.48 Details of barn owl activity can be found in the confidential Barn Owl Survey Report (document no. B0140300/OD/197, Jacobs 2017). Due to the confidential nature of some of the information in the report, it is not included in Appendix 9.1 of this ES but can be made available to those with a bona-fide need to see the information.

Desk study

9.5.49 Records received from ERIC North East from the past ten years identified 14 barn owl records within 5 km of the Scheme from between 2009 and 2016.

9.5.50 A desk-based assessment of habitat suitability for barn owl was undertaken in accordance with the standard methodology[59]; the assessment indicated that optimal 'type 1' barn owl habitat was widely distributed across the survey area but limited in area to 21.40 ha or 3.85%. Sub-optimal 'type 2' grassland covered an area of approximately 23.85 ha, or 4.3% of the survey area. The remaining 91.85% of the survey area was 'type 3' habitat, which is low-value habitat for barn owls.

Field survey

9.5.51 Two building groups were identified, during the desk study review, as having potential to support barn owl within 500 m of the Scheme and a further building was identified as having potential by a surveyor during previous bat roost potential surveys undertaken by Jacobs in 2016.

9.5.52 These buildings were subject to full external and internal surveys for signs of roosting and/or breeding barn owls. Tree inspections were also undertaken on four trees within the survey area. Where the presence of barn owl was confirmed, each building or tree was categorised as either a breeding site, regular roost site or an occasional roost.

9.5.53 Evidence of barn owl (May 2016) was identified within eight buildings across two sites in the survey area. Both sites were considered to contain regular roosts (and potential unconfirmed breeding sites). The status of these locations was verified by a visit in 2018.

Resource evaluation

9.5.54 Barn owls can reach high densities within arable landscapes (Barn Owl Trust, 2012). The density is mainly dependent on the presence of rough grassland habitat (i.e. field margins, headlands, and ditch banks) that may support main prey items (e.g. field voles). In predominately arable landscapes, it is estimated that, in the breeding season, barn owls require the equivalent of 17 to 26 hectares of suitable foraging habitat, such as rough grassland similar to that found within the study area in small isolated patches (Shawyer, 2011).

9.5.55 The survey area provides a combination of mainly arable fields and isolated small patches of rough grassland, as such it is likely to represent a relatively small proportion of the total foraging resource required to support barn owls. This assumption is supported by the lack of barn owl foraging in the study area.

9.5.56 Given the presence of 5 regular roosts and 3 potential nesting sites within the farm buildings, the survey area was considered to have **County Importance (Medium Value)** for barn owl.

Badger

9.5.57 Details of the badger survey are set out in the confidential Badger Report (Document No. B0140300/OD/192, Jacobs 2016). Due to the confidential nature of some of the information in the report, it is not included in Appendix 9.1 of this ES but can be made available to those with a bona-fide need to see the information. The badger survey focused on land within 500 m of the Scheme.

Desk study

9.5.58 The ERIC North East and Durham Badger Group desk study undertaken in 2017 and results of badger surveys undertaken for the IAMP development in 2014 identified 18 badger records that ranged from 0.84 km to 1.97 km from the nearest extent of the Scheme. These records dated from 2009-2014.

Field survey

9.5.59 Badger surveys were undertaken between the 3rd and 6th October 2016. The surveys were undertaken using the standard methodologies established for badger surveys (DMRB, 2001) and discussed by Neal and Cheeseman (1996)[60].

9.5.60 All field boundaries, watercourses, paths and other linear features within the study area were walked in order to locate badger field signs. In addition, all areas of woodland, scrub and embankments were actively searched. The field signs searched for included badger setts, badger pathways, latrines, faeces, hairs (often caught on barbed wire or branches), push-throughs (often under fences or branches), footprints and evidence of foraging (for example snuffle holes).

9.5.61 The area was surveyed in a systematic manner to record any badger field signs and not only those concentrated on boundary features.

9.5.62 There were no definitive badger field signs (including setts) recorded in the survey area during the surveys undertaken in 2016.

9.5.63 The results from the 2016 desk-based searches and field surveys are unchanged from those obtained by Jacobs in 2014, during previous studies done at earlier stages of the Scheme. The results of the surveys undertaken in 2016 indicated that although suitable foraging habitat was identified, badgers are likely to be absent within the study area. This was verified by a survey in August 2018.

Resource evaluation

9.5.64 No badger setts or other definitive field signs were recorded during the surveys undertaken in 2016. Taking this in to consideration the survey area was assumed to be of **Less Than Local Importance (Negligible Value)** for badger.

9.5.65 Given the lack of badger evidence in the survey area, badgers were scoped out of any further assessment in this ES.

[59] Shawyer, C. R. (2011) Barn Owl *Tyto alba* Survey Methodology and Techniques for use in Ecological Assessment: Developing Best Practice in Survey and Reporting. IEEM,Winchester.

[60] Neal, E and Cheeseman, C (1996) Badgers. Poyser London

Bats

9.5.66 Details of the bat survey can be found in the Bat Roost Potential and Activity Report (Document No. B0140300/OD/191, Jacobs 2017) included in Appendix 9.1 of this ES. The bat survey focused on land within 500 m of the Scheme.

Desk study

9.5.67 The records from ERIC North East and Durham Bat Group revealed 316 records of bats within 5 km of the Scheme from the past ten years. The data included 79 records of bat roosts, comprising: common pipistrelle, soprano pipistrelle, unidentified *Pipistrellus* species, Natterer's bat, whiskered bat / Brandt's bat, brown long-eared bat and unknown bat species. None of the roost records were within the 500 m survey area.

9.5.68 There were no SACs within 30 km of the Scheme that noted bats as one of the qualifying interests.

9.5.69 A habitat quality assessment for bats was conducted in April 2016. It was determined that the habitat composition within the survey area was low quality for bats, based on the parameters set by the Bat Conservation Trust (BCT) guidelines[61]. Even though the survey area contained some discrete better quality foraging / commuting features, such as woodland, rivers and tree-lined ditches, the landscape to the north and south of the survey area was predominantly industrial and urban, which reduced the overall habitat quality of the area for bats.

Field survey

9.5.70 The survey methodology and assessments followed the protocol outlined in the Bat Conservation Trust Good Practice Guidelines (3rd Edition) (Collins, J. (ed) 2016). In brief the following surveys were conducted between May and September 2016 within the survey area:

- bat roost potential;
- dusk emergence and dawn re-entry surveys;
- bat activity forward tracking surveys;
- bat activity transect surveys;
- static automated detector surveys; and
- bat activity crossing point surveys.

9.5.71 No bat roosts or indicative bat roost locations were observed during the surveys. The bat species recorded during surveys included: common pipistrelle (*Pipistrellus pipistrellus)*, soprano pipistrelle (*Pipistrellus pygmaeus)*, noctule (*Nyctalus noctula)* and *Myotis* species. Overall the general bat activity recorded during the surveys was relatively low.

9.5.72 Dusk emergence and dawn re-entry surveys were required at one building at Make-me-Rich farm which had previously been identified as a confirmed roost during surveys undertaken for the IAMP development in 2014[62]. Surveys were undertaken on the following dates:

- 9th August 2016 (dusk emergence);
- 10th August 2016 (dawn re-entry);
- 14th September 2016 (dusk emergence); and
- 15th September 2016 (dawn re-entry).

9.5.73 These surveys identified no bat roosts and bat activity recorded was generally low during the dusk/dawn surveys.

Resource evaluation

9.5.74 The general bat activity within the survey area was low, and predominantly involved common pipistrelles. However, it must be noted that occasional high levels of common pipistrelle activity were recorded, and this species was recorded crossing the A19. Compared to the surrounding landscape, the survey area featured a relatively large area of green space, comprising farmland and woodland. Therefore, it is possible that the habitat within the survey area was a valuable resource for bats, particularly as a commuting / dispersal corridor.

9.5.75 The survey area was regarded as being of **Local Importance (Low Value)** for bats**.**

Water Vole

9.5.76 Details of the water vole (*Arvicola amphibius)* survey can be found in the Water Vole and Otter Survey Report (document no. B0140300/OD/199, Jacobs 2017) included in Appendix 9.1 of this ES. The water vole survey focused on suitable habitat features within 500 m of the Scheme.

Desk study

9.5.77 ERIC North East provided 49 water vole records from within 2 km of the Scheme. A water vole survey commissioned in 2013 by South Tyneside council (Durkin 2013) produced 21 water vole records from within 500 m of the Scheme. All of these were from the River Don. The Durham Wildlife Trust confirmed that all the water vole records they have collected had been submitted to the ERIC North East.

9.5.78 Water vole desk study records have been plotted on Figure 1.1 of the Water Vole and Otter Survey Report in Appendix 9.1.

Field survey

9.5.79 The field surveys were undertaken in 2014 and repeated on 30th and 31st August 2016. Surveys followed the standard methodologies set out in the Water Vole Conservation Handbook 3rd edition (Strachan et al. 2011) and The Water Vole Mitigation Handbook (Strachan et al. 2016). The areas surveyed for field signs were the River Don and Boldon Lake, for which field signs were identified during surveys at a previous stage of the Scheme. The River Don was surveyed between Boldon Bridge (upstream of the A19 culvert) located to the east of the Scheme (and outside of any areas of proposed works) and Elliscope Farm (downstream of the A19 culvert), which is located to the west of the A19 and Downhill Lane junction.

9.5.80 Water vole surveys were conducted using standard methodologies which involved surveying for indicative signs of water vole, including:

- droppings and latrines;
- burrows;
- feeding stations;

61 Collins J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition)*. The Bat Conservation Trust, London.

62. White Young Green (WYG) (2015), Sunderland City Council Land North of Nissan Final Report 2015.

- runs through vegetation;
- prints; and
- direct sightings.

9.5.81 The optimum time for water vole surveys is during the breeding season, when the species is most active – typically between late March and October in the north of England. Consequently, the surveys were undertaken during the optimal survey period (July to October).

9.5.82 To assess whether water voles were passing through the A19 River Don culvert, a camera trap was set up in September 2016 for a two-week period. No water voles were recorded, indicating potential existing barrier effects between the upstream and downstream section of the River Don east and west of the A19.

9.5.83 Table 9-6 below gives an indication of the surveyed areas with habitat descriptions and where water vole evidence was recorded. Water vole evidence is illustrated on Figure 1-4 of the Water Vole and Otter Survey Report 2016, in Appendix 9.1.

9.5.84 Updated water vole and otter surveys[63] on the River Don, between Boldon Bridge on the A184 (Grid ref: NZ 434556, 560887) and its entry into the River Don culvert at Downhill Lane junction (Grid ref: 434132, 560038), were undertaken in May and August 2018. One potential water vole burrow was identified, but no other evidence of water vole field signs was found within the watercourse.

9.5.85 The results of the 2018 field survey were consistent with those reported in 2016, highlighting limited field signs for water vole in the survey area.

Table 9-6: Water vole field survey results

Area Surveyed	General Habitat Description	Water Vole Evidence
River Don upstream of A19 carriageway, from Glebe Farm (NZ 34684 61084) to A19 Culvert (NZ 34132 60036)	This section of the River Don is a natural meandering channel with fairly steep earth banks. The substrate varies as the river flows south through the study area. The northern extent is a mixture of boulders/cobles and sand/silt whereas the southern extent of this section is predominantly sand/silt. Bankside vegetation is characterised mainly by tall grasses and ruderal vegetation with scattered broad-leaved trees frequent along this section.	Numerous definitive signs of water vole including footprints and latrines. Burrows and runs through vegetation were also noted. No signs of American mink (*Neovison vison*) were recorded on this section of the River Don.
River Don downstream of A19 carriageway, from A19 Culvert (NZ 34044 59975) to	This section of the River Don has a less natural appearance (i.e. less meanders, steeper banks and reduced diversity of bank side vegetation) than the section up	Numerous definitive signs of water vole including footprints and latrines. Burrows were also noted.
Elliscope Farm (NZ 33500 59809)	stream of the A19 culvert. This may indicate a level of modification to the channel. Bank side vegetation in this section generally consisted of tall ruderal vegetation with some scattered scrub and trees. Further west a section of the River Don passes through broad-leaved woodland known as Elliscope Farm East/ Hylton Bridge LWS.	No signs of American mink were recorded on this section of the River Don.
Mount Pleasant Marsh LWS (NZ 340608).	Located north of Downhill Lane Junction, comprising open water, reed beds, marshy grassland, scrub and woodland habitat (also hosting West Boldon Environmental Education Centre).	No water vole field signs were recorded in this area during the 2016 surveys. No signs of American mink were recorded.
Boldon Lake LWS (NZ 340610).	The site comprises a man-made lake (the largest body of open water in the borough). The lake was created in 1986 and has developed substantial areas of marginal vegetation. It was noted that while the habitats within the site appeared to be suitable for water vole with a mixture of reed beds and open water the surrounding area the lake appeared to be highly disturbed by human activities.	No water vole field signs were recorded in this area during the 2016 surveys. No signs of American mink were recorded.
Drainage ditch, West Moor Farm from NZ 33796 59173 to NZ 33522 59114.	Located to the south-west of the Scheme adjacent to the A1290, the ditch runs parallel to a hedgerow that connects with a small copse to the west. The ditch was noted to be damp at the time of survey but with no visible standing or running water.	No water vole field signs were recorded in this area and no signs of American mink were recorded.

Resource evaluation

9.5.86 The desktop study found recent records of water vole field signs within the survey area. Records were collected from a number of sources including the local records centre, previous Jacobs' surveys, Durham Wildlife Trust and South Tyneside Council. The desktop records generally accord with the 2016 survey results on the River Don although, when compared to previous Jacobs surveys since 2007, there has been a general reduction in the number of field signs recorded since surveys undertaken by Jacobs at a previous stage of the Scheme.

[63] These water vole and otters survey updates, in 2018, were completed in response to Natural England comments during the Testo's scheme DCO Examination, but reported here as also relevant to the Scheme.

9.5.87 The 2014 survey found definitive water vole field signs (i.e. latrines) concentrated on the River Don upstream of the A19, indicating that the carriageway may act as a barrier for colonisation further downstream. However, the 2016 survey results indicated water voles were now similarly widespread south of the A19. Nonetheless, there was a reduction in the number of potential burrows observed in 2016 from that in 2014.

9.5.88 Given the distribution of water vole along the River Don upstream and downstream of the existing A19, water vole in the survey area were considered to be of **County Importance (Medium Value)**.

Otter

9.5.89 Details of the otter (*Lutra lutra*) survey can be found in the Water Vole and Otter Survey Report (document no. B0140300/OD/199, Jacobs 2017), in Appendix 9.1. The otter survey focused on suitable habitat features within 500 m of the Scheme.

Desk study

9.5.90 ERIC North East provided 50 otter records within 2 km of Scheme. It should be noted that the majority of otter records submitted in 2006 to ERIC North East within 1 km of the Scheme were from the previous Jacobs surveys conducted in relation to the Scheme in 2006. Therefore, the majority of the records held by ERIC North East are from the River Don.

9.5.91 The survey commissioned by South Tyneside council in 2013 recorded an otter spraint and a 'couch' in a riverbank willow bed on the River Don within the survey area near 'Mount Pleasant', referring to a stretch of the River Don mostly north of the A184, but also south for a short extent (shown indicatively as around 300 m extent in total) and not as far as the A19. No further location details were provided for this record.

9.5.92 Durham Wildlife Trust confirmed that all of their local records for otters have been sent to ERIC North East.

9.5.93 A desktop review of previous otter surveys undertaken at a previous stage of the Scheme identified that the 2014 field survey results for otter were limited to the identification of footprints on the River Don upstream and downstream of the A19 carriageway and a bankside run/slide on the downstream side of the A19. Clay mats emplaced at either end of the A19 culvert during autumn 2014 revealed no evidence of otter activity.

9.5.94 Similarly, the mammal ledge incorporated within the Boldon Bridge beneath the A184 to afford safe passage for mammals, was also devoid of otter field signs. However, the results of the field survey and the widespread desk study records appeared to indicate that otter were utilising the entire survey area. There were no otter field signs recorded within Boldon Lake LWS or Mount Pleasant Marsh LWS.

9.5.95 IAMP surveys undertaken in 2014 identified no field signs to indicate the presence of otter within the survey area. However, an incidental otter sighting and otter print were identified during early spring 2015 on the River Don downstream of the A19. No further evidence of otter was recorded during the surveys and no further obvious features within riparian habitats were identified that were considered likely to be used by otter for notable refuge or shelter.

9.5.96 Evidence of otter (spraint and footprints) were recorded throughout the River Don culvert during surveys undertaken for the IAMP development in 2016 (*pers comm* Arup, 2016).

Field survey

9.5.97 In 2016, otter surveys were conducted using methodologies adapted from Volume 10 of the DMRB – Vol.10, Section 4, Part 4, *HA88/91 - Nature Conservation Advice In Relation To Otters*). This involved surveying for indicative signs of otters, including:

- spraint;
- footprints;
- feeding remains;
- sightings; and
- actual or potential resting sites.

9.5.98 In addition to the above, in order to assess whether otters were passing through the A19 River Don culvert, a trail camera was set up for a two-week period in September 2016 at the upstream portal of the A19 River Don Culvert. No otters were recorded on the trail camera. As shown on Figures 1.4 to 1.7 in the Water Vole and Otter Survey Report (see Appendix 9.1), no definitive field signs of otter were recorded during the surveys. However, the EIA Scoping Report produced for the IAMP noted finds of otter footprints and a sighting of an otter on the River Don in 2015, while otter footprints and spraint were found within the River Don culvert under the A19 in 2016[64].

9.5.99 During the aforementioned updated water vole and otter surveys on the River Don during May and August 2018, an otter spraint and a single print were found in two locations along the River Don. The results of the 2018 field survey were consistent with those reported in 2016, highlighting limited field signs for otter in the survey area.

Resource evaluation

9.5.100 The desk study and review of existing otter survey information identified records of otter field signs within the survey area. The records were provided by a number of organisations including ERIC North East, Durham Wildlife Trust and South Tyneside Council and from previous Jacobs surveys in 2014. These records were mainly concentrated on the River Don and its tributaries.

9.5.101 No definitive otter field signs were recorded during surveys in 2016, but evidence from IAMP indicates they were present and using the parts of the River Don immediately adjacent to the A19. Otter territories can extend up to 50 km along a watercourse. Taking this into consideration together with the results of the field survey and the widespread desk study records, this indicates that otter are likely to be utilising the entire extent of the River Don within the survey area. Based on current data, it appears likely that otter are traversing the A19, utilising the A19 River Don culvert.

9.5.102 Given the distribution of otter field signs in the survey area, and habitat features present, the otter population in the survey area were considered to be of **Local Importance (Low Value)**.

Invertebrates

9.5.103 There were 46 records of invertebrates listed on the either: International Union for Conservation of Nature (IUCN) Red List of Threatened Species, NERC Act (2006) SoPI or Durham BAP

[64] IAMP (2016) 'International Advanced Manufacturing Park – Environmental Impact Assessment Scoping Report' https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/BC030001/BC030001-000021-Scoping%20Report

priority species provided by ERIC North East found within 2 km of the Scheme. These include the following taxa:

- Beetles (Coleoptera) – 9 species records;
- Butterfly (Lepidoptera) – 3 species records;
- Moth (Lepidoptera) - 33 species records; and
- True Flies (Diptera) – 1 species record.

Resource evaluation

9.5.104 The majority of species recorded in the study area were common and widespread or locally distributed. Accordingly, the study area was considered to be of generally low entomological interest for invertebrates based on the range of habitats identified.

9.5.105 Taking into account the range of species recorded in the study area invertebrates were considered to be of **Local Importance (Low Value).**

Invasive plant species

9.5.106 The only non-native invasive plant species, listed on Schedule 9 of the WCA 1981 (as amended), within the survey area is Indian/Himalayan Balsam (*Impatiens glandulifera*), which has been recorded on the River Don.

9.5.107 As the Scheme is not directly affecting the River Don, invasive plant species were not considered further in this chapter.

9.5.108 Japanese knotweed (*Fallopia japonica*) has been recorded near the A19 / A184 Testo's junction. However, this is beyond the affected area for the Scheme, so Japanese knotweed is not considered further in this chapter.

9.6 Baseline conditions - summary resource evaluation

9.6.1 Table 9.7 summarises the valuation of the ecological features in the study area and survey area in accordance with the methodology set out in Section 9.3 of this chapter.

Table 9-7: Summary – valuation of ecological features

Ecological Feature	Scale of Importance (Value)
Habitats	
SSSIs (Hylton Castle Cutting & Wear Bank)	National (High)
LNRs (Hylton Dene & Barmston Pond)	County Importance (Medium Value)
LWS (Make-Me-Rich Meadow)	County Importance (Medium Value)
Arable	Local (Low) – very few field margins or headlands in survey area.
Amenity grassland	Local (Low)
Bare ground	Less than Local/At site level (Negligible)
Broad-leaved semi-natural woodland	Regional (Medium)
Broad-leaved plantation woodland	County (Medium)
Dense/continuous scrub	Local (Low)
Dry ditch	Local (Low)
Improved grassland	Local (Low)
Introduced shrub	Local (Low)
Marshy grassland	County (Medium)
Mixed plantation woodland	Local (Low)
Native species-poor intact hedge	County (Medium)
Native species-rich intact hedge	County (Medium)
Neutral semi-improved grassland	County (Medium)
Poor semi-improved grassland	County (Medium)
Running water	County (Medium)
Scattered broad-leaved trees	Local (Low)
Scattered scrub	Local (Low)
Species-poor defunct hedge	Local (Low)
Species-poor hedge and trees	Local (Low)
Swamp	County (Medium)
Tall ruderal	Less than Local/Site Level (Negligible)
Species	
Amphibians	Local (Low)
Breeding birds	County (Medium)
Wintering birds	County (Medium)
Barn owl	County (Medium)
Badger	Less Than Local Importance (Negligible Value)
Bats	Local (Low)
Water vole	County (Medium)
Otter	Local (Low)
Invertebrates	Local (Low)

9.7 Baseline conditions - future ecological baseline without the Scheme

9.7.1 The information given on the previous pages describes the ecological conditions as they were at the time of the surveys carried out between 2016 and 2018, except for baseline information for breeding and wintering birds as these surveys were carried between April to June 2014 and

October 2014 to January 2015 respectively. However, these conditions are likely to change over time, whether or not the Scheme is built. The following paragraphs consider how ecological conditions might change without the Scheme by 2020 (the assumed start date for construction), 2021 (the assumed year in which the Scheme would be open to traffic) and 2036 (the 'future year', when environmental mitigation would reach maturity).

9.7.2 In this mainly agricultural area, ecological conditions are unlikely to have changed significantly by 2020 or 2021. However, changes in farming practices could occur in response to changes in agricultural economics, farming policy and agri-environment proposals. For example, an increase in the margin around arable fields would increase invertebrate abundance and diversity, thereby benefiting bat and bird populations. Conversely an increase in livestock production would be detrimental to arable flora but would benefit some bird and bat species and badger; for example. these species depend heavily on invertebrates, including earthworms, as a foraging resource and these are more abundant in grazing land.

9.7.3 It should be noted that IAMP One is assumed to have been built and operational before the Scheme starts construction. In addition, the future baseline was assumed to reflect that the Testo's scheme is under construction in 2020 and opening in 2021, with a future year of 2036. Therefore, changes to habitat composition (mainly a reduction of arable and improved grassland) and associated change in species distribution in the survey area could potentially occur; see Figure 9.2 for affected habitats. At this stage it is not anticipated that the construction of IAMP One would significantly affect the assessment or mitigation measures set out in this chapter.

9.7.4 It is not possible to accurately predict farming practices in the survey area in 2036 ('future year'). Although distribution and abundance of fauna are likely to fluctuate in the long-term, it was assumed there would be no significant changes to species or habitat status by 2021.

9.7.5 For the purposes of this assessment, all the agricultural land between the new and old roads that is not being taken for the Scheme was expected to remain in agricultural production. As such, predictable changes in the biodiversity importance or spatial extent of semi-natural habitat would be unlikely to occur in this agricultural landscape.

9.7.6 It was recognised that some land, particularly to the west and south-west of the Scheme, is subject to applications for consent for other developments. This could result in significant changes in land-use and habitats in land close to the Scheme. These third-party developments may cause cumulative effects, which are considered in Chapter 15 of this ES.

9.8 Potential impacts (without mitigation)

9.8.1 In generic terms, road schemes have the potential to affect ecology and nature conservation negatively in a number of recognised ways, arising initially as a result of the construction of the Scheme:

- direct habitat loss through land take (including temporary land take requirements);
- severance or fragmentation of existing areas of habitat;
- direct mortality of animals;
- indirect effects of environmental pollution via road drainage (including temporary haul roads), run-off and spray from construction traffic;
- disturbance/indirect effects caused by increased vehicle/ plant movements, lighting, noise, dust emissions, or pollution;
- cumulative effects of the Scheme taken together with other developments occurring in the area at the same time or before/after the construction of this Scheme (refer to Chapter 15 of this ES); and
- combined effects on a particular habitat or species of several different aspects of the Scheme (e.g. a single species may be affected by habitat loss, severance and disturbance).

9.8.2 The potential impacts specifically arising from the operational phase of a road scheme that could negatively affect the important ecology and nature conservation features of the area can be summarised as follows:

- changes in hydrology (groundwater, volume and/or quality of surface water run-off, road salt etc.);
- increased noise levels;
- changes to air quality resulting from vehicular emissions (in particular, lead, zinc, particulates, nitrogen dioxide etc.);
- lighting and visual disturbance;
- longer term fragmentation/severance issues;
- mortality from road vehicles; and
- accidental spillages on the road.

9.8.3 Construction impacts and the resultant effects can be short-term or long-term in nature. Most operational effects would be long-term but may decline in their significance as the environmental mitigation works become mature. In this context, short-term was taken to mean the impact would have ceased to occur by the end of the construction phase, and its effect would have ceased to be experienced either by the end of construction or, at the latest, by 15 years after the end of construction. Long-term means the impact may continue to occur or would mainly occur during the operational period, and the effect would still be felt 15 years or more after the end of construction.

9.8.4 Predicted effects associated with the Scheme are detailed below for each habitat type and/or species likely to be significantly affected by the Scheme. Activities or impacts associated with the Scheme that may affect important ecological features have been identified separately for the construction and operation phases.

9.8.5 In accordance with good practice, the ecological impacts identified throughout this section are described without taking any mitigation measures into account; therefore, these impacts represent a 'worst-case scenario' and provide the basis on which the necessary mitigation can be identified. The resulting mitigation measures are described in Section 9.9 of this chapter and the residual effects after mitigation are described and their significance assessed in Section 9.10 of this chapter.

9.8.6 Construction and operational impacts on each important feature are detailed in Tables 9.4-a to 9.4-s in Appendix 9.4. Impacts are described as per the guidance set out in DMRB IAN 130/10. Impacts on designated site habitats and protected species are summarised in Table 9-9 of this chapter.

Statutory designated sites

9.8.7 Given the distance to the nearest statutory designated sites (i.e. Hylton Castle Cutting SSSI, Wear Bank SSSI, Hylton Dene LNR and Barmston Pond LNR) are greater than 1 km it is not anticipated that a pathway, such as a connecting watercourses or green corridor, exists for direct or indirect effects on these sites as a result of the Scheme.

9.8.8 Therefore, potential impacts on statutory designated sites are not discussed further in this chapter.

Non–statutory designated sites

9.8.9 The assessment of construction/operational impacts on non-statutory designated sites has been undertaken with reference to the distance between the sites and the Scheme, the presence of significant existing barriers (i.e. roads, industrial/residential development and railway lines), connectivity of habitats and the likelihood of impacts or measurable effects on these sites via environmental pathways (air, water, ground and general disturbance). Based on these criteria, non-statutory designated sites have been scoped out of this assessment where there is no reasonable/probable pathway for impacts to occur.

9.8.10 Therefore, the detailed assessment tables in Appendix 9.4 concentrate on potential impacts to Make-Me-Rich Meadow LWS only as this site is within such close proximity (24 m) to the Scheme that indirect impacts may occur. These impacts are detailed in Tables 9.4-a1 to 9.4-s in Appendix 9.4 and summarised in Table 9-9 of this chapter.

Habitats

9.8.11 Where habitats of significant nature conservation importance (County/Medium Value and above) are likely to be directly impacted, detailed impact tables are included in Appendix 9.4 of this chapter. These impacts are summarised in Table 9-9 of this chapter.

9.8.12 The habitat loss for permanent and temporary land requirements have been calculated using the most up to date design information, as of February 2018, and locational details for: the main site compound, haul roads and soil storage areas provided by the contractor. Permanent and temporary habitat losses are detailed in Table 9-8.

9.8.13 The Scheme would result in long-term direct loss of habitat within the area of permanent works and short-term loss of habitat for temporary construction uses, such as the main site compound, storage areas and site access roads. Permanent and temporary losses during construction have been calculated for each habitat type (see Table 9-8) measured in hectares (ha); see Figure 2.5 for the area of temporary and permanent works, and the Environmental Masterplan for the full area of the Scheme including environmental mitigation works.

Table 9-8: Summary of habitat loss

Habitat Type	Total Area (ha)	Permanent land-take (ha)	Temporary land-take (ha)
Arable	12.38	4.88	7.5
Broad-leaved Plantation Woodland	1.64	1.64	N/A
Dense/Continuous Scrub	0.9	0.81	0.09
Improved Grassland	3.42	0.28	3.14
Marshy Grassland	0.01	N/A	0.01
Mixed Plantation Woodland	0.22	0.21	0.01
Poor Semi-improved Grassland	1.1	0.96	0.14
Neutral Semi-improved Grassland	1.97	0.95	1.02
Tall Ruderal	0.19	0.06	0.13
Total	**21.83**	**9.79**	**12.03**

9.8.14 In addition to the above, approximately 0.83 km of species poor hedgerow (including intact, defunct and species poor hedgerows with trees combined) would be lost as part of the Scheme. This would comprise 0.62 km of permanent loss and 0.21 km of temporary loss. No species rich hedgerow is anticipated to be lost as part of the Scheme.

9.8.15 The Scheme may result in terrestrial habitat fragmentation/severance, starting in the construction phase and continuing during operation. Where the highway area increases, this could present an increased physical barrier, which would have implications for all faunal groups in the survey area primarily through reduction in resource availability and limiting population migration and colonisation. Habitats would also be at risk of accidental and unmitigated pollution through spills of chemicals and other liquids, such as oils and petrochemicals during construction.

Summary impact assessment

9.8.16 Table 9-9 below provides a summary of the impact assessment provided in Tables 1 to 21 in Appendix 9.3.

Table 9-9: Ecological impact assessment summary

Feature	Nature Conservation Importance (Value)	Key Potential Impacts During construction and operation
Statutory designated sites. (SSSIs & LNRs)	National (High)	No significant effects during construction or operation.
Non-statutory designated sites (Make-Me-Rich Meadow LWS).	County (Medium)	• Disturbance through lighting or noise during construction and operation. • Potential indirect effects through severance / fragmentation. • Pollution or sedimentation of aquatic habitats during construction and operation. (For details on construction and operational impacts refer to Table 9.4-a 9.4-k in Appendix 9.4).
Habitats.	Habitat types valued at County (Medium) value are: Broad-leaved Plantation Woodland.	• Permanent (c.9.79 ha) and Temporary (c.12.03 ha) loss of habitats: predominantly arable and grasslands. • Increased fragmentation / severance of habitats adjacent to the proposals and linear features potentially used as wildlife corridors.

Feature	Nature Conservation Importance (Value)	Key Potential Impacts During construction and operation
	Poor Semi-Improved Grassland. Neutral Semi-improved Grassland. Marshy Grassland. Native hedgerow.	• Pollution or sedimentation of aquatic habitats during construction and operation. (For details on construction and operational impacts refer to Table 9.4-c and 9.4-l in Appendix 9.4).
Amphibians (Common Toad SoPI)	Local (Low)	• Permanent / temporary loss of suitable terrestrial habitat. • Increased risk of direct mortality through site clearance operations during construction. • Increased fragmentation / severance of suitable terrestrial and aquatic breeding habitats. • Pollution or sedimentation of aquatic habitats during construction and operation. (For details on construction and operational impacts refer to Table 9.4-d and 9.4-min Appendix 9.4).
Breeding Birds	County (Medium)	• Permanent / temporary loss of suitable nesting / breeding and foraging habitats. • Increased risk of direct mortality through site clearance operations (vegetation removal and vehicle strike). • Increased risk of direct mortality through vehicle strike during operational phase. • Increased fragmentation / severance of suitable nesting / breeding and foraging habitats. • Disturbance through visual disturbance, lighting and noise during construction and operation. (For details on construction and operational impacts refer to Table 9.4-e and 9.4-n in Appendix 9.4).
Wintering Birds	County (Medium)	• Permanent / temporary loss of suitable overwintering areas, such as arable stubble fields and winter food sources such as hedgerows. • Increased risk of direct mortality through site clearance operations during construction (vegetation removal and vehicle strike). • Increased risk of direct mortality through vehicle strike during operational phase.

Feature	Nature Conservation Importance (Value)	Key Potential Impacts During construction and operation
		• Increased fragmentation /severance of overwintering areas and winter food sources. • Disturbance through visual disturbance, lighting and noise during construction and operation. (For details on construction and operational impacts refer to Table 9.4-d and 9.4-n in Appendix 9.4).
Barn owl	County (Medium)	• Permanent / temporary loss of suitable foraging / hunting habitat. • Increased risk of direct mortality through vehicle strike during construction and operational phase. • Increased fragmentation / severance of suitable hunting areas and potential roosting / nesting sites. • Disturbance through visual, lighting and noise during construction and operation. (For details on construction and operational impacts refer to Table 9.4-f and 9.4-oin Appendix 9.4).
Badger	Less than Local (Negligible)	No anticipated effects during construction or operation. Species not recorded during baseline surveys.
Bats	Local (Low)	• Permanent / temporary loss of potentially suitable roosting, commuting and foraging habitat (no known roosts would be lost). • Increased fragmentation / severance of foraging areas and commuting routes. • Increased risk of direct mortality through site clearance operations (vegetation removal) affecting roost sites. • Disturbance through lighting and noise during construction and operation. (For details on construction and operational impacts refer to Table 9.4-g and 9.4-pin Appendix 9.4).
Water Vole	County (Medium)	• Disturbance through lighting or noise during construction and operation. • Potential indirect effects through severance / fragmentation of suitable habitats • Pollution or sedimentation of aquatic habitats during construction and operation.

Feature	Nature Conservation Importance (Value)	Key Potential Impacts During construction and operation
		(For details on construction and operational impacts refer to Table 9.4-h and 9.4-q in Appendix 9.4).
Otter	Local (Low)	• Disturbance through lighting or noise during construction and operation. • Potential indirect effects through severance / fragmentation of suitable habitats. • Pollution or sedimentation of aquatic habitats during construction and operation. (For details on construction and operational impacts refer to Table 9.4-l and 9.4-r in Appendix 9.4).
Invertebrates	Local (Low)	• Permanent / temporary loss of key habitat mosaics such as riparian margins, hedgerows, arable field margins and grassland. • Increased risk of direct mortality through site clearance operations (vegetation removal). • Pollution or sedimentation of aquatic habitats during construction and operation. (For details on construction and operational impacts refer to Table 9.4-j and 9.4-s in Appendix 9.4).

9.9 Design, mitigation and enhancement measures

9.9.1 Mitigation measures were developed to avoid, reduce or mitigate potential adverse effects and are outlined in each of the following sub-sections. Mitigation measures were developed using the following framework:

- effective avoidance through design change;
- prohibition of damaging activities;
- minimisation of potential effect;
- habitat creation;
- habitat management / improvement;
- translocation of habitat and/or species; and
- programming implications.

9.9.2 Where reasonably practicable, mitigation measures were developed to avoid potentially negative ecological effects, especially those that could be significant, and reduce potential negative effects that could not be avoided.

9.9.3 Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 places a duty of care on public authorities to: protect important habitats and species, and to actively seek opportunities to enhance biodiversity through development proposals, where appropriate. Therefore, where possible, opportunities for enhancement measures have been investigated (e.g. installing bat boxes or bird nest boxes in woodland and on mature trees, subject to 3rd party agreement).

9.9.4 An overall package of mitigation has been set out to meet the needs of all affected ecological features. This holistic approach was used as a number of features could have the same requirements in terms of habitat creation, connectivity and juxtaposition of different habitats.

9.9.5 Temporary land requirements for construction, such as haul roads, main site compound and topsoil storage areas, have been located to avoid adverse impacts or damage to important ecological features so far as is reasonably practicable. This assessment takes account of preliminary proposals for temporary land requirements, whilst recognising that these proposals may be subject to minor change during the detailed design stage, but that sensitive ecological features would be avoided. The preliminary proposals for temporary works have been adjusted following ecological and other environmental advice on their location and on ground preparation, management and reinstatement of temporary works; similar advice would be sought in respect of any further iteration of the temporary works plan.

Habitats

9.9.6 The Environmental Masterplan illustrates the overall habitat creation, retention, re-creation / re-establishment and planting proposals for the Scheme. Table 9-10 summarises the areas of habitat created as part of the Scheme to mitigate for loss of habitat assed as being of County Importance or above.

Table 9-10: Proposed creation of habitats of County importance or higher value

Habitat Type	Area Created (ha)	Area to be Permanently Lost (ha)	Net Gain /Loss (+/-ha)
Proposed open grassland (incorporating improved grassland and species poor semi-improved grassland).	3.58	1.24	2.33
Species rich neutral grassland (incorporating neutral semi-improved grassland and marshy grassland).	2.16	0.95	1.2
Native woodland (incorporating native broadleaved plantation and mixed plantation).	1.88	1.85	0.03
Scrub/tree and shrub planting.	1.14	0.81	0.33
Total	**8.76**	**4.85**	**3.91**

9.9.7 As identified in Table 9-10 above there would be a net gain in habitat types assessed as being of county importance or above. However, there would be a net loss of habitats of lower ecological value, such as amenity grassland or arable.

9.9.8 In addition to the provisions outlined in Table 9-10, 1.85 km of hedgerow / linear tree and shrubs would be planted as shown on the Environmental Masterplan. This would represent a net gain of hedgerow / linear tree and shrub habitat.

9.9.9 Restoration of all temporarily used land to its pre-existing condition would be controlled through provisions in the CEMP and as illustrated on the Environmental Masterplan. This would include restoration of hedgerows, if these were removed as part of the temporary works. In addition, the CEMP would include provisions controlling soil management and other controls relevant to land restoration. As such, temporary habitat loss would be minimised.

9.9.10 Although the primary function of attenuation ponds is for drainage, the areas of open water habitat and associated landscape planting of these areas is likely to have a secondary biodiversity function by providing a resource for amphibians and waterfowl. As such, balancing pond features are not considered as mitigation proposals, but are recognised for their secondary ecological function. The proposals for these areas have been developed in consultation with Jacobs' drainage design and landscape specialists and are shown in the Environmental Masterplan.

9.9.11 In addition, with reference to DEFRA's published biodiversity strategy for England[65] these measures align with key objectives of the strategy as outlined in Sections 9.2.4 and 9.2.5 of this ES chapter and address specific points raised by Natural England, such as climate change.

9.9.12 The majority of the proposed woodland planting would be located to the south of Downhill Lane junction, as shown in the Environmental Masterplan.

9.9.13 Creation of habitats of County importance or higher value, as part of the Scheme, amounts to approximately 8.76 ha (as outlined in Table 9-10) and would be managed and maintained as part of the aftercare for the Scheme with biodiversity as a key objective. It is considered that this would compensate for the permanent habitat loss of 9.8 ha (as outlined in Table 9-8), the majority of which is arable or pastoral farmland and not currently specifically managed for a biodiversity benefit. Therefore, although there is no net gain in terms of habitat area, it is likely that a net gain in the quality of habitat would be achieved.

Amphibians

9.9.14 Given the results of the amphibian survey, no European protected amphibian species (e.g. GCN) were identified as present, thus no direct impacts have been identified and no requirement for essential mitigation. However, common toad has been recorded in various ponds in the survey area. This species is listed as a SoPI under Section 41 of the NERC Act 2006. The NERC Act places a duty of care on public authorities to: protect important habitats and species, and to actively seek opportunities to enhance biodiversity through development proposals, where appropriate.

9.9.15 The habitat creation proposals shown in the Environmental Masterplan include woodland and wetland creation. These habitat types would be of benefit to the local amphibian population. As such, with the full implementation of habitat creation areas and the secondary benefit from attenuation ponds, the maintenance of the favourable conservation status of the common toad at a local level is likely to be achieved. In addition, some general measures would be implemented to safeguard common toad populations in the survey area, as follows:

- where practicable, the main site compound and storage areas to be located away from known common toad breeding ponds and other aquatic habitats that may support breeding populations of amphibians;
- ecological clerk of works to be present during site clearance operations in sensitive habitats adjacent to known breeding ponds;
- where possible, material from site clearance works would be used to create additional refugia and/or hibernacula within areas adjacent to attenuation ponds, proposed north and south of Downhill Lane junction, to improve the suitability of terrestrial habitat.

Breeding/wintering birds

9.9.16 Table 9-11 identifies the good practice measures that would be undertaken to mitigate the effects of the Scheme on birds (wintering and/or breeding).

Table 9-11: General Bird Mitigation Measures

Mitigation Measures/Enhancement Measures
• Vegetation to be retained / lost (including trees and shrubs) would be clearly demarcated with an agreed marking system with the contractor to avoid encroachment into areas of sensitive bird habitat, such as dense scrub or woodland. • Vegetation removal as part of the site clearance would consider the potential for nesting birds to be present. Where possible, vegetation removal would be scheduled to occur outside the bird breeding season. Therefore, vegetation removal would occur from late August through to February inclusive. • If vegetation removal during the bird nesting season cannot be avoided, precautionary nesting bird surveys would be required. If nesting birds are identified, then protective buffer zones around each nest would be required and vegetation removal within that buffer may have to be postponed until all the young have fledged or the nest is abandoned. • The proposed landscape planting would include native species of local provenance that provide suitable nesting areas or a source of food at different times of year, such as blackthorn, hawthorn, bramble and teasel. • Where possible night-time working would be kept to a minimum during the construction period. In addition, lighting for the operational Scheme would avoid / minimise illuminating habitats adjacent to the Scheme by using directional lighting, reduced lighting column height (where appropriate), baffles, cowls, landscaping and the use of screens.

Barn owl

9.9.17 Table 9-12 below identifies the best practice mitigation measures that would be undertaken for barn owls.

[65] DEFRA, (2011) Biodiversity 2020: A strategy for England's wildlife and ecosystem services

Table 9-12: Barn Owl Mitigation / Enhancement Measures

Mitigation/Enhancement Measures
• Where possible planting for the Scheme would take into account general habitat requirements for barn owl and seek to install low-flight obstructions (tall hedges or lines of closely spaced trees) to act as commuting corridors and reduce the risk of barn owl vehicle strike. • Approximately 1.85 km of linear tree and shrub planting would be created as part of the Scheme, as shown on the Environmental Masterplan, which would seek to connect severed ends of hedgerows to re-establish wildlife commuting corridors. This would benefit barn owl through maintaining foraging and commuting corridors in the survey area and channel them away from the road network. • Night-working would be avoided where possible, especially in proximity to known barn owl roosts. If it cannot be avoided, it would be restricted in the vicinity of likely commuting routes and valuable areas of foraging habitat (i.e. hedgerows should not be illuminated nor have generators placed next to them). In addition, lighting for the operational Scheme would avoid / minimise illuminating habitats adjacent to the Scheme through the use of directional lighting, reduced lighting column height (where appropriate), baffles, cowls, landscaping, and the use of screens.

Bats

9.9.18 Bats have been recorded foraging and commuting across the survey area in several locations, but no bat roosts have been identified.

9.9.19 Habitat creation as part of the landscape proposals have been developed with the requirements of bats and maintaining suitable flight lines and foraging features in mind.

9.9.20 Table 9-13 below identifies the best practice mitigation measures that would be implemented for bats.

Table 9-13: Bat Mitigation Measures

Mitigation/Enhancement Measures
• Where possible, planting for the Scheme would take into account general habitat requirements for bats and seek to create rough grassland habitat and replace severed linkages / commuting corridors, such as hedgerows, through translocations and/or new planting and ditches through habitat creation. • No bat roosts have been recorded in trees surveyed as part of the baseline data gathering for the Scheme. However, as a general precaution any felling of trees with significant (moderate or high) bat roost potential, should be undertaken in autumn, between late August and October / early November following a check of the potential roost features and soft felling protocols (where required). This is because bats do not have dependent young at this time and are not hibernating, so should be active enough to escape harm if proper precautions are taken. • Additional lighting of the Scheme to be installed in accordance with the Lighting Engineers Guidance for the Reduction of Light Pollution (Bat Conservation Trust & The Institution of Lighting Engineers, 2009). Where practicable, the effect on bats and disturbance to adjacent habitats can be minimised by: reducing the amount of lighting installed; using low pressure sodium lamps or high-pressure sodium instead of mercury or metal halide lamps; reducing the brightness (potentially at certain times of night); and reducing the height of lighting columns. The brightness would be kept as low as possible and light spill reduced by directing the beam downwards and using hoods, cowls, screens and appropriate landscaping (Bat Conservation Trust & The Institution of Lighting Engineers, 2009). • Night-working should be avoided where possible. If this is not possible, it should be restricted in the vicinity of known bat commuting routes and valuable areas of foraging habitat (i.e. commuting routes should avoid being illuminated nor have generators placed next to them).

Water vole

9.9.21 No water vole habitat would be directly affected by the Scheme, so specific mitigation for water vole presence is considered unnecessary (i.e. licensing or compensatory habitat creation). This is further supplemented by the drainage design for the Scheme that would reduce the likelihood of large fluctuations in water levels on the River Don. In addition, runoff from the Scheme would be attenuated before reaching any minor tributary/ditch that connects with the River Don, therefore reducing the likelihood of contamination or pollution events.

Otter

9.9.22 No holts have been identified in the area proposed for construction of the outfall, so no specific mitigation for loss of habitat or otter holts is required.

9.9.23 Based on the Scheme design and survey data it is unlikely that there would be an increased risk of direct mortality due to vehicle strike. Therefore, no specific mitigation is required, such as otter proof fencing or underpasses.

9.9.24 Table 9-14 below identifies the best practice mitigation measures that would be implemented for otter.

Table 9-14: Otter Mitigation

Mitigation/Enhancement Measures
• No steep-sided, deep and/or water-filled excavations would be left uncovered overnight as otters could fall in and become trapped. Any major excavations that need to be left uncovered overnight would have their slopes battered. If it is necessary to leave excavations open overnight they would be protected with suitable fencing to avoid trapping any animals. • Night-working should be avoided where possible. If it cannot be avoided, it should be restricted in the vicinity of known commuting routes and valuable areas of foraging habitat. (i.e. River Don). • In addition, lighting for the operational Scheme would avoid or minimise illuminating habitats adjacent to the Scheme through the use of directional lighting, reduced lighting column height (where appropriate), baffles, cowls, landscaping and the use of screens.

Invertebrates

9.9.25 Table 9-15 below identifies the best practice mitigation measures that would be implemented for invertebrates.

Table 9-15: Invertebrates Mitigation

Mitigation/Enhancement Measures
• Where possible, planting for the Scheme would take in to account general habitat requirements for invertebrates and seek to create rough grassland habitat, plus replace severed linkages, such as hedgerows. • Aquatic invertebrates: all fuel, oil and chemicals would be stored in accordance with the requirements of the Control of Pollution (Oil Storage) Regulations 2001. The construction plant would be refuelled in designated areas on an impermeable surface, away from drains and watercourses. If any refuelling did need to take place in other areas of the site, a prescribed safe method would be used. An emergency spill plan would be generated, and spill kits would be available at appropriate locations. The implementation of these measures would be managed through the CEMP. • Aquatic invertebrates: temporary soil storage areas would require temporary drainage arrangements to be put in place to capture construction site run-off and to settle out silt that would be mobilised during construction. The implementation of these measures would be managed through the CEMP. • Aquatic invertebrates: interceptors would be included in the drainage design to prevent contaminated runoff reaching habitats. • Aquatic invertebrates: attenuation ponds built into drainage design would minimise contaminants and sediments reaching aquatic habitats.

Monitoring and maintenance

9.9.26 The aim of the monitoring proposals is to identify any change in status between ES publication and construction and to determine the success of the mitigation measures post construction. The monitoring/aftercare period should extend a minimum of 5 years post construction. As a minimum, a monitoring visit should also be completed in the 'future year' (2036) of the Scheme to assess the operational impacts and would be subject to DCO obligations and associated requirements.

Table 9-16: Proposed Monitoring (minimum requirements)

Monitoring Proposal	Timing
Habitat Creation/Enhancement Areas **Aim** – Monitor the success of the planting proposals (woodland and hedge planting especially) and wetland creation. The monitoring programme to be agreed with all stakeholders. In particular, to decide what the indicators of success would be. This could include the successful establishment of certain species, or % cover of certain botanical species.	**During Construction** – Regular monitoring by a suitably qualified Ecological Clerk of Works (ECoW) according to an agreed programme to be determined for the construction programme. **Post construction** – Continue annually until end of aftercare period.
The monitoring programme would also include actions to resolve any failures in the mitigation.	
Barn Owls **Aim** – To monitor barn owl activity during and post construction to identify any increased risk of Road Traffic Accidents (RTAs). The monitoring programme would also include actions to resolve any additional measures required.	**During construction** – Regular monitoring by a suitably qualified ECoW according to an agreed programme to be determined. **Post construction** – Bi-annual site visits and environmental record centre record checks to identify recorded barn owl RTAs and general barn owl activity in the area and also to determine the current status of previous identified roosts/nesting sites during the aftercare period (conditional on 3rd party agreement for access).

9.10 Assessment of effects

9.10.1 The overall residual impacts for the construction of the Scheme at opening year (2021) range from not significant to significant at a local level only, depending on the sensitivity of the ecological feature(s) affected. With successful implementation and establishment/maturation of the mitigation measures detailed herein, the Scheme would overall result in **Neutral (i.e. Not Significant)** residual impacts by the future operational year (2036), with potential specific benefits if additional enhancement measures are implemented.

9.10.2 Table 9-17 provides a summary of the significance of residual effects, assuming the successful implementation of mitigation and enhancement measures, plus adherence to best practice working methods as detailed in Sections 9.9 and 9.10.

Table 9-17: Ecological residual effects assessment summary

Feature	Overall significance of residual effects during construction (2021)	Overall significance of operational residual effects (2036)
Statutory designated sites	N/A	N/A
Non-statutory designated sites	Significant at a local level only. (For details on construction impacts refer to Table 9.4-a in Appendix 9.4).	Not Significant. (For details on operational impacts refer to details refer to Table 9.4-k in Appendix 9.4).
Habitats	Significant at a local level only. (For details on construction impacts refer to Table 9.4-cin Appendix 9.4).	Not Significant. (For details on operational impacts refer to details refer to Table 9.4-l in Appendix 9.4).

Feature	Overall significance of residual effects during construction (2021)	Overall significance of operational residual effects (2036)
Amphibians (Common Toad SoPI)	Significant at a local level only. (For details on construction impacts refer to Table 9.4-d in Appendix 9.4).	Not Significant. (For details on operational impacts refer to details refer to Table 9.4-m in Appendix 9.4).
Breeding Birds	Significant at a local level only. (For details on construction impacts refer to Table 9.4-e in Appendix 9.4).	Not Significant. (For details on operational impacts refer to details refer to Table 9.4-n in Appendix 9.4).
Wintering Birds	Significant at a local level only. (For details on construction impacts refer to Table 9.4-e in Appendix 9.4).	Not Significant. (For details on operational impacts refer to details refer to Table 9.4-n in Appendix 9.4).
Barn owl	Significant at a local level only. (For details on construction impacts refer to Table 9.4-f in Appendix 9.4).	Not Significant. (For details on operational impacts refer to details refer to Table 9.4-o in Appendix 9.4).
Badger	N/A – no badger evidence recorded.	N/A – no badger evidence recorded.
Bats	Not Significant. (For details on construction impacts refer to Table 9.4-g in Appendix 9.4).	Not Significant. (For details on operational impacts refer to Table 9.4-p in Appendix 9.4).
Water Vole	Not Significant. (For details on construction impacts refer to Table 9.4-h in Appendix 9.4).	Not Significant. (For details on operational impacts refer to Table 9.4-q in Appendix 9.4).
Otter	Significant at a local level only. (For details on construction impacts refer to Table 9.4-i in Appendix 9.4).	Not Significant. (For details on operational impacts refer to Table 9.4-r in Appendix 9.4).
Invertebrates	Not Significant. (For details on construction impacts refer to Table 9.4-j in Appendix 9.4).	Not Significant. (For details on operational impacts refer to Table 9.4-s in Appendix 9.4).

Inter-relationship effects between topics

9.10.3 Individual potential inter-relationship effects on ecological features have been assessed in detail in Tables 9.4-a to 9.4-s in Appendix 9.4. Inter-relationship effects have been considered in light of the significance of these individual effects and their likely interactions in the context of the size and scale of the Scheme.

9.10.4 It is considered that any inter-relationship effects of the Scheme would be **Not Significant** given the design elements and mitigation measures proposed.

Shared use of the A19 Testo's scheme main site compound

9.10.5 As discussed in Section 1.5, in Chapter 1 of this ES, there is the potential that the Scheme could share use of the temporary main site compound for the Testo's scheme for the purpose of general storage, traffic management and office-based administrative purposes. If this was undertaken from the commencement of construction of the Scheme, the area of land take required for the Downhill Lane main site compound could be reduced. There would also be a period where both the Testo's and Downhill Lane junction schemes are being constructed at the same time, followed by a period where only the Scheme is under construction but still using the Testo's scheme main site compound.

9.10.6 There would be no additional land take or significant change in compound activities required for the Testo's main site compound to accommodate use by the Downhill Lane Scheme. Therefore, there would be no addition of temporary agricultural habitat loss or increase in construction activity disturbance to local fauna near the Testo's main site compound; consequently, there would be no change to the ecological effects reported in Chapter 9 of the Testo's Scheme ES.

9.10.7 Though the extended use of the Testo's scheme main site compound would mean a longer presence of disturbance to the local ecology and a delay in restoring the area to agricultural land, these would not be significant as they would remain temporary and a greater benefit is had from the reduction in the temporary land take required by the Downhill Lane Scheme main site compound, north of Downhill Lane (East), for the full duration of the Scheme's construction period. This would provide a positive effect from reducing in the area of habitat loss (mainly arable) and the associated reduction in cumulative effects on species using that habitat, in particular farmland birds, assessed in this ES Chapter 9 for the Scheme.

9.10.8 Therefore, the shared use and extended of the Testo's main site compound would provide a net positive ecological effect.

Cumulative effects

9.10.9 The cumulative effects of the Scheme with other developments are assessed within Chapter 15 of this ES.

CHAPTER 10 GEOLOGY AND SOILS

Executive summary

An assessment of the effects of the construction and operation of the Scheme on the geology and soils of the area was undertaken in accordance with the Design Manual for Roads and Bridges (DMRB) guidance[66], using a generic sensitivity-magnitude-significance methodology. This has allowed the sensitivity of the site to be determined by identifying potential receptors and the effects of the Scheme on those receptors, and has informed the development of appropriate mitigation measures.

The geological and geomorphological features of the local landscape are not highly sensitive to the effects of highway construction and operation. Groundwater resources in the study area are of local importance. An assessment of agricultural land in the study area has shown it all to fall into Agricultural Land Classification Grade 3b, which is of moderate quality. A site investigation has not identified any significant risks associated with existing contaminated land or old mine workings, although such risks cannot be ruled out entirely. In the event that such land is encountered, contaminated soils / excavated materials would be handled, managed and disposed of appropriately.

The potential for adverse effects has been identified, relating to the re-use or disposal of excavated soil, mineral resources, soil deterioration, creation of dust and changes to surface water and groundwater flow regimes. However, with the implementation of relevant mitigation measures, the residual effects on the geology and soils of the site are considered to be slight.

10.1 Introduction

10.1.1 Geology and soils are important factors in determining the environmental character of an area. Underlying rocks are key determinants of landform, while the physical and chemical properties of rocks and the overlying soils influence the type and variety of vegetation that will grow, as well as agricultural quality, flood risk and water-storage capacity. In some cases, historic land uses have resulted in changes to the geology and soils, for instance by introducing contaminants as a result of industrial activity or by replacing or infilling natural strata with waste (landfill).

10.1.2 Highway construction can have a significant effect on soil and geological resources, while the nature and condition of the soils and underlying rocks can be key constraints on a scheme's design.

10.1.3 This chapter addresses the following aspects of geology and soils:

- geology and geomorphology (the structure, origin and development of topographical features of the land; e.g. hills and valleys);
- agricultural land comprising Agricultural Land Classification (ALC) grade and soil resources;
- designated sites (i.e. sites protected by law or policy because of their geological importance);
- mining and mineral extraction;
- soil deterioration and consolidation;
- creation of dust during construction;
- potentially contaminated land; and
- earthworks balance.

10.1.4 It should be noted that earthworks balance is addressed only in brief as this is dealt with in more detail in Chapter 11 (Materials).

10.2 Legislative and policy framework

Legislation

10.2.1 The EIA Regulations implement the requirements of the European Council Environmental Impact Assessment Directive (Directive No. 85/337/EEC as amended by Directive No. 97/11/EC).

10.2.2 Under the EIA Regulations, soil is specifically listed as an aspect of the environment which might be significantly affected by a development and, as such, should be the subject of an EIA. In addition, the regulations also state that consideration should be given to likely significant effects resulting from the use of natural resources (such as rocks and minerals) and the emission of pollutants.

10.2.3 Part 2A of the Environmental Protection Act 1990 sets out the contaminated land regime for the UK, and requires land to be determined as contaminated if it poses an unacceptable risk to human health, controlled waters or the environment. The Scheme is currently subject to an application for a DCO and, as such, Part 2A is not directly relevant. However, the NPPF requires planning policies to make sure that, when land has been remediated as part of a development, the land should not be capable of being determined as contaminated land under Part 2A.

10.2.4 Natural England's '*Guide to assessing development proposals on agricultural land*' (published January 2018) explains that, where significant development of agricultural land is demonstrated to be necessary for a development, local planning authorities should seek to use areas of poorer quality land in preference to land of higher quality. Consultation with Natural England is required on applications for non-agricultural developments if the proposed after-use is for agriculture or where the loss of best and most versatile (BMV) agricultural land will be 20 hectares or more.

10.2.5 The Water Resource Act 1991, as amended, (WRA) regulates surface and ground water resources, water quality and pollution, and flood defences, with Part 2 providing the general structure for the management of water resources.

National policy

10.2.6 National policy relevant to the scope of potential effects on geology and soils is outlined in Table 10.1.

[66] DMRB guidance, Volume 11, Section 3, Part 11 (Geology and Soils), HMSO

Table 10.1: Relevant National Policies

National Policy	Relevant Paragraph	How the policy has been assessed
National Networks National Planning Policy Statement (NNNPS) (Designated January 2015)	Geology and soils are not covered as a specific generic topic in the NNNPS, but are referred to in the following section of the NNNPS: Biodiversity and ecological conservation: **paragraphs 5.20 to 5.38**.	The NNNPS sets out the Government's vision and policy against which the Secretary of State will make decisions on applications for development consent for nationally significant infrastructure projects on the strategic road and rail networks. A full review of the Scheme against the NNNPS is set out in Appendix A of the Planning Statement (DCO application reference TR010024/APP/7.14)
National Planning Policy Framework (NPPF) (July 2018)	**Chapter 15** (Conserving and Enhancing the Natural Environment) – promotes the protection and enhancement of geological conservation interests and soils as well as the remediation and mitigation of despoiled, degraded, derelict, contaminated and unstable land. **Paragraph 170** states that ""*Planning policies and decisions should contribute to and enhance the natural and local environment by: … b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services - including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland; ...*" **Paragraph 179** asserts that "*Where a site is affected by contamination or land stability issues, responsibility for securing safe development rests with the developer and/or landowner".* **Paragraph 178 (a)** states that planning decisions should ensure that: "*the site is suitable for its proposed use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation; after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and adequate site investigation information, prepared by a competent person, is presented*". Footnote 53 (NPPF para 171) says "*Where significant development of agricultural land is demonstrated to be necessary, areas of poorer quality land should be preferred to those of higher quality."* The Glossary at **Annex 2** to the NPPF defines BMV land as land in grades 1, 2 and 3a of the ALC.	Potential effects in relation to agricultural or contaminated land are covered in Section 10.6 of this chapter. Mitigation measures are detailed under Section 10.7 of this chapter.
Planning Practice Guidance (PPG)	Planning Practice Guidance relating to NPPF policies of relevance are included under "*Brownfield land, soils and agricultural land" within "Natural Environment"* paragraphs 024 and 025, *"Land affected by contamination*" paragraphs 001 to 009.	Potential effects in relation to agricultural or contaminated land are covered in Section 10.6 of this chapter. Mitigation measures are detailed under Section 10.7 of this chapter.
A Green Future: Our 25 Year Plan to Improve the Environment (January 2018)	**Chapter 1** (Using and Managing Land Sustainably) – states that new development will be in the right places, delivering maximum economic benefit while taking into account the need to avoid environmental damage, and asserts "We will protect … our best agricultural land."	Potential effects in relation to agricultural land are covered in Section 10.6 of this chapter.

Local policy

10.2.7 Local planning policy relevant to the scope of potential effects on geology and soils is outlined in Table 10.2. There are no policies relevant to the geology and soils topic in the Plan City of Sunderland Unitary Development Plan: Saved Policies (March 2007).

Table 10.2: Relevant Policies within the South Tyneside statutory Development Plan

South Tyneside Local Development Framework	Relevant Policy	How the policy has been addressed
Core Strategy (June 2007)	**Policy ST2 Sustainable Urban Living** "*High quality in sustainable urban living will be promoted by ensuring that:* *H) all new development is encouraged to incorporate biodiversity and geological features at the design stage.*" **Policy EA3 Biodiversity and Geodiversity** "*To optimise conditions for wildlife, implement the Durham Biodiversity Action Plan and tackle habitat fragmentation the council will:* *A secure and enhance the integrity of designated sites;* *B maintain, enhance, restore and add to biodiversity and geological conservation interests;* *C ensure that new development would result in no loss of biodiversity values of the following Priority Habitats:* *i) magnesium limestone grassland;* *ii) coastal sand dunes;* *iii) maritime cliffs and slopes;* *iv) mudflats;* *v) rivers and wetlands;* *vi) species rich neutral grasslands;* *vii) rocky shores;* *D reduce the fragmentation of, improve or extend existing Priority Habitats;* *E create new Priority Habitats, especially in the Habitat Creation Zones of:* *i) Cleadon Hills;* *ii) Downhill;* *iii) River Don Valley;*	Potential effects in relation to contaminated land are covered in Section 10.6 of this chapter. Mitigation measures are detailed in Section 10.7 of this chapter.
	iv) Wardley Colliery; *F protect and strengthen populations of Priority or other protected species;* *G enhance the biodiversity value of wildlife corridors; and* *H where appropriate, restrict access and usage in order to conserve an area's biodiversity value*". **Policy EA5 Environmental Protection** "*To complement the regeneration of the Borough, the Council will control new development so that it:* *A) acts to reduce levels of pollution, environmental risk and nuisance throughout the Borough;* *B) minimises adverse impacts on the Magnesian Limestone Aquifer and its associated groundwater protection zones;* *C) focuses the treatment of contaminated and derelict land so as to achieve a balance between:* *i) the management of risk approach in its Contaminated Land Strategy; and* *ii) the regeneration of the riverside corridor*"	
Development Management Policies (December 2011)	**Policy DM7 Biodiversity and Geodiversity Sites** "*We will protect and enhance the important environmental assets of the borough, including part of the most northerly outcrops of magnesian limestone in the country. We will promote and support high quality schemes that enhance nature conservation and management, preserve and restore historic and natural environmental character, and maximise benefits for geological conservation and the enhancement of biodiversity in line with the Durham Biodiversity Action Plan targets.* *All proposals for development:* *A) must ensure that any individual or cumulative detrimental impacts on sites are avoided; and* *B) will only be permitted where they would not adversely affect the integrity, natural character or biodiversity and geodiversity value of:*	There are no designated geological sites within the study area.

South Tyneside Local Development Framework	Relevant Policy	How the policy has been addressed
	i) designated Sites of Special Scientific Interest; *ii) designated Local Wildlife Sites;* *iii) designated Local Geodiversity Sites;* *iv) designated Local Nature Reserves;* *v) the Cleadon Hills, Boldon Downhill and South Boldon areas of high landscape value and significance;* *vi) Wildlife Corridors; and* *vii) other land that forms part of the borough's strategic green infrastructure; as shown on the Proposals Map.* *Development within or outside these designations will only be approved where the benefits of development clearly outweigh any adverse impact on the site, and any broader impacts on the national network of Sites of Special Scientific Interest. Exceptions will only be made where no reasonable alternatives are available. In such cases, we will use planning conditions and/or planning obligations to mitigate or compensate for the harmful effects of the development, and through good design seek opportunities to incorporate biodiversity and geodiversity features into the development*".	
Site-Specific Allocations and Proposals Map (April 2012)	No relevant policies	N/A

10.3 Assessment methodology

10.3.1 This ES chapter reports on the assessment of effects of the Scheme on the geology and soils of the study area, following guidance provided in DMRB Volume 11, Section 1, Part 6. Where no specific guidance is provided for assessment of particular effects, professional judgement has been used to assess the significance of each effect.

10.3.2 The available guidance does not include methods for determining the magnitude of soil and geology impacts, or for measuring the sensitivity of the receptors to these impacts. There is also no agreed scale against which these factors can be measured. No DMRB guidance is available specifically on the categorisation of effects on ALC grade and soil resources. Therefore, each receptor has been assessed on an individual basis, based on professional judgement. Professional judgement, along with a knowledge of the designated status, quality, nature and extent of geological and soil deposits, has been used to distinguish between significant and insignificant effects, but different levels of significance have not been assessed. This is in line with the approach set out in Chapter 5 (Approach to Assessment) of this ES, based on the DMRB and Highways England's IAN principles, for topics where no published assessment method is available.

10.3.3 Using general descriptions from HA 201/08[67], the proposed level of assessment is a 'simple' assessment due to the anticipated limited potential for effects from / to geology and soils.

10.3.4 The potential for the following effects has been considered:

- risks to human health (construction workers and future site users) from potentially contaminated soils within the study area;
- risks to groundwater and surface water arising from the presence of leachable contamination in soils present within the study area;
- potential loss of or damage to agricultural soils; and
- risks from uncontrolled leaks and spills during construction.

10.3.5 The assessment includes:

- assessing the effects of the Scheme on the baseline conditions in accordance with Model procedures for the management of land contamination (Environment Agency, Contaminated Land Report 11, CLR11) using source – pathway – receptor approach to assessment; and
- identifying mitigation measures required to reduce / eliminate potentially negative effects.

10.3.6 The assessment has considered the following factors:

- presence of any nationally or locally designated geological sites;
- the nature of any contamination present, and how easily and to what extent those contaminants could be mobilised and whether excavated material is potentially chemically suitable for re-use;
- the proximity of any areas of contaminated land within the site to receptors such as local residents, flora, fauna and water bodies and the potential for contamination present to adversely impact identified receptors;
- underlying aquifers; and
- mineral resources and potential to sterilise these deposits.

10.3.7 Effects on agricultural land and soils are likely to be most significant during the construction phase. Where a specific construction effect is identified, further details are given in the text.

10.3.8 Assessment of risk in relation to geotechnics and earthworks has also been considered as the corresponding mitigation measures may have an effect on the soil and geological aspects of

[67] DMRB Volume 11, Section 2, Part 1 – General Principles and Guidance of Environmental Impact Assessment, 2008

the environment. This risk will be managed through the geotechnical reporting, investigation, assessment and certification procedures as detailed in HD 22/08[68].

10.3.9 In addition, there is much overlap with other sections of this ES, which are cross referenced where appropriate, namely in terms of:

- materials and earthworks balance (see Chapter 11, Materials); and
- changes to surface water flows and groundwater regimes (see Chapter 14, Road Drainage and the Water Environment).

Study area

10.3.10 The Scheme focuses on the A19 / A1290 Downhill Lane junction. The study area covers all land within the DCO boundary, and therefore any direct effects on geology and soils within the footprint of both the temporary and permanent works (see Figure 2-1). The assessment has also considered the surrounding soils and geology for sources of contamination up to 250 m beyond the DCO boundary.

Data sources

10.3.11 Information has been gathered from the following sources to identify and assess effects on geology and soils:

- Envirocheck Report by Landmark Information Group (Report Ref. 20098468 June 2006).
- Envirocheck Report: Datasheet by Landmark Information Group (Order No. 71943691, 2015).
- The Coal Authority, Planning Act 2008 Section 42: Duty to Consult on a Proposed Application, October 2017.
- The Coal Authority, Non-residential Coal Mining Report (Report Ref. 00019381-06, June 2006).
- The Coal Authority, Non-Residential Coal Authority Mining Report (2015).
- State Veterinary Service (Ref. Burial Sites, September 2006).
- British Geological Survey, Sheet 21, Sunderland. Solid and Drift (1:50,000 – 1978).
- British Geological Survey, Geology of the Country around Sunderland. Memoir for Geological Sheet 21. (1994).
- A19 Downhill Lane Junction Improvement, Environmental Impact Assessment Scoping Report, Jacobs (April 2017).
- Valuation Office Agency, Mining Subsidence Report (Ref. 1560008, September 2015).
- Agricultural Land Classification report, soil descriptions and map, 'Elliscope Farm' (MAFF, February 1992) supplied by Natural England (October 2014).
- MAGIC.gov website – data on soil types and post 1988 ALC (reviewed March 2018).
- Environment Agency website - http://maps.environment-agency.gov.uk.
- A19 Downhill Lane Junction Improvement, DCO Boundary Proposed Land Usage Plan, Jacobs (2018).
- A19 Downhill Lane Junction Improvement, General Arrangement Plan, Jacobs (2018).

10.3.12 Previous geotechnical studies and investigations concerning the site include:

- Northeast Package B, Testo's Junction Improvement, Preliminary Sources Study Report, Jacobs UK Ltd (Report Ref. B0140300/OD/04 Rev. A, September 2006);
- A19 Testo's Junction Improvement, Boldon, Ground Investigation Final Factual Report, Costain Geotechnical Services (Contract No. 018936/3766, May 2007);
- Northeast Package B, A19 Testo's Junction Improvement, Geotechnical Report, Jacobs UK Ltd, (Report Ref. B0140300/OD/34 Rev. O, March 2007);
- A19 / A184 Testo's Junction Improvement, Ground Investigation Report, Jacobs UK Ltd. (Report Reference B0140300/OD/104 Rev 0, October 2014);
- Report on a Ground Investigation for A19 Testo's and Downhill Lane Junctions Improvements, Soil Engineering, draft (September 2017); and
- A19 / A184 Testo's and A19 Downhill Lane Junction Improvements, Ground Investigation Report, Rev 0.

Consultations

10.3.13 The Coal Authority has been consulted to establish the risk to land stability posed by legacy coal mining. The Coal Authority confirmed that the proposed development site falls within a coalfield, but outside the defined Development High Risk Area. However, the Scheme should consider whether prior extraction of the mineral resource is practicable and viable.

10.3.14 Acorus carried out a visual assessment of the agricultural land within the study area in November 2015. Farmers and land managers with land within the study area were interviewed in September and October 2017, and information was gathered regarding potentially affected farmland, including soil type, land drainage characteristics, cropping regime and likely ALC grade.

10.4 Assessment assumptions and limitations

10.4.1 The findings contained within this section are based on information obtained from a variety of sources, as detailed in Section 10.3 of this ES, which are considered to be reliable. Nevertheless, the authenticity and reliability of the information cannot be guaranteed. Further, it is possible that the research carried out, whilst fully appropriate to meet the requirements of the brief, may not indicate the full extent of conditions across the site and the existence of other important information sources. Assuming such sources exist, their information would not have been used in the formulation of the findings and options presented in this report.

10.4.2 An assessment of the ALC of the areas which would be affected by temporary and permanent land take for the Scheme has been restricted to a desk study of available information, farmer interviews and a visual inspection from the A1290 and Downhill Lane.

10.4.3 At this stage of development of the Scheme, no detailed soil resources investigation has been undertaken of the areas which would be temporarily affected and returned to agriculture on

[68] DMRB, Volume 4, Section 1, Part 2, HD 22/08 Managing Geotechnical Risk. HMSO 2008.

completion of construction of the Scheme. This is considered appropriate in the circumstances of the Scheme, given that the effects on these areas would be temporary.

10.4.4 Finally, none of the potential effects on geology and soils can be predicted with certainty, rather the effects are risks that may or may not occur.

10.5 Baseline conditions

Geology

10.5.1 The superficial geology of the study area is presented in Figure 10.1. The figure shows the site to be underlain by a sequence of deposits, comprising:

- Alluvium (locally present, associated with the River Don);
- Pelaw Clay;
- Tyne and Wear Complex (mainly laminated clay); and
- Durham Lower Boulder Clay.

10.5.2 In addition to the geology recorded on the published geological map, Made Ground associated with the existing road construction was confirmed in the 2017 Soil Engineering ground investigation (hereafter referred to as the 2017 ground investigation) at Downhill Lane carried out between April and June 2017.

10.5.3 The ground investigation encountered Made Ground up to 8 m thick at Downhill Lane junction, although it was more commonly found to be less than 2 m thick. Material descriptions suggest that the Made Ground was reworked natural soils, with much of this material described as slightly sandy, slightly gravelly clay and sandy gravel with slag, concrete and brick fragments and root fragments.

10.5.4 Local to the River Don, the boreholes encountered up to around 3 m of alluvium associated with the watercourse.

10.5.5 Underlying the Made Ground, Pelaw Clay was present, typically at thicknesses of between 2.5 m and 4.5 m. This material was generally described as a firm clay.

10.5.6 The superficial deposits immediately underlying the Pelaw Clay are collectively grouped under the name 'Tyne and Wear Complex'. These deposits were typically round 2 m thick and comprise predominantly laminated silts and clays, with a band of more granular material at the base of the deposit.

10.5.7 The Durham Lower Boulder Clay was situated below the Tyne and Wear Complex. The 2017 ground investigation established this unit as stiff and very stiff, slightly sandy, slightly gravelly clay commonly in the order of 2 m thick.

10.5.8 The bedrock geology of the study area is presented in Figure 10.2. The figure shows the site to be underlain by a sequence of siltstones, mudstones, sandstones and thin coal seams coals of the Pennine Middle and Upper Coal Measures.

10.5.9 Where initially encountered, the recent ground investigation found Coal Measures often comprised residual soil around 0.75 m to 1 m thick, described as slightly sandy, slightly gravelly silt and very dense, sandy gravel. Underlying the residual soil, Coal Measures were described as very weak to strong sandstone, siltstone or mudstone.

10.5.10 The bedrock geological map (Figure 10.2) shows a series of faults in the vicinity of the Scheme route corridor, trending north-west to south-east, which downthrow the strata to the south-west. Additionally, there are a number of north to south trending faults in the area, which downthrow the strata to the east. The amount of displacement was not recorded for any of these faults.

10.5.11 The recent ground investigation broadly confirmed the geological sequence anticipated from published information.

Geomorphology and topography

10.5.12 The topography along the route is relatively flat and lies at an elevation of between approximately 30 m AOD and 40 m AOD.

10.5.13 The River Don flows eastward across the study area, passing under the A19 approximately 150 m north of Downhill Lane Junction. Once east of the A19, the River Don flows in a north-easterly direction towards West Boldon. Boldon Lake is a small artificial lake located approximately 50 m to the north-east of Testo's Junction.

10.5.14 The land rises steeply to around 90 m AOD at Down Hill 1 km east of the study area.

Pedology[69] and Agricultural Land Classification

10.5.15 A Cranfield University Soils Site Report was obtained for the study area[70]. Two soil types were identified in the vicinity of the study area: Aberford and Foggathorpe 1.

10.5.16 The Aberford soil type is present to the east of the A19 at Downhill Lane Junction. It is derived from the underlying Permian limestone, and described as "*shallow, locally brashy well drained calcareous fine loamy soils over limestone.*"

10.5.17 The Foggathorpe 1 soil type underlies the area to the west of the A19 at Downhill Lane junction. It is derived from glaciolacustrine drift and till, and described as "*slowly permeable seasonally waterlogged clayey and fine loamy over clayey soils, often stoneless*."

10.5.18 Provisional and post-1988 ALC maps have been reviewed on the MAGIC map application[71]. The area to the south-east of Downhill Lane junction is classified as Urban, and the area to the north-east and south-west is classified as Grade 3. The area to the west of the A19 has been surveyed in greater detail; the majority of it is classified as Grade 3b, with a small area of Grade 2 following the alignment of the River Don. Grade 3b land lies outside the 'best and most versatile' land category. The agricultural land use reflects the identified soil types and ALC grading: mainly combinable arable crops, such as wheat grown to the south-west and south-east of the junction; and areas of permanent grassland to the north-west and north-east.

Designated sites

10.5.19 There are no nationally designated geological or geomorphological sites in the study area. The closest such site is Hylton Castle Cutting, a SSSI designated for its geological value, located approximately 1.5 km to the south-east of the study area. The site contains exposed fossil beds in Permian limestone, although there is no pathway by which this site could be affected by the Scheme.

[69] Geology is the study of the solid earth, the materials of which it is composed (principally rocks) and the processes by which they evolve. Pedology is more specific – it is the study of soils in the natural environment.

[70] National Soil Resources Institute (2015) Full Soils Site Report for location 434452E, 559768N, 2km x 2km, National Soil Resources Institute, Cranfield University. Available at https://landis.org.uk/sitereporter/ (Accessed October 2017).

[71] Landmark (2017) MAGIC Map [on-line] Available at: http://magic.defra.gov.uk/MagicMap.aspx (Accessed October 2017)

Mining and mineral extraction

10.5.20 The study area is believed to be underlain by mine workings in four seams at between 360 m and 540 m depth. The last recorded date of working of these seams is 1979, and consequent ground movement should have ceased. There are no recorded mine entries within 50 m of the study area.

10.5.21 The Coal Authority has been consulted to establish the risk to land stability posed by legacy coal mining. The letters received in October 2017 and August 2018 state, "*the site falls within the coalfield but the site is outside the defined Development High Risk Area, meaning that the are no recorded coal mining legacy hazards at shallow depth that could pose a risk to land stability*".

10.5.22 Coal encountered during the recent ground investigation was shown to be thin and generally interbedded with mudstone with no evidence of workings.

10.5.23 None of the superficial deposits were identified as potential mineral reserves by the British Geological Society on their mineral resource plan for the area.

Hydrology and hydrogeology

10.5.24 The River Don is the main watercourse within the study area, and flows in an easterly direction. It passes under the A19 to the north of Downhill Lane junction via a culvert, then continues in a northerly direction towards Boldon Bridge. The River Don is classified as a Main River by the Environment Agency. There are no groundwater protection zones within the study area.

10.5.25 The latest (2016) assessment of the River Don, in line with the Water Framework Directive, classifies the river as 'Good' in chemical quality. This is an improvement upon the 'Fail' recorded in 2013 and 2014.

10.5.26 A small Ordinary watercourse flows north-west from Downhill Lane, joining the River Don to the north-east of the A19 Downhill Lane junction.

10.5.27 A pond is located to the north of the electricity sub-station, in the area known as Mount Pleasant Marsh. The 2006 site walkover noted that reeds were also present beside the A184, indicating waterlogged ground. Boldon Lake is located to the north of the A184, approximately 880 m north of the DCO boundary.

10.5.28 The bedrock and superficial (alluvial and glaciolacustrine) deposits underlying the study area are classified by the Environment Agency as a Secondary A aquifer. This means that the bedrock and superficial deposits are capable of supporting water supplies at a local rather than strategic scale, and can form an important source of base flow to rivers.

10.5.29 The Pelaw Clay underlying the study area is classified as unproductive strata due to its low permeability, and has negligible significance for water supply.

Groundwater

10.5.30 Groundwater strikes were encountered in four of the exploratory holes undertaken in the vicinity of the site boundary during the 2017 ground investigation. The depth of water strike varied from 5.6 m below ground level (mbgl) to 15 mbgl and was primarily within the Pennine Upper Coal Measures. One groundwater strike was within gravel.

10.5.31 Monitoring standpipes were installed in 12 of the boreholes in the vicinity of the site boundary during the 2017 ground investigation. Groundwater levels within the superficial deposits were generally 1 - 4 mbgl, though some depths were recorded up to 8.16 mbgl. Groundwater within the Pennine Upper Coal Measures was generally 3.6 to 6.75 mbgl.

10.5.32 A single licensed groundwater abstraction is located 1 km to the north of Downhill Lane junction, within Boldon Business Park. The abstraction draws from the Pennine Upper Coal Measures and is used to supplement the water within Boldon Lake, with a maximum abstraction limit of 218.4 m^3 per day.

Potential sources of contamination

10.5.33 A review of historical maps, Envirocheck data and the Preliminary Risk Assessment[72] identified the following potential contaminative land uses on or adjacent to the site:

- Nissan Plant approximately 150 m south of the site boundary;
- A19 road;
- electricity sub-station approximately 550 m north of the site boundary;
- existing embankment fill – potential for burnt shale;
- former mineral railway line cross-cutting the A1290 and the northern end of the site; and
- licensed waste facilities / historic landfills approximately 250 m south and 300 m north-east of the site boundary.

10.5.34 The 2017 ground investigation, carried out in April and June 2017, encountered Made Ground across the site, generally at thicknesses of up to 2 m, but up to 8 m in one location. The Made Ground was primarily described as sandy gravelly clay with inclusions of brick, sandstone, siltstone, mudstone, ceramics and concrete. A hydrocarbon odour was noted at two boreholes within Made Ground on a slip road near Boston Crescent, Town End, during the 2017 ground investigation. There was no other evidence of visual / olfactory contamination noted in the other 34 exploratory locations undertaken in the 2017 ground investigation.

10.6 Potential effects (without mitigation)

10.6.1 Impacts on geology and soils are likely to cause the most significant effects during the construction of the Scheme. These are described under the sub-headings below.

Designated sites

10.6.2 There were no geologically designated sites within the study area, so there would be no impact on geologically designated sites. Therefore, designated sites are not considered further in this chapter.

Geomorphology and topography

10.6.3 Alteration of the geomorphology and topography through construction of cuttings and embankments would be required to build the Scheme. Embankments are required for the side roads, slip roads and overbridge to enable Downhill Lane to cross the A19 at the junction. Minor cuttings are required at the southern end of the A19.

[72] A19 Testo's Junction Preliminary Risk Assessment, February 2015, Jacobs UK Ltd. Reference B0140300/OD/130.

10.6.4 Further details on the landscape and visual impacts of the cuttings and embankments are considered in Chapter 8 (Landscape and Visual Effects). Therefore, geomorphology and topography are not considered further in this Chapter 10.

Agricultural land

10.6.5 Agricultural land within the DCO boundary is quantified in Table 10-3. For this assessment, the quality of all the Grade 3 land was considered to be Grade 3b.

Table 10-3 Agricultural Land Impact

Grade	Type	Area (ha)
Grade 3/3b	Temporary	12.45
	Permanent	5.83
Urban	Temporary	0.36
	Permanent	11.59

10.6.6 The temporary uses would be for the main site compound, material storage, soil storage and haul routes.

10.6.7 Agricultural activities within the above temporary areas would cease for some or all of the construction period, but those areas would progressively return to agriculture on completion of construction and replacement of soils. The policy in paragraph 5.179 of the NNNPS applies, and protection of soils during construction would be required.

10.6.8 Although included in the draft DCO boundary for acquisition, the intention would be to return these sites to the owner on completion of the restoration, as the sites would have only been used temporarily for the works.

10.6.9 The majority of the permanent land required for the Scheme is occupied by the current A19 corridor and therefore classified as urban. The remainder is occupied by woodland, grassland (some unmanaged) and arable land.

10.6.10 For the purposes of this assessment, in light of the agricultural land classification showing initial indications that all the land was classified as Grade 3b and is not BMV land, the agricultural land and soils encountered in the study area were considered to be of medium sensitivity.

10.6.11 The permanent loss of agricultural land would be limited to that necessitated by the Scheme design. This may be contrasted with the larger area potentially required for temporary works in order to construct the Scheme, including diversion of utility infrastructure. There is no practical alternative to taking the agricultural land, but by using the assessment set out in this ES the overall significance of this effect on a national scale was considered to be low.

Mining and mineral extraction

10.6.12 Historic mineral extraction has been identified by the Coal Authority at significant depth beneath the site.

10.6.13 Overall, the effect of the Scheme on mineral resources within the study area was considered to be insignificant as the Scheme would not prevent future access to these seams.

Soil deterioration and consolidation

10.6.14 It is inevitable that physical and chemical characteristics of soil along the route of the improvement works would be altered during the construction and operation of the Scheme.

10.6.15 During the construction phase, the movement of construction plant would affect the soil characteristics due to the compaction of near-surface soils.

10.6.16 Construction of embankments was also anticipated to impact on the underlying superficial deposits through consolidation due to an increase in vertical load. This would predominantly occur during the construction phase, but a percentage of consolidation would occur during the operational phase.

10.6.17 The width of the embankment footprint is a function of its height, which consequently determines its associated impact on the underlying soils. Compaction and consolidation can restrict root growth and adversely affect the drainage of surface water and groundwater.

Changes to surface water flows and groundwater regimes

10.6.18 Details on the effects in relation to surface water and groundwater are given in Chapter 14 (Road Drainage and the Water Environment). Therefore, changes to surface water flows and groundwater regimes are not considered further in this Chapter 10.

Potential sources of contamination

10.6.19 A number of potential contamination impacts could arise during the construction phase of the Scheme, as listed below:

- disturbance of localised contaminated land and areas of Made Ground;
- mobilisation of contaminants in soil which would otherwise be relatively immobile;
- remobilisation of residual pollutants (i.e. pollutants that are already present, but stable and inactive in their present condition);
- creation of new pollutant pathways (i.e. routes by which pollutants can reach environmental receptors that are vulnerable to their effects (engineering works such as excavations and piling for foundations may have the potential to create new pathways for contamination to reach groundwater or for gases to migrate and build up in other areas));
- creation of potentially contaminated dust and airborne particles;
- potentially contaminated run-off from land, which may also impact upon groundwater and surface water;
- pollution incidents causing contamination of soil, groundwater and/or surface water; and
- construction workers coming into contact with contaminated soils.

10.6.20 It is considered unlikely that there would be significant risks to human health (construction workers) or controlled waters (underlying aquifers, the River Don) associated with land contamination at the site. This is due to:

- desk studies having identified limited potentially contaminative land uses on site;
- it being unlikely that migration of contaminants from off-site sources has occurred; and

- the 2017 ground investigation having identified visual or olfactory evidence of contamination in Made Ground only in a limited area near Town End.

10.6.21 A limited number of potentially significant effects could arise during the operational phase of the Scheme:

- future site users (e.g. maintenance workers, road users, users of adjacent land) potentially being exposed to contaminated material if it remains within the Scheme footprint; and
- poor management of contaminated soils, or importing unsuitable fill material, potentially leading to impacts upon controlled waters (underlying aquifers, the River Don) via leaching of contaminants.

10.6.22 Potential impacts upon surface water quality from the operation of the road are considered further in Chapter 14 (Road Drainage and the Water Environment).

Earthworks balance

10.6.23 The proposed alignment for the Scheme shows there is a net deficit in the earthworks balance (i.e. more fill material is required to construct the Scheme than would be generated by excavation to form cuttings) in the order of 59,625 m^3. The earthworks balance is subject to change as the design develops.

10.6.24 Pulverised fuel ash (PFA), a waste product from coal-fired power stations, may be considered for importing as fill material. The use of such a material has two advantages over imported granular material, such as crushed rock or natural sand and gravel: It does not deplete finite natural resources elsewhere; and it represents a sustainable re-use of what would otherwise be a waste material.

10.6.25 Since PFA is a waste material, its handling, transport and disposal normally requires environmental permits. However, sustainable re-use in certain types of construction projects, including highway improvements, qualifies for an exemption from these requirements. Nevertheless, the use and storage of PFA does require care, especially in windy or wet conditions, to prevent environmental effects. Alternatively, additional fill material may be sourced from nearby brownfield sites or quarries.

10.6.26 The type and source of material to be imported is not yet determined. It should be sourced from a location within economical haulage distance from the site and shall be subject to geotechnical and geo-environmental testing. Import of material would also create additional heavy duty transport movements, which could affect the local highway network.

10.6.27 The assessment of the effects arising from the transport, storage and use of the material resources within the construction site are addressed further in Chapter 11 (Materials) and the impact of construction traffic on the road network in Chapter 13 (People and Communities).

10.7 Design, mitigation and enhancement measures

Agricultural land

10.7.1 The permanent loss of 5.83 ha of Grade 3/3b agricultural land cannot be mitigated in this Scheme. However, surplus topsoil from all areas would be sustainably managed and re-used; this would be in line with the requirements of a Soil Management Plan to be outlined in the CEMP. Suitable outfalls would be provided for severed agricultural land drainage located to the land west of the new highway boundary.

10.7.2 The 12.45 ha of Grade 3/3b land affected by the Scheme's temporary uses would be out of production during part or all of the construction period. However, the land would be returned to agricultural uses on completion of the works. A detailed methodology would be prepared to help manage reinstatement of these areas back to agriculture.

10.7.3 In accordance with the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Defra, 2009), a Soil Resources survey would be used to devise a Soil Management Plan as part of the CEMP and / or Site Waste Management Plan (SWMP). The Soil Management Plan would include measures to achieve careful stewarding of the soil resources during construction, proper restoration of the land and subsequent agricultural aftercare, including any necessary land drainage.

10.7.4 Soil management operations generally would be in accordance with Defra's Good Practice Guide for Handling Soils. The guide is made up of 19 sections which describe various phases and alternative methods of soil handling. The soil management strategy would review these sections and apply more detailed strategies depending on the planned methodologies adopted, but would include:

- stripping of topsoil and subsoil when weather and soil conditions are suitable;
- separate storage and management of topsoil and subsoil stockpiles;
- return of these soils to the original plots, also in separate layers (where possible and where these plots are not occupied by permanent new infrastructure);
- use of appropriate machinery to minimise soil compaction;
- relief of any compaction of restored soils;
- surface ripping and, if necessary, under-drainage of restored sites (subject to other environmental constraints, such as the presence of buried archaeological remains); and
- aftercare of restored soils, including appropriate cropping, for example a temporary grass ley if required, and associated soil nutrient requirements.

Mining and mineral extraction

10.7.5 The effect of the Scheme on mining and mineral extraction is anticipated to be insignificant based on the depths of the identified workings. Therefore, no associated mitigation measures are proposed.

Soil deterioration and consolidation

10.7.6 Appropriate design of the Scheme would seek to reduce the amount of soil consolidated during construction and operation. This includes drainage measures at the toe of embankments to prevent ponding of water.

Potential sources of contamination

10.7.7 Implementation of a Contaminated Land: Applications In Real Environments (CL:AIRE) Materials Management Plan (CL:AIRE, 2014) would mitigate the risks arising from the re-use of site won material or the importation of unsuitable material for use on site. This should significantly reduce the likelihood that receptors (both human health and groundwater) would be affected by contaminated soils on site following construction.

10.7.8 If areas of unexpected contamination were encountered during the construction works, then options for their re-use would be investigated fully. The re-use of any contaminated soils would

be controlled via an Inspection and Discovery Strategy, which is required to form part of a Materials Management Plan. This Inspection and Discovery Strategy would clearly set out the procedures to be followed in the event that unexpected contamination is encountered, including the appropriate assessment and mitigation actions and requirements to consult with regulators. Further information on the impacts upon waste management and re-use of materials (including contaminated soils) is present in Chapter 11 (Materials).

10.7.9 A CEMP would be used on site that would reduce the likelihood of any pollution occurring during the site works. If any pollution incidents occur, the plan would set out methods to mitigate the impact upon the environment.

10.8 Assessment of effects

Agricultural land

10.8.1 Two individual agricultural land receptors have been considered, with impacts identified for both these receptors: agricultural land quality and soil resources. The impacts may be long-term, principally permanent loss of land and soil quality, or short-term, principally remediable soil damage arising from temporary, non-agricultural use of land during the construction period.

10.8.2 Mitigation measures would be provided for the agricultural land receptors where appropriate and feasible. These include design measures to reduce the effects of the proposals and construction management measures aimed at minimising disruption to soil resources. However, these mitigation measures do not reduce the area of land required permanently.

10.8.3 The restoration to agricultural use of temporarily disturbed land required for the construction phase, such as the main site compound area, would result in a reduction in the significance of the overall impact. These measures would include implementing good practice for soil handling, storage, replacement and agricultural aftercare, together with reinstatement of agricultural land drainage systems.

10.8.4 The identification and assessment of effects, taking account of mitigation where appropriate, indicates the residual effect on soil resources and Grade 3b agricultural land to be slight adverse.

Mining and mineral extraction

10.8.5 The residual effect on mining and mineral extraction activities in the area surrounding the Scheme has been assessed as insignificant.

Soil deterioration and consolidation

10.8.6 Following the implementation of precautionary measures, as detailed in Section 10.7, any effects on the quality and nature of the soils are likely to be local to the Scheme in extent. Therefore, the residual effect is considered to be insignificant.

Potential sources of contamination

10.8.7 Given the proposed mitigation measures and the low potential for encountering significant contamination on site, the residual risk from land contamination is considered to be insignificant.

Shared use of the A19 Testo's scheme main site compound

10.8.8 As discussed in Section 1.5, in Chapter 1 of this ES, there is the potential that the Scheme could share use of the temporary main site compound for the Testo's scheme for the purpose of general storage, traffic management and office-based administrative purposes. If this was undertaken from the commencement of construction of the Scheme, the area of land take required for the Downhill Lane main site compound could be reduced. There would also be a period where both the Testo's and Downhill Lane junction schemes are being constructed at the same time, followed by a period where only the Scheme is under construction but still using the Testo's scheme main site compound.

10.8.9 There would be no additional land take or significant change in compound activities required for the Testo's main site compound to accommodate use by the Downhill Lane Scheme, so there would be no increase in temporary agricultural land loss and other soils or geology effects outlined in Chapter 10 of the Testo's Scheme ES.

10.8.10 Though the extended use of the Testo's scheme main site compound would mean a longer duration of exposing soils and geology receptors to pollution risks from the Testo's compound, these would not be significant due to continued application of good construction practices (e.g. CEMP pollution controls) and the reduction of construction activity in the Testo's compound to mainly low risk general storage, traffic management and office-based administrative purposes.

10.8.11 However, use of the Testo's Scheme main site compound would enable a reduction in the temporary land take required by the Downhill Lane Scheme main site compound, north of Downhill Lane (East). This would provide a positive effect from reducing the area of Grade 3b agricultural land temporarily lost and temporary construction effects on soils and geology that would have otherwise been needed to create the larger standalone Downhill Lane Scheme main site compound assessed in this ES Chapter 10 for the Scheme.

10.8.12 Therefore, the shared use and extended of the Testo's main site compound would provide a net positive effect on soils and geology, especially the net reduction in temporary loss of Grade 3b agricultural land.

Inter-relationship effects between topics

10.8.13 A review of the receptors identified within this chapter has been undertaken to consider the potential for effects from inter-relationships with other topics, such as dust emissions (Chapter 6, Air Quality) affecting agricultural land. It has been concluded that the potential for inter-relationship effects on the relevant receptors are fully identified within the chapter and that no additional effects would occur.

Cumulative effects

10.8.14 The cumulative effects of the Scheme with other developments are assessed within Chapter 15 of this ES.

CHAPTER 11 MATERIALS

Executive summary

This chapter addresses the potential environmental effects associated with the use of material resources and the management of waste in accordance with Highways England guidance as detailed within the Scoping report. The assessment focuses on the construction phase of the Scheme. Operational effects in terms of resource use and waste generation during maintenance are likely to be insignificant as they would be similar to the status-quo as the Scheme alters an existing junction.

In summary, effects relating to material resources for the Scheme would be of a minor magnitude, and for wastes would be of minor to slight adverse significance.

By applying key sustainability and waste management principles, such as the waste management hierarchy, the effects on natural resources and the need for disposal of wastes would be reduced. In particular, this would be achieved by re-using existing soils and infrastructure, where feasible, taking into consideration the embodied carbon and water impacts of products, and sourcing materials from local suppliers as much as possible.

It is anticipated that the effects would reduce with the implementation of mitigation measures such as a Construction Environmental Management Plan (CEMP), which would include a Site Waste Management Plan (SWMP), a Materials Management Plan in accordance with CL:AIRE and a Soils Management Plan.

There are links between topics, with effects resulting from the storage and transportation of materials and waste also addressed in the following chapters: Chapter 6 (Air Quality); Chapter 9 (Ecology and Nature Conservation); Chapter 10 (Geology and Soils); Chapter 12 (Noise and Vibration); and Chapter 13 (People and Communities).

11.1 Introduction

11.1.1 The Design Manual for Roads and Bridges (DMRB) Volume 11, Section 2, Part 5, HD205/08 (DMRB HD205/08) (Highways Agency et al, 2008)[73], and Interim Advice Note (IAN) 153/11 (Highways Agency et al, 2011)[74] were proposed as references for the Materials assessment during Scoping. The IAN provides guidance on certain aspects of the scope only and does not provide a method of assessment of impacts; in consequence, the methods specified in the IAN were supplemented by advice given in unpublished draft guidance provided by Highways England.

11.1.2 For the purposes of this assessment, the 'Materials' topic is defined as comprising the:

- use of material resources; and
- generation and management of waste and the effect on waste management infrastructure.

Material resources

11.1.3 Material resources include primary raw materials, such as aggregates and minerals, and secondary manufactured products, such as recycled aggregates, PFA and plastics. Material resources may originate off-site (purchased as construction products) or on-site (such as excavated soils or recycled road planings).

11.1.4 Road schemes generally require both primary raw materials and secondary manufactured products. The production, sourcing, transport, handling, storage and use of these materials, as well as the disposal of any surplus materials, have the potential to adversely affect the environment.

11.1.5 The beneficial on-site re-use of materials arising during construction can prevent materials from becoming waste. It can also avoid the impacts associated with the transport and disposal of the material off-site. Beneficial re-use of unwanted material on another construction site avoids the impacts associated with disposal of the material. In both cases the depletion of finite primary material resources is reduced.

Generation and management of waste

11.1.6 In considering material resource use and waste management, it is important to define when, under current legislation and understanding, a material is considered to be a waste. Current law in England and Wales defines waste as any substance, or object, that the producer or holder discards, intends to discard or is required to discard[75,76,77].

11.1.7 Waste can arise from materials that exist on site in advance of construction, but are not required or suitable for use in the Scheme, as well as from materials brought to site for construction that are not used (such as offcuts, damaged items and surplus).

11.1.8 Some types of waste are harmful to human health or to the environment, either immediately or over an extended period of time. These are defined as hazardous wastes.

11.1.9 Once a material has become waste, it remains a waste until it has been fully recovered and no longer poses a potential threat to the environment or to human health, at which point it is no longer subject to the controls required by the Waste Framework Directive[75]. These principles are applied by the Environment Agency to waste used as aggregate / construction material in civil engineering applications.

11.1.10 Construction, demolition and excavation wastes currently account for more than four times as much waste as domestic waste from all UK households combined[78].

11.2 Legislative and policy framework

11.2.1 The current key directives, acts, regulations and policies relevant to this assessment and to the sustainable design and construction of the Scheme are:

- National Policy Statement for National Networks (NPS), 2015;
- National Planning Policy Framework (NPPF), 2018;
- Highways Agency Strategic Plan, 2010 – 2015;
- Highways Agency Environment Strategy, 2010 – 2015;
- Highways Agency Sustainable Development Plan, 2012 – 2015;

73 Highways Agency et al., (2008). Design Manual for Roads and Bridges Volume 11, Section 2, Part 5, HD205/08. The Highways Agency, Scottish Government, Welsh Assembly Government and The Department of Regional Development Northern Ireland
74 Highways Agency et al. (2011). Interim Advice Note (IAN) 153/11 Guidance on the Environmental Assessment of Material Resources
75 European Commission (2006) The Waste Framework Directive (Directive 2006/12/EC of the European Parliament and of the Council) as amended by: European Directive (2008) on Waste (Directive 2008/98/EC of the European Parliament and of the Council)
76 Waste (England and Wales) Regulations 2011 (and associated revised Waste Duty of Care: Code of Practice– March 2016)
77 The Waste (England and Wales) (Amendment) Regulations 2012
78 Department for Environment Food and Rural Affairs (2017). Digest of Waste and Resource Statistics.

- Highways Agency Procurement Strategy, 2009;
- South Tyneside statutory Development Plan: Core Strategy, 2007;
- Sunderland statutory Development Plan: City of Sunderland Unitary Development Plan: Saved Policies, 2007;
- Waste Strategy for England, 2007;
- Waste Framework Directive, 2008;
- Government Review of Waste Policy in England, 2011;
- Waste (England and Wales) Regulations, 2011;
- The Waste (England and Wales) (Amendment) Regulations, 2012;
- Waste Management Plan for England, 2013;
- Environmental Permitting (England and Wales) Regulations, 2016; and
- National Planning Policy for Waste, 2014 (supersedes the Waste Strategy for England, 2007).

11.2.2 A review of legislation and policy has identified the following principal statutory and policy requirements (Table 11-1) influencing materials resource use and waste management during construction projects that are applicable to the Scheme.

Table 11-1 Summary of legislation and policy requirements

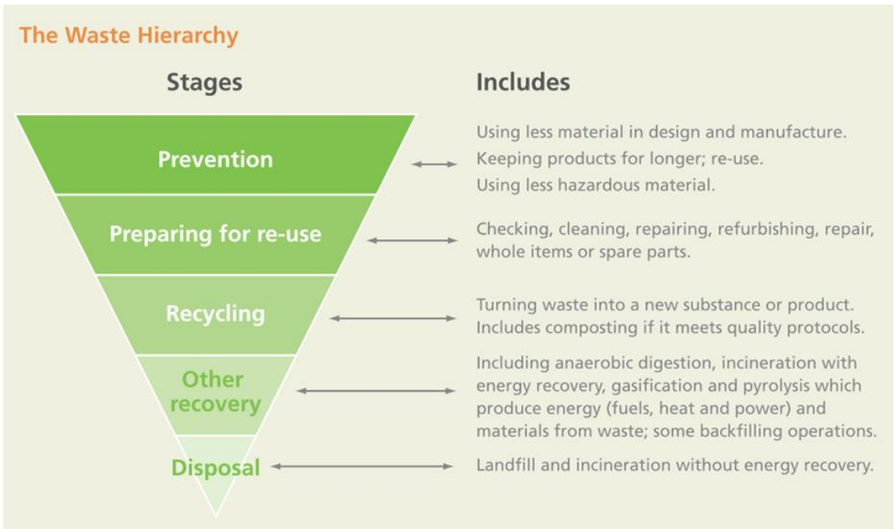
Legislation/ Policy	Relevant Section	How the policy has been addressed
Waste (England and Wales) Regulations 2011 and National Policy Statement for National Networks 2014	**Paragraphs 5.39 to 5.45** The NPS sets out the Government's vision and policy against which the Secretary of State will make decisions on applications for development consent for nationally significant infrastructure projects on the strategic road and rail networks. Includes requirements for taking all reasonable steps to apply the following waste management hierarchy when transferring waste: (a) prevention; (b) preparing for re-use; (c) recycling; (d) other recovery (for example energy recovery); (e) disposal.	A full review of the Scheme against the NPS is set out in Appendix A of the Planning Statement (DCO application reference TR010024/APP/7.1). Consideration has been given to this when developing mitigation in section 11.7 of this ES.
National Planning Policy for Waste 2014	*All* *Including:* *"Helping to secure the re-use, recovery or disposal of waste without endangering human health and without harming the environment."* *"The handling of waste arising from the construction and operation of development maximises reuse/recovery opportunities, and minimises off-site disposal."*	Consideration has been given to this when developing mitigation in Section 11.7 of this ES chapter.
National Planning Policy Framework (NPPF, July 2018)	**Paragraph 203**." …minerals are a finite natural resource, …, best use needs to be made of them to secure their long-term conservation." **Paragraph 204**. "*Planning policies should:* *b) so far as practicable, take account of the contribution that substitute or secondary and recycled materials and minerals waste would make to the supply of materials, before considering extraction of primary materials, whilst aiming to source minerals supplies indigenously;* *c) safeguard mineral resources …,*"	Consideration has been given to this when developing mitigation in Section 11.7 of this ES chapter.
Planning Practice Guidance (PPG)	**"Waste" paragraphs 001 - 056.**	Consideration has been given to this when developing mitigation in Section 11.7 of this ES chapter.
South Tyneside Local Development Framework: Core Strategy (June 2007)	**Policy EA6 Planning for Waste** *"To integrate waste management into the creation of more sustainable communities throughout the Borough the Council will:* *D) require major proposals and those generating significant volumes of waste to incorporate an appropriate level of waste sorting, recovery and recycling facilities…"*	Consideration of this has been included in Section 11.5 of this ES chapter.

Legislation/ Policy	Relevant Section	How the policy has been addressed
Sunderland statutory Development Plan: City of Sunderland Unitary Development Plan: Saved Policies (March 2007)	**Policy M4** *"The city council will encourage the use of secondary/ recycled aggregates in preference to primary aggregates wherever economically and technically feasible".*	Consideration has been given to this when developing mitigation in Section 11.7 of this ES chapter.
Highways Agency Procurement Strategy 2009	**P20** 25 % (minimum) of products used in construction projects to be from schemes recognised for responsible (sustainable) sourcing by 2012.	The targets will be included within the project CEMP, as detailed within Section 11.7 of this ES chapter.
Waste Management Plan for England[79]	Target derived from the Waste Framework Directive. By 2020, the recovery of non-hazardous construction and demolition waste shall be increased to a minimum of 70% by weight.	The targets will be included within the project CEMP, and SWMP as detailed within Section 11.7 of this ES chapter.

11.2.3 The Government removed the statutory requirement for Site Waste Management Plans (SWMP) in 2013. However, as the use of SWMPs is considered good practice, any requirements to manage demolition and construction wastes in an appropriate manner, and in accordance with the waste hierarchy, would be met and secured by using a SWMP. This approach is consistent with the guidance in the National Policy Statement for National Networks (Department for Transport, December 2014)[80] to implement sustainable waste management through the application of the waste hierarchy.

11.2.4 Article 28 of the European Union's revised Waste Framework Directive sets the basic concepts and definitions related to waste management and provides waste management principles[81]. It requires that, as a priority, Member States apply the waste management hierarchy (Illustration 11.1) and make sure that their competent authorities establish one or more waste management plans covering all of their territory[82].

Illustration 11 .1 Waste management hierarchy[83]



11.3 Assessment approach and method

Impact assessment

11.3.1 The assessment of potential impacts has been undertaken with consideration of:

Materials

- assessment against regulatory and policy drivers;
- assessment against embodied carbon; and
- materials re-use / recycling / recovery.

Waste

- assessment against regulatory and policy drivers;
- waste prevention, re-use, recycling and recovery; and
- waste classification, volumes and disposal routes.

Data sources

11.3.2 The following sources of information have been consulted to inform the assessment of baseline conditions and potential environmental impacts:

79 Waste Management Plan for England (2013) https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/265810/pb14100-waste-management-plan-20131213.pdf

80 Department for Transport (December 2014) Draft National Policy Statement for National Networks

81 European Commission. (2014). *Environment.* Directive 2008/98/EC on waste (Waste Framework Directive). Accessed on 12 October 2014 from http://ec.europa.eu/environment/waste/framework/

82 Department for Environment Food and Rural Affairs. (2013). *Waste Management Plan for England Post Adoption Statement*. December 2013. Accessed on 12 October 2014 from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/265543/pb14101-waste-manage-post-adopt-20131212.pdf

83 Source: Department for Environment Food and Rural Affairs. (2011). Government Review of Waste Policy in England 2011. The Case for Action. Crown copyright, London. Page 11.

- A19 Downhill Lane Junction Improvement: Preliminary Environmental Information, Highways England (2017); and
- design information (locations, indicative land take proposals, estimates of materials quantities, cut and fill balance) provided by Costain and Jacobs.

Study area

11.3.3 There is no fixed study area for this topic contained within IAN 153/11 and there is no topic specific DMRB guidance for Materials. Therefore, the study area was determined using professional judgement of the likely sources of waste and material uses. The 'site' was considered to include the full area of the permanent works for the Scheme, together with any land required temporarily during construction, as outlined by the DCO boundary shown on Figure 2.4. Such temporary land includes the main site compound, temporary storage areas for soils and other materials, haul-roads, and land for temporary construction site drainage and service diversions.

11.3.4 Statutory services that require diversion include telecommunications equipment located to the west of Downhill Lane junction, on Downhill Lane (west), due to the realignment of the Downhill Lane (west) and A1290 junction. These services would be diverted to new routes, if required, within the DCO boundary outlined for the Scheme on Figure 2.4.

11.3.5 For defining the study area for the assessment, potential sources of materials (such as quarries) and waste management facilities outside the boundaries of the construction site were considered on a sub-regional basis (Tyne and Wear consisting of the five metropolitan boroughs of South Tyneside, North Tyneside, City of Newcastle upon Tyne, Gateshead and City of Sunderland) to provide suitable context.

Scope

11.3.6 This chapter focuses on the assessment of impacts arising from the transport, storage and use of material resources within the construction site, and the production, movement, transport, processing and disposal of wastes.

11.3.7 The Scheme is currently at Project Control Framework (PCF) Stage 3 – Preliminary Design, so there remains some uncertainties and limitations regarding estimations of quantities materials and their sources. However, an assessment in accordance with the 'Detailed Assessment' approach has been undertaken and uncertainties in the assessment are presented. Whilst the materials assessment has been undertaken using preliminary estimates of the use of materials, expected waste production has not yet been quantified and professional judgement has been used for qualitative assessment for wastes, as appropriate.

11.3.8 The operational effects of the Scheme, associated with ongoing maintenance works, would be relatively unchanged compared to the existing situation, as the Scheme involves improvement of an existing road junction.

11.3.9 Existing maintenance activities include inspection and repair of barriers and signage, drain inspection and clearance, road repairs and road verge / vegetation maintenance (amongst other activities). For Highways England and parties acting on their behalf, future maintenance activities would include these same tasks, plus the addition of inspection and maintenance of bridges and balancing bonds, including any oil interceptors. Statutory undertakers would retain permanent access corridors for maintenance of the buried services.

11.3.10 In terms of materials resources and waste generation, operational effects were considered likely to be insignificant and so were scoped out of the assessment.

Methodology

Materials

11.3.11 In terms of materials resource depletion there is no guidance given in either DMRB HD205/08 or IAN 153/11 for assessment of significance of impact in relation to this topic. Therefore, the assessment for materials was based on the quantification of the carbon footprint of the materials, including transport used as a proxy for other environmental effects, as set out in draft DRMB guidance on materials assessment which is currently unpublished.

11.3.12 The methodology in the draft guidance provided by Highways England does not include sensitivity criteria for the carbon footprint assessment, which would need to be accounted for in order to derive the significance of any effect, and only magnitude was used to describe the impact. Levels of magnitude are defined in Table 11-2:

Table 11-2 Materials (Carbon) assessment magnitude criteria

Scale of Impact Magnitude	Total CO_2 Equivalent (CO_2e) of Materials (tonnes)
No change	<1,000
Negligible	1,000 – 5,000
Minor	5,000 – 20,000
Moderate	20,000 – 40,000
Major	>40,000

11.3.13 The magnitude of impacts associated with material use for the design has been derived from a calculation of embodied carbon associated with those materials known to be required for the construction of the Scheme using Highways England's Carbon Tool[84].

Waste

11.3.14 The published guidance (DMRB HD205/08 and IAN 153/11) also does not provide definitions for receptor sensitivity or significance of impact in relation to waste. However, the draft unpublished guidance on waste assessment provided by Highways England does provide assessment methodology for sensitivity, magnitude and significance criteria for this topic.

11.3.15 In accordance with this method, sensitivity has been determined on the basis of capacity, as follows:

- Very High - There is no available waste management capacity for any waste arising from the Scheme.
- High - There is limited waste management capacity in relation to the forecast waste arising from the Scheme.
- Medium - There is adequate waste management capacity for the majority of wastes arising from the Scheme.

[84] https://www.gov.uk/government/publications/carbon-tool

- Low - There is adequate available waste management capacity for all wastes arising from the Scheme.

11.3.16 Magnitude is then defined as follows:

- Major - Waste would be predominantly disposed of to landfill or to incineration without energy recovery, with little or no prior segregation.
- Moderate - Wastes would be predominantly disposed of by incineration with energy recovery.
- Minor - Wastes would be predominantly segregated and sent for composting, recycling or for further segregation and sorting at a materials recovery facility.
- Negligible - Wastes would be predominantly re-used on-site or at an appropriately licensed or registered exempt site elsewhere.

11.3.17 Determination of the sensitivity of waste management facilities is based on the available local waste management permitted capacity. For example, a high sensitivity waste management operation (or even the whole waste management infrastructure in the area) could be considered to have very limited permitted capacity for the waste type requiring treatment / disposal. This may be particularly true of hazardous or difficult wastes where local capacity may be limited. Low sensitivity operations / local infrastructure could be considered to be large, or numerous waste management sites with plenty of permitted capacity to deal with the waste arisings.

11.3.18 Significance is derived by combining sensitivity and magnitude as in Table 11-3.

Table 11-3: Determination of significance of effects

		Sensitivity / Value of Receptor			
		Very High	**High**	**Medium**	**Low**
Magnitude	**Major**	Very Large	Large / Very Large	Moderate / Large	Slight / Moderate
	Moderate	Large / Very Large	Moderate / Large	Moderate	Slight
	Minor	Moderate / Large	Slight / Moderate	Slight	Neutral / Slight
	Negligible	Slight	Slight	Neutral / Slight	Neutral

11.4 Assessment assumptions and limitations

11.4.1 The level of detail with regards to materials required for and wastes to be produced by the Scheme was limited by the design information currently available. Therefore, estimates may need to be refined at later stages in the design development process when further information is available during pre-construction preparation or during the construction period.

11.4.2 The Scheme is at PCF Stage 3 - Preliminary Design and a detailed assessment has been undertaken, but limitations on the availability of design information should be taken into account such as the exact sources / origins of materials. Whilst the materials assessment has been undertaken using preliminary estimates of the use of materials, expected waste production has not yet been quantified and professional judgement has been used for qualitative assessment for wastes, as appropriate.

11.4.3 Baseline information, impacts and mitigation are described based on known information; however, some relevant aspects may not be finalised until later stages (during pre-construction preparation or during the construction period). This limitation is accepted within the DMRB guidance.

11.4.4 Information on the permitted capacity of quarries and waste facilities is provided in Section 11.5 of this ES chapter, but it should be noted that changes to this permitted capacity, both before and during the construction of the Scheme, cannot be determined at this stage. Available capacities are also not known as these are likely to be commercially confidential.

11.4.5 Some environmental impacts associated with the extraction and transport of primary raw materials and manufactured products would occur off-site and, in some cases, potentially outside the UK. The source and processing/manufacture cannot be determined at this stage and the production of these materials is likely to have been the subject of separate consent procedures (such as applications for planning permission or environmental permits), which may have included environmental assessment. Therefore, it is outside the scope of this assessment to consider the environmental impacts associated with the extraction of raw materials and the processing and/or manufacture of products.

11.5 Baseline conditions

11.5.1 Based on the current programme, the Scheme is anticipated to be in construction from 2020 to 2022 and will, for a period, be concurrent with the development of the Testo's Scheme. Baseline conditions have been determined, where possible, according to conditions likely to occur at the commencement of construction rather than the conditions that occur at the time of publication of this assessment via consideration of future trends.

Potential receptors

11.5.2 Receptor types likely to be subject to impacts under this topic heading include:

- quarries and other sources of minerals and other finite raw material resources; and
- landfill capacity and other waste treatment/ disposal facilities.

Material resources

11.5.3 The materials to be used would comprise:

- primary raw materials;
- secondary / recycled raw materials; and
- manufactured/ processed materials.

11.5.4 There are several potential sources of key project materials in the Tyne and Wear area; some of these are identified in the following sections. It is likely that some of the Scheme materials (e.g. bulk fill material, graded aggregates) would be sourced from the Tyne and Wear area. Other materials (e.g. steel) are likely to be sourced from outside the area.

Primary raw materials

11.5.5 Primary raw materials are those in an unprocessed (or minimally processed) state. In relation to road construction, the principal raw materials are aggregates. Most construction aggregates

are produced from hard, strong rock formations by crushing to produce crushed rock aggregate or from naturally occurring particulate deposits, such as sand and gravel. The most important sources of crushed rock in Britain are limestone (including dolomite), igneous rock and sandstone. Sand and gravel can be either land-won or marine dredged.

11.5.6 The Scheme would be located centrally within Tyne and Wear. The Joint Local Aggregates Assessment (LAA) for County Durham, Northumberland and Tyne and Wear (April 2018) has identified that the geology within Tyne and Wear gives rise to primary aggregates from Permian Magnesian Limestone and Sand and Gravel.

11.5.7 The Joint LAA identified two active aggregate mineral quarries in Tyne and Wear; see Table 11-4.

Table 11-4: Sites with planning permission for aggregate extraction in Tyne and Wear

Quarry	Location and post code	Operator	Distance by Road	Mineral	Planning status at 31 December 2014	Expiry date for extraction
Eppleton Quarry	Hetton le Hole, Sunderland DH5 9AR	Eppleton Products Ltd	14.9 km	Magnesian Limestone and Basal Permian Sand	Active	Extension granted (2015) for 25 years from commencement of development.
Marsden Quarry	Whitburn SR6 7NG	Owen Pugh	12.0 km	Magnesian Limestone	Active	2027

11.5.8 The Marsden Quarry in South Tyneside is a relatively hard, crystalline limestone and is capable of producing higher grades of aggregate materials suitable for roadbase usage or concreting aggregates.

11.5.9 Joint LAA identified Tyne and Wear to be a major source of demand for, and a net importer of, crushed rock aggregate and sand and gravel from quarries in north-east England. This demand is largely met by production from quarries within Tyne and Wear, combined with intra-regional imports from Northumberland, County Durham and marine dredged sand and gravel landed at wharfs in Tyne and Wear. Although a major importer the Joint LAA concludes Tyne and Wear has permitted reserves of crushed rock to meet demand to 2032.

11.5.10 Marine dredged sand and gravel makes a significant contribution to the overall provision of sand and gravel in north-east England, particularly in terms of provision to Tyne and Wear where there are four associated wharves listed in Table 11-5. It is anticipated that this supply would likely be maintained for the proposed construction years (2020 – 2021).

Table 11-5: Wharves for the importation of aggregate minerals in Tyne and Wear

Site	Location and post code	Operator	Distance by Road	Mineral	Planning status in 2014
Gateshead Wharf	Gateshead NE10 0SB	Lafarge Tarmac	8.5 km	Sand and Gravel	Inactive
Hayhole Road Wharf	Northumberland Dock Rd, North Shields, Wallsend NE28 0PB	Northumbrian Roads / Stema Shipping	9 km	Igneous Rock	Active
Howdon Wharf	North Shields, North Tyneside NE8 3AE	Lafarge Tarmac	10.0 km	Sand and Gravel	Inactive
Jarrow Wharf	South Shields, South Tyneside NE32 3DX	Cemex	6.5 km	Sand and Gravel	Active
Sunderland (Greenwells Quay) Wharf	Sunderland SR1 2BU	Northumbrian Roads	9.9 km	Sand and Gravel	Active
Port of Tyne	Maritime House, South Shields NE34 9PT	Aggregate Industries	5.5 km	Igneous rock	Active

11.5.11 The sources of key materials to be used on the Scheme are not defined in detail but, based on the above evidence of availability of materials in Tyne and Wear and the wider region, it is not anticipated that the baseline availability of primary materials required for the Scheme would be significantly affected by the material requirements of the Testo's scheme.

Secondary raw materials and reused / recycled materials

11.5.12 Secondary raw materials / aggregates are defined as those produced as a by-product of other quarrying and mining operations, such as china clay waste, slate waste and colliery spoil (minestone), or as a by-product of other industrial processes, such as blast furnace/steel slag, PFA, coal-fired power station ash, incinerator ash and spent foundry sand.

11.5.13 Recycled aggregates arise from various sources, including demolition or construction of buildings and structures, or from civil engineering works. Other forms of recycled aggregate include asphalt planings, from resurfacing roads, and railway track ballast. 'Recycling' involves the removal of deleterious materials, such as fines, wood, plastic or metal and processing by crushing and screening as required for reuse, often for less demanding applications than the original material was used for. Once a material is processed into a saleable product it becomes a resource rather than a 'waste.'

11.5.14 The Joint LAA identified the key sources of secondary aggregate for the area to comprise ash from Lynemouth Power Station in Northumberland and colliery spoil from the former Eppleton Colliery site in Sunderland (although it should be noted that future supply from Lynemouth Power Station is uncertain due to plans for conversion to biomass and prevented exports during the reported 2016 year). Important sources of materials suitable for secondary aggregates are also found in the Tees Valley sub-region to the south of the Joint LAA area. Within the Joint LAA area, materials available for use as recycled aggregate are most commonly construction, demolition and excavation waste and road planings.

11.5.15 The Joint LAA identified six fixed recycled and secondary aggregate sites within Tyne and Wear. These are listed in Table 11-6.

Table 11-6: Recycled and secondary aggregate sites in Tyne and Wear

Site	Location	Distance by Road	Operator
Eppleton Quarry	Hetton le Hole	14.9 km	Eppleton Quarry Products
Hudson Dock	Sunderland	10.4 km	Northumbrian Roads
Marsden Quarry	Whitburn Owen	12.0 km	Owen Pugh
Newburn	Newburn, Newcastle upon Tyne	20.5 km	MGL Group
Springwell Quarry	Washington	9.0 km	W & M Thompson
Stephenson Street Willington Quay G O'Brien	Stephenson Street Willington Quay	8.5 km	G O'Brien

11.5.16 A summary of the quantities of materials produced in Tyne and Wear (assessed via sales) is provided within Table 11-7.

Table 11-7: Sales of recycled and secondary aggregates in Tyne and Wear, 2016.

	Sales within Tyne and Wear (000s tonnes)
Construction and demotion waste	271
Road planings	16
Spent railway ballast	20

11.5.17 It is anticipated that the supply of both recycled and secondary aggregates is likely to continue at similar levels for the proposed construction of approximately 3 years and that sufficient capacity, and market flexibility exists for provision to the Scheme.

Manufactured materials

11.5.18 Manufactured materials are those products that have been converted from a raw material into a finished product. Key manufactured materials associated with road construction projects include concrete, steel and macadam.

11.5.19 Manufacture of concrete uses aggregates and cement. Raw materials associated with cement production can include limestone and clay gypsum. Manufacture of steel primarily involves iron and carbon. Manufacture of macadam uses aggregate and bitumen. The primary raw materials associated with bitumen production are crude oil and aggregate.

11.5.20 A large number of concrete batching and coating plants located in Tyne and Wear were identified in the Joint LAA.

11.5.21 The site is located close to A-road infrastructure capable of accommodating vehicle movements for the transportation of manufactured materials.

Waste

Key waste arisings

11.5.22 The key waste arisings anticipated to be generated during construction include:

- non-hazardous demolition and excavation waste;
- non-hazardous construction waste;
- vegetation - green waste from site clearance; and
- municipal wastes – from workforce bins.

11.5.23 Further detail on the types of waste anticipated is provided in Table 11-12. All waste arisings would be managed in accordance with the waste hierarchy where feasible. It is possible that the Scheme may generate some hazardous demolition and excavation waste. This would be managed in accordance with relevant legislation and good practice. A high landfill-diversion rate is anticipated for non-hazardous waste arisings and where possible priority will be given for waste management options higher up the waste hierarchy.

Existing landfill capacity

11.5.24 Data obtained from the UK Government (DEFRA Waste Management Information) indicates that, for the year 2016 (the most recent data available)[85], there was a total permitted landfill capacity of approximately 7.1 million cubic metres in the Tyne and Wear area, with approximately a total of 32 million cubic metres of landfill capacity in the north-east of England. It should be noted that while there is no hazardous waste landfill capacity within the Tyne and Wear area, there is approximately 7 million cubic metres in the north-east of England. This is summarised in Table 11-8 below.

Table 11-8: North-east permitted landfill capacity in 2016

Landfill Type	Sub-region (000s cubic metres)				NORTH EAST
	Durham	Northumb-erland	Tees Valley Unitary Authorities	Tyne & Wear	
Hazardous Merchant	-	-	6,985	-	6,985
Hazardous Restricted	-	-	-	-	-
Non Hazardous with Stable Non-Reactive Hazardous Waste cell*	2,065	1,220	1,000	-	4,285
Non Hazardous	1,700	16	3,562	5,483	10,761
Non Hazardous Restricted	-	-	-	-	-
Inert	7,340	1,205	-	1,692	10,237

[85] DEFRA Waste Management for England 2016 https://www.gov.uk/government/publications/waste-management-for-england-2016 Most up to date information available accessed October 2018.

Landfill Type	Sub-region (000s cubic metres)				NORTH EAST
	Durham	Northumb-erland	Tees Valley Unitary Authorities	Tyne & Wear	
Total	11,105	2,441	11,547	7,175	32,268

11.5.25 The DEFRA data indicates an overall trend for decreasing landfill capacity within the Tyne and Wear area, mirroring a similar situation for the north-east of England and the UK as a whole, as landfill capacity has been falling in recent years, refer to Illustrations 11.2 and 11.3.

Illustration 11.2: North-east landfill capacity trends 2008 - 2016 (000s cubic metres) Inert landfill:

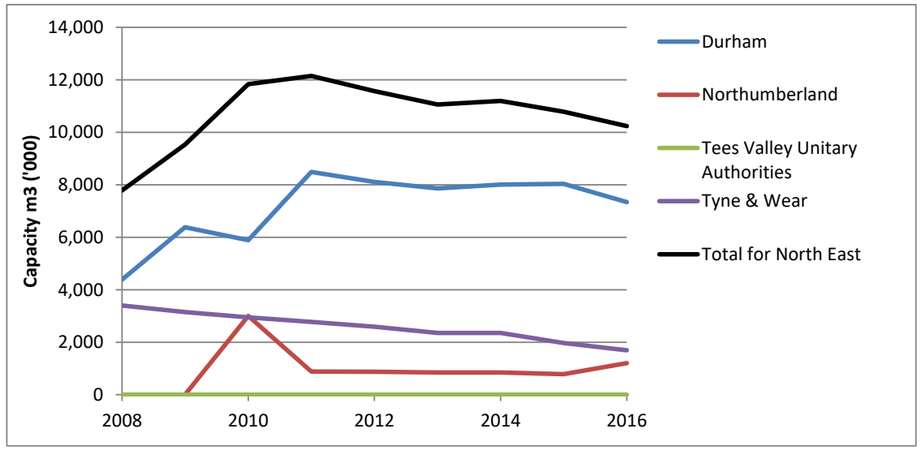
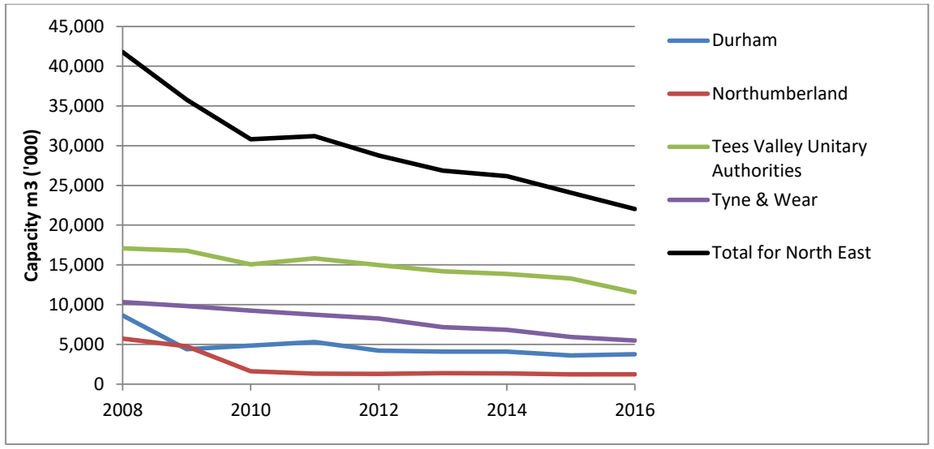


Illustration 11.3: Northeast landfill capacity trends 2008 - 2016 (000s cubic metres) Non–Inert: Non-hazardous landfill sites, non-hazardous landfill sites with a Stable Non-Reactive Hazardous Waste (SNRHW) cell.



11.5.26 Despite an overall general trend of reducing landfill, a study undertaken (2016 New Waste Management Capacity permitted in the North East)[86] concludes that approximately 3.7 million cubic metres of additional landfill capacity has been permitted within the north-east since 2012. Based on the above trends and the concurrent development of the Testo's Scheme it is conceivable that the availability of inert landfill capacity within Tyne and Wear may become limited during the construction period. However, the overall capacity for the region (North East) indicates a large capacity of inert landfill being available for the construction period and it is the intention to employ the waste hierarchy and use landfill as a last resort. Therefore, the cumulative effect of waste generated from Testo's is unlikely to have a significant impact on the available baseline capacity in the North East.

Waste recycling facilities

11.5.27 The site is located in a relatively industrial area and lies within relatively close proximity of a range of waste collection and treatment facilities, located mainly in Sunderland. Data obtained from the UK Government (DEFRA Waste Management Information) indicates that, for the year 2016 (the most recent data available)[87], there is large capacity of waste treatment facilities within the Tyne and Wear area. A summary of the relevant facility categories is provided below in Table 11-9.

[86] http://www.gateshead.gov.uk/DocumentLibrary/Building/PlanningPolicy/Core-Strategy-Documents/Waste-Capacity-Update-Report-January-2016.pdf

[87] DEFRA Waste Management for England 2016 https://www.gov.uk/government/publications/waste-management-for-england-2016 Most up to date information available accessed October 2018.

Table 11-9: Waste treatment capacity within the North East (figures are provided in 000s tonnes).

Year	Site Type		Tyne & Wear	NORTH EAST	Notes on treatment type
2016	Transfer	Transfer	1,387	2,646	Transfer stations may be utilised for bulking and onward transfer of wastes to appropriate facilities.
		Civic amenity	99	277	
	Transfer Total		1,486	2,924	
	Treatment	Material recovery	56	651	
		Physical	466	1,509	Physical treatment likely to include sites for the treatment of construction and demolition wastes.
		Physico-chemical	61	94	
		Chemical	-	-	
		Composting	31	140	Composting sites may be utilised for the treatment of green waste and cleared vegetation.
		Biological	233	917	Biological treatment will include AD sites which may be used for treatment of food wastes from workforce.
	Treatment Total		846	3,312	
	MRS	Metal recycling	221	572	Metal recycling sites may be utilised for the recycling of metal wastes from decommissioning and construction wastes.
2016 Total			**2,554**	**6,807**	

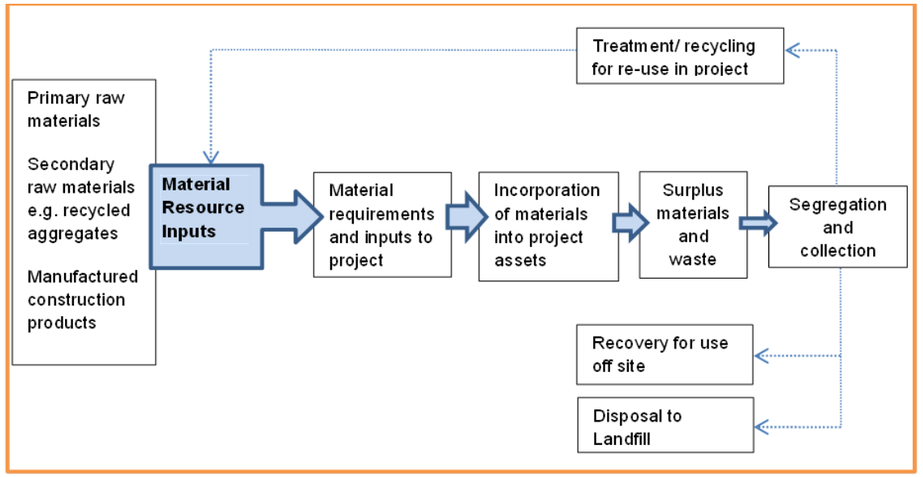
11.5.28 The information above provides evidence that there is a large capacity of waste management facilities in the Tyne and Wear area suitable for the management of the anticipated wastes to be generated by the Scheme. The indication of capacity also provides confidence that the baseline will not be significantly affected by the overlap with the delivery of the Testo's scheme. In reality, the available of waste management facilities is to some extent driven by supply and demand so any potential shortfalls in capacity are likely to be tempered over the longer-term by market development.

11.6 Potential Impacts (without mitigation)

11.6.1 Potential environmental impacts associated with material resources and waste would occur at each stage of the Scheme's material flow cycle. Illustration 11.4, is a simplified diagrammatic representation of materials resource flows that identifies material resource use and the management of waste.

11.6.2 The following section outlines the potential impacts without mitigation, whilst mitigation measures are described in Section 11.7 of this ES. The assessment using the methodologies outlined in Section 11.3 of this ES for magnitude / significance / sensitivity with and without mitigation is provided in Section 11.8 of this ES.

Illustration 11.4 Project material flow diagram (Source: Highways Agency (2011) IAN 153/11)



Potential materials use impacts

11.6.3 The following outlines the anticipated cut and fill volumes for the Scheme, estimated by Costain. A 'cut' is where soil or rock material is removed from a higher elevation area, contrasting to 'fill' areas, where soil or rock material is added to areas of lower elevation.

- Approximate cut volume 9,619 m^3
- Approximate fill volume 69,244 m^3
- Volume difference 59,625 m^3

11.6.4 It was estimated that a minimum of 59,625 m^3 of additional fill would need to be imported onto site for the Scheme.

11.6.5 Potential environmental impacts of materials include those associated with the extraction and transport of primary raw materials, the processing and manufacture of secondary materials, and the transportation of both primary and secondary materials to use on construction sites.

11.6.6 The choice of whether to use primary or secondary aggregates (or a combination of both) would be made considering a combination of factors such as performance requirements, value for money, materials source, specification, production and transport. Secondary (recycled)

aggregates may not always have the lowest impact on the environment and materials would be selected based on a consideration of all relevant factors (including transport impacts, embodied carbon benefits and reduction of impacts associated with extraction of virgin aggregates).

Potential carbon impacts

11.6.7 Energy is considered an aspect of both materials use and waste management. For example, energy is consumed during raw material extraction, the processing and manufacture of products, transport and in their use on site. Energy is also consumed in the management of waste associated with transport for reprocessing and disposal, as well as the energy consumed during recycling and reprocessing into secondary products.

11.6.8 In addition to the energy used in extracting and manufacturing materials, energy would also be required to transport materials to and from site. The site is located close to A-road infrastructure capable of accommodating vehicle movements for materials and waste transportation.

11.6.9 Estimated distances by road for materials transport are provided within the tables. During construction, an increase in freight traffic on the A19 and A184 is expected due to deliveries to the construction site. At this stage, insufficient information is available to enable this increase to be accurately quantified. However, the increase is expected to be negligible in the context of the existing volume of freight traffic on these roads.

11.6.10 The Highways England Carbon Tool[88] was developed to better manage carbon emissions resulting from the maintenance and improvement of the trunk road network. It contains average embodied carbon figures for various construction materials taken from the Bath Inventory of Carbon and Energy (ICE), along with transport, energy and waste factors from Defra 2014 and the Waste Resources Action Programme (WRAP). Table 11-10 sets out an estimate of embodied and transport carbon for the Scheme. This was based on estimates provided by Costain combined with embodied and transport carbon factors contained in the Highways England Carbon Tool and Highways England Major Projects Carbon Calculation Spreadsheet.

11.6.11 'Embodied Carbon' is defined as greenhouse gas emissions associated with the life cycle of a product. This includes all emissions (or portion of emissions) released as part of all processes involved in creating, modifying, transporting, storing, disposing of and/or recycling the product. Therefore, the use of energy contributes to both global energy demand and emissions of greenhouse gases to the atmosphere with the associated impacts on global climate. Based on current materials estimates provided by Costain, a total embodied carbon emissions estimate of approximately 7,075 tCO_2 (total for materials and transport) was derived.

Table 11-10: Estimated embodied and transport carbon for A19 Downhill Lane Junction Improvement Scheme

Key construction material	Highways England carbon calculation material type	Approx. quantity	Units	Embodied (tCO_2)	Transport distance by road (km)	Estimated road transport (tCO_2)
Bulk earthworks materials (soils and / or rock)	Quarried aggregate	69,244	m^3	720	20	341
Graded aggregates (6F1-5)	Stone, general	16,728	m^3	2,643	12	49
Macadam	Asphalt	6,078	m^3	682	15	19
Soil for landscaping	Soil	7,174	m^3	293	1	2
In situ concrete	General Concrete	3,418	Tonnes	366	10	4
Pre-cast concrete	Pre-cast Concrete, general	302	Tonnes	41	10	0
Timber	Timber, general	802	m^3	285	15	1
Steel (steel bar reinforcement, bridge beams, road restraint, lighting columns and signs)	Reinforcement Steel	1690	Tonnes	2,045	60	13
TOTALS				7,075		429

Potential waste impacts

11.6.12 As set out above, there are environmental impacts associated with the movement, transportation and processing (including recycling/recovery) of wastes and surplus/defective materials, such as the use of energy involved in the process. A further potential impact is the risk of sterilising waste management or waste disposal facilities, either through permanent or temporary severance of access to existing waste management sites, or by filling a local facility site up to capacity with surplus excavated materials or other wastes. It is considered unlikely that the Scheme would have any significant impact in respect to disposal facilities as the Scheme is aiming to manage all waste generated on site in accordance with the waste hierarchy (i.e. landfill would be the option of last resort to be used only for waste which is not

[88] https://www.gov.uk/government/publications/carbon-tool Last updated:19 September 2016

feasible to manage in any other way). However, if very significant quantities of wastes were generated at one time it could force locally-produced wastes to be transported greater distances for disposal elsewhere. It was considered that this would be largely avoided by the phasing of the works.

11.6.13 Table 11-11 outlines the anticipated types and quantities of waste expected to be generated from the Scheme.

Table 11-11: Anticipated types and quantities of waste generated

Activity	Potential wastes sources and possible classifications	Types of waste forecast to be produced	Additional information on waste arisings, including quantity where currently defined
Site remediation/ preparation	Site clearance, site preparation works and groundworks	Quantities unknown at this stage. Redundant pavements, unreinforced slab (construction). Pre-cast concrete kerbs, channels and edging. Earthworks. Cold Milling (50 mm) of pavements (removal of asphalt or concrete surface). Vegetation.	Clearance of open field, wooded areas and hedgerows 22 hectares. 1 hectare of structures including pre-cast concrete kerbs.
Demolition	No Demolition required.	N/A	N/A
Site construction	Wastes are likely to be generated from surplus construction materials and also potentially from damaged items and offcuts.	Quantities unknown at this stage. However, wastes likely to include: • surplus excavated soils; • road planings; • surplus construction materials, including concrete, metals & plastics. Mainly non-hazardous, but possibly some hazardous.	At this stage in the Scheme, there is little additional information available on the waste generated from the Scheme to support the assessment.

11.6.14 The potential quantities of wastes are largely unknown at this stage, but it is the intention for the Scheme to re-use or recycle as much as possible. Although the Scheme is likely to require net import of bulk fill material (see paragraph 11.6.4), there will be some surplus fill material which would require removal from site if not suitable for re-use.

11.7 Design, mitigation and enhancement measures

11.7.1 Mitigation measures would be implemented to limit the impacts identified in Section 11.6 of this ES relating to the use of materials and the generation of waste. There is significant synergy between materials re-use and the avoidance of the generation of waste; therefore, there is overlap between the mitigation measures for both.

11.7.2 The importance of careful management of materials to promote re-use and reduce waste generation has been widely recognised by the construction industry. Both legislation and voluntary best practice mechanisms provide measurable and accountable processes and provide the basis for mitigating environmental effects associated with materials and waste. These approaches would be used on the Scheme, including the use of site-won materials. As the Scheme will be delivered concurrently with the Testo's scheme there are likely to be opportunities for efficiencies in materials requirements, waste management and treatment, and transportation to be realised.

Material-efficient design

11.7.3 The principal mitigation measure for reducing the impacts associated with the use of materials would be material-efficient design. This process, which would continue through the detailed design stages, involves aiming to identify design solutions which minimise the use of materials whilst still meeting the Scheme's requirements.

11.7.4 Structures, drainage, road restraint systems, street lighting, traffic signals and signage products would be procured with consideration of the environmental effects associated with their manufacture, as well as other considerations such as structural design, carbon footprint, energy consumption, long-life performance, visual impacts, durability and cost. Both reinforced concrete and steel structures include a measurable recycled content in their manufacture. Where possible, the availability of responsibly sourced local and recycled materials would be considered in order to reduce potential environmental effects, such as from transport emissions.

Implementation of a CEMP

11.7.5 Key mitigation measures would be included within the CEMP for the Scheme. The CEMP would continue to be further developed during the detailed design phase (i.e. before the start of construction) and implemented during the construction phase. The CEMP would set out the approach to managing environmental issues on site and would include the following information:

- appropriate project targets for materials, waste and use of recycled materials;
- Site Waste Management Plan (SWMP);
- Materials Management Plan (MMP) in accordance with CL:AIRE 2014[89];
- Soil Management Plan (SMP) detailing protocols for soil management in line with current industry best practice as set out by DEFRA's Construction Code of Practice for the

[89] Available at: https://www.claire.co.uk/projects-and-initiatives/dow-cop/29-executing-dowcop-projects/116-materials-management-plan-mmp

Sustainable Use of Soils on Construction Sites[90] and requirements within the Specification for Highways Works series 600[91] and 3000[92];

- procedures for the management of material procurement, delivery, storage, handling, use and disposal; and
- use of materials responsibly sourced in accordance with BES 6001:2009 and the UK Government Timber Procurement Policy[93].

11.7.6 The development and use of a SWMP would be a key mitigation measure to manage the waste generated on site. The SWMP would identify, prior to the start of construction, the types and likely quantities of wastes that may be generated. It would set out, in an auditable document, how these wastes would be reduced, re-used, managed and disposed of. Regular reviews of, and updates to, the SWMP would also enable the monitoring of mitigation measure's effectiveness at maximising the use of locally sourced and low environmental impact materials.

11.7.7 The SWMP would set out how all construction phase materials would be managed, which may include a soils management plan and be developed taking into account the following voluntary and industry regulated Codes of Practice:

- Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (DEFRA, 2009) provides guidance for the excavation, handling, storage and final placement of soils [94]; and
- Environment Agency Position Statement: Definition of Waste: Development Industry Code of Practice[95].

11.7.8 These codes of practice provide a process whereby contaminated soils can be re-used on the site of origin (i.e. they do not become a waste) if the soils are proven, through appropriate risk assessments, to be suitable for use. They also provide for soils with elevated contamination levels to be used directly on another site provided that they are suitable for use at that site.

11.7.9 Where materials generated during construction cannot be used for the Scheme, opportunities would be sought to re-use the materials on other local schemes, including the Testo's scheme and IAMP Two. Conversely, Testo's scheme and IAMP Two materials may also be re-used for the Downhill Lane Scheme where appropriate. It may be possible to recycle all, or most, of the road surface (planings) for incorporation in other schemes or for sale to other local construction projects, but it would not be possible to confirm this until closer to the time of implementing the works.

11.7.10 Local sourcing of materials would be actively investigated and pursued where consistent with value for money and other project requirements (including relevant EU procurement directives) in order to reduce potential environmental effects, such as from transport emissions, and to support local businesses.

Hazardous Wastes Management

11.7.11 If contaminated soils or wastes are encountered during the construction works, further investigation, testing and risk assessment would be undertaken to determine whether the soils could either: stay on-site, require treatment to make them suitable to remain on-site, or would need to be disposed of off-site. Details for dealing with unexpected contaminated soils and waste would be included in the CEMP, and are set out in Chapter 10 (Geology and Soils).

Mitigation Summary

11.7.12 Table 11-12 summarises the general mitigation tools and processes that would be adopted for the Scheme in relation to managing materials resource and waste. The assessment of effects following mitigation is provided in Section 11.8 of this ES.

Table 11-12: Summary of potential impacts and mitigation proposed for the Scheme

Scheme Activity	Potential impacts associated with material resource use / waste management	Description of the mitigation measures	How the measures would be implemented, measured and monitored
Site remediation / Preparation / Demolition	Disposal of soils unsuitable for use on-site	SWMP including use of targets as KPIs. Market testing for the use of wastes off-site via the materials exchange. Pre-demolition audit to identify wastes.	Implemented by contractor. Use of weighbridge records and waste transfer notes. Audited regularly by Environmental Coordinator / Clerk of Works. Set aside areas for storage of waste for appraisal / treatment as appropriate.
	On-site use of soils and green waste	Materials Management Plan (MMP), CEMP, SWMP and Key Performance Indicators (KPIs).	Incorporation of on-site recovered materials in detailed design. Implemented by contractor. Audited regularly by Environmental Coordinator / Clerk of Works.
	Production of hazardous wastes	Contaminated Land risk assessment and SWMP. On or off-site treatment of contaminated soils for any other hazardous wastes identified on-site, as appropriate.	Use of weighbridge records and special waste transfer notes. Audited regularly by Environmental Coordinator / Clerk of Works.
Construction	Material use and depletion (e.g. virgin aggregates)	Materials management plan and CEMP. Use of procurement policies, targets and KPIs to increase local sourcing of materials and the inclusion of as much	Procurement policies to be implemented by the contractor. Measured via weighbridge records and receipts and analysis of procurement criteria used for specific materials. Audited regularly by Environmental

90 Department for Environment, Food and Rural Affairs (DEFRA) (2009). Construction Code of Practice for the Sustainable Use of Soils on Construction Sites.
91 Available at: http://www.standardsforhighways.co.uk/ha/standards/mchw/vol1/pdfs/600.pdf
92 Available at: http://www.standardsforhighways.co.uk/ha/standards/mchw/vol1/pdfs/series_3000.pdf
93 Available at: https://www.gov.uk/guidance/timber-procurement-policy-tpp-prove-legality-and-sustainablity
94 Department for Environment, Food and Rural Affairs (DEFRA) (2009). Construction Code of Practice for the Sustainable Use of Soils on Construction Sites.
95 Environment Agency, Position Statement: Definition of Waste: Development Industry Code of Practice (V2) (March 2011)

Scheme Activity	Potential impacts associated with material resource use / waste management	Description of the mitigation measures	How the measures would be implemented, measured and monitored
		recycled content as practicable in accordance with the required specifications of the construction material. Consideration of synergies between local schemes including Testo's and IAMP Two.	Coordinator / Clerk of Works. Set aside areas for storage of materials for re-use.
	Carbon footprint of materials use	As above	As above. Procurement policies to include whole life CO_2 emissions data as a KPI for all materials.
	Transport of materials and wastes (carbon footprint impact)	As above and use of 'just-in-time' delivery to reduce double handling. Sensitive traffic management to reduce effects on amenity.	Procurement and waste management policies and sensitive routing arrangements to be implemented by the contractor. Measured via weighbridge records and receipts and analysis of procurement criteria used for specific materials. Audited regularly by Environmental Coordinator / Clerk of Works.
	Wastes from materials use and municipal solid waste production	SWMP and KPIs. Provision of segregation facilities.	Implemented by contractor. Use of weighbridge records and waste transfer notes. Audited regularly by Environmental Coordinator / Clerk of Works.

11.7.13 A key mitigation measure would be to set aside land for the temporary storage of materials and waste next to the site (refer to Section 2.8, in Chapter 2 of this ES). The land would mainly be needed for the main site compound, haul roads and topsoil and sub-soil storage, the details for which will be set out in the CEMP.

11.7.14 Current areas marked for temporary materials storage are outlined in Figure 2.4, based on the requirement of 59,625 m^3 of fill for the Scheme completion. The temporary land-take requirements make provision for storage of imported fill, topsoil, other soils, other construction materials, waste, main site compound and access / haul roads, statutory undertakers diversion works, etc. (not all separately labelled on Figure 2.4). Storage made available for materials and waste (under applicable exemptions) would increase the amount of materials that can be re-used on-site and reduce the amount of materials required to be imported, protecting the quality of materials (e.g. by allowing separate storage areas for topsoils and sub-soils), and potentially reducing the amount of waste generated and its management burden by collation of recyclable waste streams.

11.7.15 Where suitable, cleared vegetation would be recycled for on-site landscaping or ecological improvement works, for example habitat creation, or spread as chippings or mulch, with appropriate consideration and control of any pollution risk, and relevant legislation. Off-site management through a green waste disposal contractor could also offer recycling through composting. Details of ecological improvement works are outlined in Chapter 9 (Ecology and Nature Conservation), and Landscaping works are detailed within Chapter 8 (Landscape and Visual Effects).

11.8 Assessment of Effects

11.8.1 The effects identified for both materials and waste, and their magnitude/significance both prior to and following mitigation, are summarised in Table 11-13. Note that, in accordance with guidance, impacts relating to materials are only assessed in relation to magnitude, whereas receptor sensitivity and significance of effect are also assessed for impacts relating to waste (refer to Section 11.3).

11.8.2 In summary, effects relating to material resources and wastes for the Scheme are considered to be of minor or negligible magnitude. It was anticipated that these effects may be further reduced via implementation of the mitigation measures.

Inter-relationship effects between topics

11.8.3 A review of the receptors identified within this chapter has been undertaken to consider the potential for effects from inter-relationship effects with other topics, such as combined material carbon emissions with Chapter 6 (Air Quality) impacts. Effects on visual receptors from temporary construction activities, for example soil storage, are covered in Chapter 8 (Landscape and Visual Effects). No potential significant inter-relationship effects have been identified.

Shared use of the A19 Testo's scheme main site compound

11.8.4 As discussed in Section 1.5, in Chapter 1 of this ES, there is the potential that the Scheme could share use of the temporary main site compound for the Testo's scheme for the purpose of general storage, traffic management and office-based administrative purposes. If this was undertaken from the commencement of construction of the Scheme, the area of land take required for the Downhill Lane main site compound could be reduced. There would also be a period where both the Testo's and Downhill Lane junction schemes are being constructed at the same time, followed by a period where only the Scheme is under construction but still using the Testo's scheme main site compound.

11.8.5 There would be no additional land take or significant change in compound activities required for the Testo's main site compound to accommodate use by the Downhill Lane Scheme, so there would be no significant change to the waste and material use effects outlined in Chapter 11 of the Testo's Scheme ES.

11.8.6 Though the extended use of the Testo's scheme main site compound would mean a longer duration for generating waste arisings or using materials, these would be relatively small in relation to general storage, traffic management and office-based administrative activities at the Testo's main site compound during this extended period.

11.8.7 However, use of the Testo's Scheme main site compound would enable a reduction in the temporary land take required by the Downhill Lane Scheme main site compound, north of Downhill Lane (East). This would provide a positive effect from reducing the volume of material use (and associated waste arisings and carbon emissions) that would have otherwise been needed to create the additional temporary hardstanding with secure fencing for a standalone Downhill Lane Scheme main site compound; as assessed in this ES Chapter 9 for the Scheme.

11.8.8 Therefore, the shared use and extended of the Testo's main site compound would provide a net positive effect on materials use and construction waste generation.

Cumulative effects

11.8.9 The cumulative effects of the Scheme with other developments, including shared use of the Testo's main site compound, are assessed within Chapter 15 of this ES.

Table 11-13: Detailed Assessment Reporting Matrix

Project activity	Potential impacts associated with material use / waste production	Description of the Effects – prior to mitigation	Brief description of mitigation measures	Description of the effects – following mitigation
Site remediation / Preparation / Demolition	Disposal of demolition wastes and soils unsuitable for use on-site or off-site.	If waste requires landfill disposal, landfill capacity is available in the Tyne and Wear area (total 7 M tonnes in 2016). No demolition required so the amount of waste requiring disposal would be limited. Although local landfill capacity availability is decreasing and will be affected by the Testo's development, there would still be sufficient capacity for the expected, relatively small quantum that would require disposal. Inert landfill is the most capacity restricted but further extensive landfill capacity is available on a regional basis if it were to be required. The effect of sterilising local landfill would be adverse, but long-term and localised. Effect = low sensitivity, minor magnitude. Significance = **Neutral to Slight Adverse.**	Continue design development to avoid disposal. SWMP including use of targets as KPIs. Assessment shows good opportunity for recycling of materials and wastes through local waste management and recycling facilities. Consideration of synergies between local schemes including Testo's for off-site uses.	If waste can be re-used at other construction sites if appropriate permits/ exemptions are in place, including Testo's, the magnitude of impact could be reduced thereby potentially reducing significance of the effect to neutral. However, this may not be achievable, depending on construction phase, therefore the residual effect has been determined to be **neutral to slight adverse**.
	On-site or off-site use of demolition wastes, soils and green waste.	No demolition of large structures is required. The majority of materials (e.g. excavated soils) are anticipated to be re-used for construction works; and some soils and green wastes can also be used for landscaping. With respect to the effect of sterilising local recycling capacity resource, the baseline study indicates the North East region contains many potential facilities for recycling. Many of the facilities are capable of the treatment of types of waste to be generated. This effect will be limited due to the low quantities of waste in comparison to capacity, and adverse but short-term and localised. Effect = low sensitivity, Negligible magnitude Significance = **Neutral**	Continue design development to avoid disposal. Proposals developed for the MMP, CEMP, SWMP and KPIs. Investigation to prioritise the treatment of waste over disposal. Consideration of synergies between local schemes including Testo's for off-site uses. Market testing for the potential for wastes to be used off site. Set aside areas for storage of waste for appraisal/treatment, as appropriate.	Would increase re-use of wastes, but the effects remain **Neutral**
	Production of hazardous wastes.	No or low volumes expected. Contamination issues dealt with in Chapter 10 (Geology and Soils). The baseline has identified sufficient capacity of hazardous waste facilities present in the region for disposal if required. Effect = low sensitivity, negligible magnitude, short-term, localised. Significance = **Neutral to Slight Adverse if realised.**	Identified through the Contaminated Land Risk Assessment and proposals for management within the SWMP. Identify on-or off-site treatment of contaminated soils for any hazardous wastes on-site, as appropriate.	If no contamination is found, or it is found and remediated, significance of the effect would be **Neutral.**
Construction	Material use and depletion (e.g. virgin aggregates)	The Scheme has a significantly greater fill volume than cut and will therefore be a net importer of materials. The Joint LAA identified Tyne and Wear to be a major source of demand and a net importer of crushed rock aggregate, but identified major sources of suitable primary materials within the Tyne and Wear area and wider region. Magnitude of impact assessed through carbon impact; see below and Section 11.3 of this ES.	Materials Management Plan and CEMP for minimisation, recycling and reuse. Use of procurement policies and KPIs to maximise local sourcing of materials and the inclusion of as much recycled content as practicable, in accordance with the required specifications of the construction material. Maximisation of the use of on-site material, wherever practicable. Set aside areas for storage of materials for re-use. Consideration of synergies between local schemes including Testo's for materials.	Scheme would be likely to remain a net importer of material.

Project activity	Potential impacts associated with material use / waste production	Description of the Effects – prior to mitigation	Brief description of mitigation measures	Description of the effects – following mitigation
	Carbon footprint of materials use, including transport.	**Minor Magnitude** – Carbon footprint of construction materials and waste (not including transport) = c. 7,074tCO_2e. Carbon footprint relating to road transport of materials = c. 429tCO_2e. Total = 7,503 tCO2e (i.e. between 5,000-20,000 with reference to the Materials (Carbon) Assessment Magnitude Criteria Table 11-2). Note re transport: The source of the materials is unknown at this stage and broad assumptions have been made based on relatively local availability.	Continue design development to avoid disposal. Consideration of materials with lower carbon impact such as steel incorporating recycled content. Proposals developed for the MMP, CEMP, SWMP and KPIs. Investigation to prioritise the treatment of waste over disposal. Use of 'just-in-time' delivery to reduce double handling, and sensitive routing to reduce amenity effects.	Continued development of design proposals, and shared materials/waste requirements with Testo's may reduce carbon impact magnitude (i.e. <5,000 tCO_2e) resulting in a **Negligible effect.**
	Wastes from materials use and municipal solid waste production.	Baseline indicates there is local recycling capacity such that sensitivity is low and there is the likelihood that some waste would be sent off-site for recycling or back to the manufacturer so the magnitude is minor. Municipal solid waste production is expected to be small. If waste requires landfill disposal / treatment off site, landfill capacity is available. Effect = low sensitivity, minor magnitude, short-term, localised and adverse impact. **Significance = Neutral to Slight Adverse.**	SWMP and KPIs, use of segregation facilities for municipal wastes. Options for on-site recycling will be explored. Except in relation to soils and demolition wastes it is anticipated that ~90% of wastes would be recycled. If waste can be re-used at other construction sites the magnitude of the impact could be further reduced thereby reducing significance. Consideration of synergies between local schemes including Testo's for waste management.	If disposal of construction materials can be avoided and re-use on site or for Testo's can be increased, the magnitude of the impact can be reduced to negligible resulting in an effect with a significance level of **Neutral.**

CHAPTER 12 NOISE AND VIBRATION

Executive summary

Potential noise and vibration effects arising from the construction and operation of the A19 Downhill Lane Junction Improvement Scheme have been assessed for sensitive receptors within a defined study area.

There are a number of residential properties and other noise sensitive receptors located in close proximity to the A19 along with other roads on the local road network. These properties currently experience high levels of noise, with road traffic dominating.

In the short-term, no receptors were predicted to experience a perceptible increase or decrease in noise resulting from the Scheme. The majority of receptors, 869, were predicted to experience negligible reductions in noise compared to the 117 receptors predicted to experience negligible noise increases. Therefore, it was considered that the overall effect of the Scheme would be negligible in the short-term.

In the long-term, four receptors would experience perceptible noise increases. These receptors are associated with commercial offices associated with the IAMP One and Two developments[96]. The noise increases result from a large increase in road traffic flows through the internal road network of the IAMP. Such increases in traffic would be observed in both the future Do Minimum and Do Something scenarios. It was therefore concluded that such traffic increases would not be as a direct result of the Scheme. No receptors were predicted to experience perceptible noise decreases in the long-term. Therefore, the overall effect of the Scheme was considered neutral in the long-term.

The predicted worst-case construction noise levels indicated the potential for significant effects at those properties to the north-east of the Town End Farm housing estate and those closest to the proposed NMU Pegasus crossing construction on the A1290. In order to control the potential construction noise impacts, localised mitigation measures would be implemented. With the implementation of suggested mitigation measures, and the application of a Construction Environmental Management Plan, any effect would be minimised. However, despite this, it is possible that some residents would experience significant construction noise levels during the construction period for short durations.

Perceptible vibration due to soil compaction activity would be a possibility for short periods (e.g. two to three days) at those properties closest to the construction works. The levels of vibration have the potential to be perceptible to residents and could lead to complaint. However, such levels would likely be tolerated if prior warning and explanation has been given to residents and are experienced for only a short duration.

12.1 Introduction

12.1.1 Noise in its widest sense can be defined as unwanted sound. Such sound can be associated with industrial, domestic and transportation sources. In this assessment, any potential noise effects would relate to changes in road traffic or would be associated with construction activities. Road traffic noise can be a source of complaint for people in their homes, their gardens and also outside in recreation areas. The effect upon other sensitive receptors and the enjoyment of these receptors is also important. While noise effects derived from road traffic during operation of the Scheme would continue in the long-term, any effects associated with construction would cease at the end of the construction period.

12.1.2 Vibration comprises oscillatory waves that propagate from a source through either the ground or the air to adjacent buildings. Although there is no evidence that traffic induced airborne vibration could cause even minor damage to buildings, it could be a source of annoyance to local people, causing vibrations of doors, windows and, on occasions, floors of properties close to the route. Ground-borne vibration effects could potentially be produced during the construction phase if percussive piling or compaction techniques are used in close proximity to receptors and could be the source of annoyance to local residents.

12.1.3 This chapter examines the potential for traffic noise and vibration effects at locations considered likely to be affected by the construction and operation of the Scheme. Such locations can include, for example, dwellings, schools, hospitals, community facilities and designated areas. The chapter considers mitigation measures appropriate to the potential noise and vibration effects. The methodology used complies with the guidance provided in the Design Manual for Roads and Bridges[97] (DMRB; HD213/11 - Revision 1).

12.1.4 The 'Detailed Assessment' methodology within HD 213/11 - Revision 1 has been followed, with appropriate assessment tables and a summary of the likely effects provided.

12.1.5 Noise levels in this chapter are expressed in terms of the decibel (dB), which is explained further in Appendix 12.1, together with some of the other technical concepts and terms used in this chapter.

12.2 Legislative and policy framework

12.2.1 Legislation and policy relevant to this noise and vibration assessment of the Scheme is summarised in Tables 12-1 to 12-4, whilst further information is provided in Appendix 12.2.

Table 12-1: Relevant legislation

Legislation	Description	How the requirement has been addressed
Noise insulation regulations 1975 (amended 1988) [98]	The highways authority has a duty to offer to insulate the living rooms and bedrooms of dwellings affected by new roads and roads that have their line or level altered, if the dwellings satisfy certain criteria.	An assessment has been carried out and its results are reported in Section 12.6 of this chapter.
Control of Pollution Act 1974[99]	Highways England and its contractor are not bound by the provisions of the Act due to crown immunity, but do act in the spirit of the Act. Under the Act, local authorities have powers to impose requirements or restrictions on construction methods under the act, including the type of plant to be used and permitted noise levels during specified hours. Restrictions can be imposed even if the noise levels would be below those causing a statutory nuisance.	References to the Act are contained in Section 12.2F of Appendix 12.2, in Volume 3 of this ES. It is anticipated through the detailed design process that the construction assessment undertaken in the ES will be refined and updated, allowing for applications under Section 61 of the Act to be made to the local authorities, should Highways England wish.

[96] Development associated with IAMP has been outlined in paragraph 12.3.2.
[97] Design Manual for Roads and Bridges, Volume 11, Section 3, Part 7, "Noise and Vibration" November 2011 August 2008 (HD 213/11 – Revision 1)
[98] Statutory Instrument, 1988. The Noise Insulation (Amendment) Regulations 1988. HMSO.
[99] Control of Pollution Act, 1974 (CoPA)

Legislation	Description	How the requirement has been addressed
	Anyone who intends to carry out construction activities is entitled to apply to the local authority for prior consent to carry out the work under Section 61 of the Act. The application should describe the works, the construction methods to be used and the steps that are to be taken to minimise noise resulting from the works. The local authority has the power to attach conditions to any consent granted and limit the length of its duration.	

Table 12-2: Relevant national policies

National Policy	Relevant Paragraph	How the policy has been addressed
National Networks National Policy Statement (NNNPS) January 2015	Noise and vibration are referred to in **paragraphs 5.186 to 5.200** of the NNNPS.	The NNNPS sets out the government's vision and policy against which the Secretary of State will make decisions on applications for development consent for nationally significant infrastructure projects on the strategic road and rail networks. A full review of the Scheme against the NNNPS is set out in Appendix A of the Planning Statement (DCO application reference TR010024_APP_7.1).
National Planning Policy Framework (NPPF) (March 2018)	**Paragraph 170** of Chapter 15 states that the planning system *"should contribute to and enhance the natural and local environment by… preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;…".*	The NPPF is identified in section 12.2F of Appendix 12.2 in Volume 3 of this ES. Section 12.3 of this ES Chapter identifies a methodology for determining both adverse impacts and significant effects.
	Paragraph 180 of Chapter 15 states *"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:* *a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life*;* *b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason…"* *Reference made to the NPSE	This has been taken into consideration during the assessment of significant effects and the development of appropriate mitigation, as required. The methodology is outlined in Section 12.3 of this chapter and Appendix 12.2 in Volume 3 of this ES.
Planning Practice Guidance (PPG)	Planning Practice Guidance relating to relevant NPPF policies are included under 'Noise', **paragraphs 001 to 012.**	The PPG is identified in Section 12.2F of Appendix 12.2 in Volume 3 of this ES. This chapter identifies thresholds for determining of Lowest Observed Adverse Effect Levels (LOAEL) and Significant Observed Adverse Effect Levels (SOAEL) in line with the PPG. These are used in determining potential significant effects in the assessment.
Noise policy statement for England (NPSE)	The NPSE lists three policy aims: "*Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:* • *Avoid significant adverse impacts on health and quality of life;* • *Mitigate and minimise adverse impacts on health and quality of life; and* • *Where possible, contribute to the improvement of health and quality of life.*"	The assessment of significance of effects in relation to noise is based on criteria derived from the concepts spelt out in the NPSE. See Section 12.3 of this chapter and Appendix 12.2 in Volume 3 of this ES for more information.

National Policy	Relevant Paragraph	How the policy has been addressed
	The 'Explanatory Note' within the NPSE provides further guidance on defining 'significant adverse effects' and 'adverse effects' using the concepts: • No Observed Effect Level (NOEL) - the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established. • Lowest Observable Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected. • Significant Observed Adverse Effect Level (SOAEL) - the level above which significant adverse effects on health and quality of life occur.	
Noise Action Plan[100]	Defra produced the Noise Action Plan in March 2010 and updated this in January 2014 to address the effects of noise from major roads in England under the terms of the Environmental Noise (England) Regulations 2006. The Noise Action Plan aims to promote good health and good quality of life. In doing so it aims to identify 'Important Areas' within England where the competent Authority should look, where feasible, to reduce noise levels.	Potential impacts on Noise Important Areas are addressed in Section 12.6 of this ES chapter. Potential improvement measures for NIAs are outlined in Section 12.7 of this ES chapter.

Table 12-3: Relevant policies within the South Tyneside statutory Development Plan

South Tyneside Local Development Framework	Relevant Policy	How the policy has been addressed
Core Strategy (June 2007)	**Policy EA5 Environmental Protection**	This Noise and Vibration ES chapter assesses the potential effects of the Scheme in terms of its construction and operation. The assessment of
	"*To complement the regeneration of the Borough, the Council will control new development so that it…..* *D: ensures that the individual and cumulative effects of development do not breach noise, hazardous substances or pollution limits….*"	effects is outlined in Section 12.8 of this ES chapter.
Development Management Policies (December 2011)	**Policy DM1 Management of Development** "*In determining all applications under the planning Acts we will ensure that where relevant…* *B: the development is acceptable in relation to any impact on residential amenity….*"	See above
Site-Specific Allocations and Proposals Map (April 2012)	No relevant policies.	N/A

Table 12-4: Relevant policies within the Sunderland statutory Development Plan

Sunderland City Council	Relevant Policy	How the policy has been addressed
City of Sunderland Unitary Development Plan: Saved Policies (March 2007)	**EN1 General Environmental Protection** "*Improvement of the environment will be achieved by: Seeking to minimise all forms of pollution*". **Policies EN5 and EN6 Noise and Vibration** **EN5** "*where development is likely to generate noise sufficient to increase significantly the existing ambient sound or vibration levels in residential or other noise sensitive areas, the council will require the applicant to carry out an assessment of the nature and extent of likely problems and to incorporate suitable mitigation measures in the design of the development. Where*	This Noise and Vibration ES chapter assesses the potential effects of the Scheme in terms of its construction and operation. The assessment of effects is outlined in Section 12.8 of this ES chapter.

[100] Noise Action Plan: Roads (Including Major Roads), Environmental Noise (England) regulations 2006 as amended, January 2014, Defra.

Sunderland City Council	Relevant Policy	How the policy has been addressed
	such measures are not practical, permission will normally be refused". **EN 6** "*where noise sensitive development is proposed which is likely to be exposed to unacceptable levels of noise or vibration from roads, railways, existing industrial areas or other potentially noisy uses, the council will require the applicant to carry out an assessment of the nature and extent of likely problems and to incorporate suitable mitigation measures in the design of the development. Where such measures are not practical, permission will normally be refused*."	

12.3 Assessment methodology

12.3.1 The assessment follows the methodologies contained within HD 213/11 – Revision 1[101] and describes the works, their construction and the associated noise and vibration effects. The overall approach to each sub-topic is summarised below, whilst full details of the approach to each sub-topic is provided in Appendix 12.3.

12.3.2 For the assessment reported in this Chapter 12, as described in Section 5.4 of Chapter 5 of this ES, the operational effects assessment uses the 2021 and 2036 Do Minimum and Do Something traffic models where the future baseline includes the different road network and traffic flow changes associated with the Testo's scheme and IAMP One and IAMP Two developments in these periods. However, the construction assessment assumes IAMP One has been built and is operational when the Scheme starts construction, whilst the Testo's scheme is still under construction; cumulative construction effects with the IAMP Two development being built at the same time as the Scheme are considered in Chapter 15 of this ES.

Study Area

Noise

12.3.3 The study area and the calculation area for the noise assessment were defined in accordance with HD 213/11 – Revision 1. Firstly, the study area was defined as including all roads within a 1 km boundary around the start and end points of the physical works associated with the Scheme, including any routes to be improved or bypassed as part of the Scheme. A 'calculation area' is then defined, which includes:

- the whole area within 600 m of the Scheme;
- the whole area within 600 m of any other roads within 1 km of the Scheme, if changes on those roads are predicted to result in noise changes (increases or reductions) of 1 dB in the opening year or 3 dB in the design year of 2036; and
- noise calculations are then made for all residential dwellings and other noise sensitive receptors within the calculation area.

12.3.4 HD 213/11 – Revision 1 requires consideration beyond the calculation area, to take into account the likely noise effects on the wider road network (considered in terms of change in basic noise level (BNL)). This is required for such roads where there is a 1 dB increase or decrease in noise in the baseline year and/or a 3 dB increase or decrease in the future assessment year in comparison with the baseline year. These roads are included in the study area.

12.3.5 Figure 12.1 illustrates both the study area and the calculation area used within the assessment.

Ground-borne vibration

12.3.6 The study area for the vibration assessment was defined as within 40 m of all roads where noise level predictions were undertaken, in accordance with guidance given in HD213/11.

Identification of potential construction impacts

12.3.7 Disruption caused during the construction phase of the Scheme has the potential to affect residents and other sensitive receptors adjacent to the Scheme. HD 213/11 – Revision 1 advises on the use of BS 5228[102] to assess and control noise and vibration from construction activities.

12.3.8 Predicted noise and vibration levels arising from construction activities have been assessed following the criteria contained within BS 5228 Parts 1 and 2 to determine whether potential construction impacts are likely to occur within the study area.

Identification of potential operational impacts

Noise Assessment

12.3.9 The assessment of noise levels at noise sensitive receptors has followed the 'Detailed Assessment' methodology outlined in HD 213/11 – Revision 1. Noise levels were calculated at all residential dwellings and other noise sensitive receptors within the calculation area.

12.3.10 An assessment of night-time noise levels has also been undertaken in accordance with HD 213/11 – Revision 1.

12.3.11 An assessment, focussing on the night-time noise levels at noise sensitive receptors between the hours of 05:00 and 06:00, was undertaken. This is to take into consideration the proposed shift pattern change for IAMP One resulting from the introduction of the Scheme in 2021, which would increase traffic flows on the local road network in this period considered as Scenario TA1 within the Transport Assessment. This assessment has been undertaken to consider the potential noise impacts (i.e. increase in noise levels for sensitive receptors) that may occur during this period.

Noise nuisance

12.3.12 HD 213/11 – Revision 1 defines the level of noise 'nuisance' by reference to the percentage of people in the affected population that would likely be 'bothered very much or quite a lot' by traffic noise.

12.3.13 In this assessment, noise nuisance predictions have been based on the highest nuisance levels expected during the first 15 years after opening (2036) for the Do Minimum and Do Something scenario and compared to the nuisance levels of the Do Minimum baseline year (2021).

[101] DMRB Volume 11 Section 3 Part 7 HD 213/11 – Revision 1 'Noise and Vibration (2011) – referred to hereafter as HD213/11.

[102] BS 5228:2009+A1:2014 Code of practice for noise control on construction and open sites – Part 1 & 2, 2009 BSI

Ground-borne vibration

12.3.14 HD 213/11 – Revision 1 provides guidance on ground-borne vibration from highway schemes. This assessment provides a qualitative assessment on the likelihood of perceptible traffic induced ground-borne vibration in line with that guidance.

Vibration nuisance

12.3.15 Consideration has been given to changes in airborne vibration nuisance at all dwellings within 40 m of roads where noise level predictions have been undertaken.

Assessment of the significance of effects

Construction noise

12.3.16 BS 5228-1 provides two methodologies for the prediction of significance during typical construction works, based upon noise change and existing measured ambient noise levels. Method 1 applies only for residential properties, so for this assessment consideration has been given to Method 2, which takes account of both residential properties and other sensitive receptors.

Construction vibration

12.3.17 Vibration is a low frequency disturbance producing physical movement in buildings or to their occupants. Ground-borne vibration is usually measured in terms of peak particle velocity (ppv), which is measured in terms of movement in millimetres per second (mm/s). BS 5228-2 contains guidance on vibration levels in structures from construction works. It provides a prediction methodology for mechanised construction works, such as compaction and tunnelling works, and piling works. The Standard also presents guidance for the control of vibration from construction works.

12.3.18 Assessment of the likelihood of significant effects, as a result of ground-borne vibrations arising from construction activities, has been carried out using the guidance contained within BS 5228-2.

12.3.19 Airborne vibration was not considered in this assessment as no blasting is proposed and this would therefore not occur.

Operational noise - DMRB assessment

12.3.20 Section 3 of HD 213/11 - Revision 1 provides guidance on the magnitude of traffic noise impacts. The human ear responds differently to noise in the short-term and in the long-term, so the magnitude of impact is classified differently for different timescales. In the short-term, a change in road traffic noise of 1 dB (A), for example when a project is opened, is the smallest change that is considered perceptible to the human ear. In the long-term, a 3dB(A) change is considered perceptible. These values are used as thresholds in identifying short-term and long-term impacts. The classification of noise impact, provided by HD 213/11 - Revision 1, is set out in more detail in Appendix 12.3.

Operational noise - Significance of effects

12.3.21 For the operational noise assessment, appropriate noise level criteria (in terms of LOAEL and SOAEL noise levels) was defined for the purposes of identifying potential significant effects arising from the operational phase of the Scheme. The criteria were defined based on the guidance provided in the NPSE and PPG. Appendix 12.3 provides the definition of the significance criteria adopted for this assessment.

Operational vibration

12.3.22 HD 213/11 - Revision 1 advises that should the level of vibration at a receptor be predicted to rise to above a level of 0.3 mm/s, or an existing level above 0.3 mm/s is predicted to increase, then this should be classed as an adverse effect from vibration.

Consultation

12.3.23 Consultation was undertaken with South Tyneside Council and Sunderland City Council on the following aspects:

- an assessment to be undertaken in line with the guidance contained within the Design Manual for Roads and Bridges (HD 213/11);
- construction assessment to be undertaken in accordance with BS 5228; and
- noise monitoring locations and durations

12.3.24 Comments and feedback received were taken into account during the assessment, with support received for the assessment approach used and the monitoring locations and durations agreed with South Tyneside and Sunderland City Council as appropriate.

12.4 Assessment assumptions and limitations

12.4.1 The identification of operational noise impacts was based on the outputs of a traffic model, so was subject to the assumptions applied to, and limitations of, the model (see Section 5.4 of Chapter 5 of this ES).

12.4.2 No special limitations or technical difficulties have been encountered in the course of this assessment. However, all noise modelling studies are dependent on computer-modelling of future conditions. The noise model itself is dependent on input data taken from computer modelled traffic data and on a number of assumptions. All computer-modelled information is subject to an inherent degree of uncertainty and depends on a number of assumptions. The data and assumptions used in this assessment are set out in Section 12.3 of this chapter, with further information in Appendix 12.3 in Volume 3 of this ES.

12.4.3 Construction plant information, together with a provisional construction works programme, was provided by Costain as the Early Contractor Involvement (ECI) Contractor.

12.4.4 Construction plant noise levels used in this assessment have been taken from the current sound level data presented in Annex C of the relevant British Standard (BS 5228-1: 2009 + A1 2014).

12.4.5 Traffic data is fundamental to predicting operational noise levels, thus facilitating the noise and vibration assessment of a scheme. Traffic flow (numbers of vehicles), composition (percentage of heavy vehicles) and speed data (following the guidance contained in IAN 185/15[103]) all contribute to calculating road traffic noise levels. Traffic data has been provided for the year of opening (2021) and future assessment year (2036) for the Do Minimum and Do-Something scenarios. With reference to Chapter 5, traffic flow data from Scenario TA1 for 2021 and Scenario TA3 for 2036 were used in this assessment. In terms of the noise impact, this scenario

[103] Interim Advice Note 185/15 - Updated traffic, air quality and noise advice on the assessment of link speeds and generation of vehicle data into 'speed-bands' for users of DMRB Volume 11, Section 3, Part 1 'Air Quality and Volume 11, Section 3. Part 7 Noise

was determined, through consideration of predicted noise levels, to marginally represent the worst-case of both potential traffic scenarios.

12.4.6 In line with HD 213/11 - Revision 1, a minimum traffic speed of 20 kph (12 mph) has been used in the noise model, where the traffic model predictions provide speeds less than this. This represents a worst-case scenario assessment for these low-speed situations.

12.4.7 It was considered that all data inputs for this assessment are of an adequate level to support a 'Detailed Level' of assessment as defined in HD 213/11 - Revision 1.

12.5 Baseline conditions

12.5.1 Within the study area there are 56 properties south-east of Downhill Lane junction and one property south-east of the A1290, The Chalet, located within 100 m of the Scheme alignment. These properties currently experience high levels of noise, with road traffic being the dominant source of noise. Noise levels for such receptors vary from around 60 dB $L_{A10,18h}$ to 65 dB $L_{A10,18h}$ according to the distance between the road and the façade of the property, and whether or not there are other properties or other screening structures are between them and the road. If no changes are made to the existing road infrastructure, these noise levels would likely gradually increase with time, due to expected growth in the volume of traffic.

Measurement of existing noise levels

12.5.2 Noise monitoring was undertaken at two locations in close proximity to the Scheme. Noise monitoring was undertaken at Make-Me-Rich Farm in 2014, which was considered representative for this assessment, due to there having been no major changes in the area since this time. Long-term, unattended noise monitoring was undertaken during the period of November 20th to 4th December 2014. Long-term noise monitoring was also undertaken at 35 Benton Avenue between 10th to 17th November 2017.

12.5.3 The monitoring locations are shown in Figure 12.3 and the daytime and night-time monitoring data are summarised in Tables 12-5 and 12-6, respectively.

12.5.4 The monitoring results are the average values of the measurements taken across the day and night-time periods. Unsuitable weather conditions prevailed for periods during each of the surveys (i.e. rain and high wind speed). Measurements obtained during these periods have been discounted from the averages presented in these tables.

12.5.5 Table 12-5 presents the $L_{Aeq,12h}$ noise level, relevant for establishing the day-time baseline conditions for the construction assessment, The LA10,18h noise levels provided in Table 12-5 are relevant for the day-time operational road traffic noise assessment. The LAeq,8h noise levels presented in Table 12-6 are relevant for use in the night-time assessment for both the construction and operational scenarios.

Table 12-5: Summary of daytime baseline noise monitoring (06:00 – 00:00)

Location	Average Measured Noise Level (dB)	
	$L_{Aeq,12h}$	$L_{A10,18h}$
Make-Me-Rich Farm	63.5 dB	64.1 dB
35 Benton Avenue	58.3 dB	58.6 dB

Table 12-6: Summary of night-time baseline noise monitoring (23:00 – 07:00)

Location	Average Measured Noise Level (dB), $L_{Aeq,8h}$
Make-Me-Rich Farm	56.5 dB
35 Benton Avenue	56.0 dB

12.6 Potential impacts (without mitigation)

Construction impacts

12.6.1 Appendix 12.4 sets out indicative details of the construction activities and plant expected to be used on the construction site. The construction plant information, including numbers of plant, percentage on times and BS 5228-1: 2009+A1:2014 references, are also detailed in Appendix 12.4. This information was provided by the contractor and forms the basis of the construction noise and vibration assessment.

12.6.2 A provisional construction programme has been provided by the contractor which showed all activities programmed to occur simultaneously at various locations during the construction period. Table 12.7 summarises the construction works as considered within the construction assessment in terms of activities and phases, periods and areas. These activities were considered representative of the main construction programme. The construction information used in this chapter was considered to represent the most likely worst-case works proposal. However, although the assessment of potential noise and vibration effects during construction is based on the best available information at this stage, the ultimate impacts may alter slightly to those presented.

12.6.3 Table 12-7 makes reference to anticipated periods when each construction activity will occur, which is based upon the programme presented in Section 2.15 within Chapter 2 of this ES. As per Section 5.4, in Chapter 5 of the ES, it is noted that these dates are subject to change as there is a realistic potential the construction programme could be accelerated to complete in 2021. However, given the sequential construction programme, such revisions would not alter the predicted impacts contained within this assessment.

Table 12-7: Construction programme summary

Area	Construction Activities	Period
1	**Construction and set-up of the main site compound**	5 – 30 October 2020
2	**A19 S/B Temporary On-slip Construction:** site establishment, install traffic management, site clearance, earthworks, drainage, lighting and signs, subbase, kerbs, surfacing, road markings and finishes.	2 November 2020 – 17 March 2021
3	**A1290 W/B Off Link & Downhill Lane Junction:** install traffic management, earthworks, site clearance, subbase, drainage, kerbs, lighting and signs, surfacing, road markings and finishes.	10 December 2020 – 3 February 2021
3	**New Roundabout West Side:** site clearance, earthworks, drainage, lighting and signs, subbase, kerbs, surfacing, road markings and finishes.	30 November 2020 – 4 March 2021

Area	Construction Activities	Period
4	**A19 N/B Permanent Off-slip:** revise traffic management, site clearance, earthworks, drainage, lighting and signs, subbase, kerbs, surfacing, road markings and finishes.	2 December 2020 – 12 March 2021
3	**A1290 E/B On Link Nearside:** revise traffic management, site clearance, earthworks, subbase, drainage, kerbs, lighting and signs, surfacing, road markings and finishes.	7 December 2020 – 15 February 2021
2	**A19 S/B Permanent On-slip:** revise traffic management, site clearance, earthworks, drainage, lighting and signs, subbase, kerbs, surfacing, road markings and finishes.	2 April – 31 August 2021
5A	**East Abutment:** revise traffic management, site clearance, earthworks, piling, Formwork, Reinforcement and Concrete (FRC), earthworks backfill.	22 March – 21 July 2021
5B	**West Abutment:** revise traffic management, site clearance, earthworks, piling, FRC, earthworks backfill.	9 March – 22 June 2021
5B	**Bridge Deck:** beams, decking, parapets, kerbs, surfacing, road markings and finishes.	22 July – 21 October 2021
6	**A19 S/B Permanent Off-slip:** revise traffic management, site clearance, earthworks, drainage, lighting and signs, subbase, kerbs, surfacing, road markings and finishes.	2 December 2020 – 25 February 2021
7	**A19 N/B Permanent On-slip:** revise traffic management, site clearance, earthworks, drainage, lighting and signs, subbase, kerbs, surfacing, road markings and finishes.	2 December 2020 – 24 February 2021
13	**A19 N/B Reinstate Old Off-slip:** site clearance, earthworks, drainage, subbase, kerbs, lighting and signs, surfacing, road markings and finishes.	15 March – 5 August 2021
2	**A19 S/B Temp On-slip Removal:** revise traffic management, earthworks, reinstatement, landscaping.	26 October 2021 – 4 January 2022
18	**A1290 E/B On Link Offside:** revise traffic management, site clearance, earthworks, drainage, lighting and signs, subbase, kerbs, surfacing, road markings and finishes.	26 October 2021 – 3 January 2022
8	**A19 North Bridge Road Realignment:** revise traffic management, site clearance, lighting and signs, kerbs, surfacing, road markings and finishes.	27 October – 20 December 2021
16	**Old Washington Road Junction Removal:** site clearance, landscaping.	22 October – 2 December 2021
17	**Old A19 N/B On-slip Removal:** site clearance, landscaping.	22 October – 2 December 2021
18	**A1290 E/B On Link Nearside:** revise traffic management, site clearance, drainage, earthworks, lighting and signs, subbase, kerbs, surfacing, road markings and finishes and completion.	6 January – 8 February 2022
18	**A1290 Pegasus Crossing:** site clearance, earthworks, creating subbase, barrier fencing, road kerbs and edgings, NMU route surfacing, road surfacing and lining, and landscaping	17 December 2021 – 24 January 2022

12.6.4 Noise and vibration impacts would vary from time to time and location to location throughout the construction period. The impacts are also dependent on the contractor's chosen method of working and on the timing and phasing of certain operations. Factors expected to influence the effect of construction work on noise and vibration levels at nearby properties include:

- existing noise levels;
- type and number of activities;
- type of plant/equipment;
- distance from noise sources;
- nature of the local ground and strata;
- topography; and
- wind direction.

12.6.5 It is expected that the majority of construction works would normally take place between 07:30 - 18:00 Monday to Friday and 08:00 to 13:00 on Saturday. There may be exceptions to these hours for oversize deliveries and junction tie-ins, etc. In addition, there are likely to be extended working hours in the summer months for the earthworks to take advantage of the weather / daylight. The circumstances in which work may take place outside 'core' hours are set out in paragraph 4(2)(c) of Schedule 2 to the draft DCO.

12.6.6 Night-time construction work is expected to take place over 9 nights between July to September 2021 in Area 5B (west abutment, shown in Table 12-7) for installing beams, decking and parapets.

12.6.7 Noise levels would be elevated in the immediate vicinity of the Scheme due to various construction activities taking place. Receptors in these areas have the potential to be adversely affected by construction noise.

Construction Noise

12.6.8 Construction noise levels have been predicted at representative sample receptors located in close proximity to the works (see Tables 12-8 and 12-9). Noise levels were predicted for each of the activities listed in Table 12-7 and a maximum construction noise level identified for each sample receptor. Construction noise levels would be similar for other receptors situated nearby.

12.6.9 The noise level predictions took into account the information referred to in paragraph 12.6.1, distance of plant to the receptors, and topographical information between the plant and the receptors. The noise model assumed typical locations for activities working simultaneously as per the construction programme. Daily predicted noise levels for each receptor were calculated and used in this assessment. This approach was considered to provide realistic construction noise levels for each receptor for the entirety of the construction period.

Table 12-8: Construction Noise Impact – Daytime

Receptor	Maximum Construction Noise Level ($L_{Aeq,12h}$) (A)	Baseline Sound Level ($L_{Aeq,12h}$) (B)	Maximum Total Noise Level ($L_{Aeq,12h}$) (C=A+B)	Maximum Noise Change (dB) (C-B)	Number of Days where Construction Noise results in a 5 dB Noise Change and Total Noise Level is greater than 65 dB $L_{Aeq,12h}$
35 Benton Avenue	63	**58**	64	6	0
33 Boston Crescent	68	61	69	8	94
45 Boston Crescent	68	65	70	5	27
114 Baltimore Avenue	65	65	68	3	0
5 Usworth Cottages	69	58	69	11	10
Town End Primary School	61	53	62	9	0
Town End Primary School, Playing Field	56	52	58	6	0
24 Baltimore Avenue	59	67	68	1	0
Make-Me-Rich Farm	66	**64**	68	4	0
Unit 6 of IAMP 1 Offices	58	57	61	4	0
The Chalet	73	59	73	14	28

Table 12-9: Construction Noise Impact – Night-time

Receptor	Maximum Construction Noise Level ($L_{Aeq,8h}$) (A)	Baseline Sound Level ($L_{Aeq,8h}$) (B)	Maximum Total Noise Level ($L_{Aeq,8hr}$) (C=A+B)	Maximum Noise Change (dB) (C-B)	Number of Nights where Construction Noise results in a 5 dB Noise Change and Total Noise Level is greater than 45 dB $L_{Aeq,8h}$
35 Benton Avenue	52	**56**	58	2	0
33 Boston Crescent	56	56	59	3	0
45 Boston Crescent	59	59	62	3	0
114 Baltimore Avenue	58	59	62	3	0
5 Usworth Cottages	49	52	54	2	0
Town End Primary School	N/A	N/A	N/A	N/A	N/A
Town End Primary School, Playing Field	N/A	N/A	N/A	N/A	N/A
24 Baltimore Avenue	55	61	62	1	0
Make-Me-Rich Farm	51	**56**	57	1	0
Unit 6 of IAMP 1 Offices	N/A	N/A	N/A	N/A	N/A
The Chalet	48	53	54	1	0

12.6.10 Predicted noise levels emanating from the daytime (Monday to Saturday) construction activities during the construction programme are shown in Table 12-8. Columns 2, 3, 4 and 5 of Table 12-8 provide the predicted maximum construction noise level, the existing baseline noise level, the resultant maximum noise level and the maximum change in noise level for each receptor considered respectively. Column 6 shows the number of days where the change in baseline noise level exceeds 5 dB and the construction noise level exceeds 65 dB $L_{Aeq,12h}$; i.e. the point where significant effects have the potential to occur if occurring for a total of one month (see Appendix 12.3).

12.6.11 Table 12-9 shows the predicted maximum noise levels emanating from the night-time (Monday to Saturday) construction activities. The column layout of this table is similar to that shown in Table 12-8. The exception being that a lower threshold is shown of 45 dB $L_{Aeq,1h}$ for potential significant effects to arise.

12.6.12 Construction works are transient and variable in nature and it is difficult to predict exact plant and vehicle movements in advance of the works. However, with the detailed construction information provided it was considered that the predicted noise levels presented here are representative of those that receptors would be exposed to.

12.6.13 The baseline noise levels (L_{Aeq}) contained in Tables 12-8 and 12-9 were taken from two sources. Those baseline levels in bold were taken from the noise monitoring exercise. Where baseline noise measurements were not representative, or available, for the receptor locations, baseline noise levels have been derived through applying the $L_{A10,18h}$ to $L_{Aeq,12h}$ and $L_{Aeq,8hr}$ formulae provided within the TRL report '*Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping*' to the predicted noise level for the Do Minimum 2021 scenario.

12.6.14 All noise levels in Tables 12-8 and 12-9 were 'façade noise levels'; i.e. the levels were measured or calculated 1 m in front of the most exposed window or door in the façade of the property, with exception to Town End Primary School's playing field where the noise levels presented for that sample receptor were free-field (i.e. measured or calculated at least 3.5 m away from any vertical reflective façade). Therefore, the presented noise levels constitute a worst-case scenario.

12.6.15 Table 12-8 indicates that sample receptors 33 Boston Crescent, 45 Boston Crescent, 5 Usworth Cottages and The Chalet were predicted to experience potentially significant adverse noise effects. That is, at these receptors, construction noise levels were predicted to be over 65 dB $L_{Aeq,12h}$ and would result in an increase in ambient noise level of 5 dB or more for 94, 27, 10 and 28 days, respectively, during the daytime. This was mainly due to construction activities at the adjacent Area 2, running concurrently with other construction activities at other areas, especially constructing the A1290 Pegasus Crossing in relation to sample receptor 5 Usworth Cottages and The Chalet. Therefore, only sample receptors 33 Boston Crescent, 45 Boston Crescent and the Chalet were predicted to experience construction noise levels over 65 dB $L_{Aeq,12h}$ resulting in an increase in ambient noise level of 5 dB or more for a period of 1 month or more, and would therefore be exposed to a significant adverse effect during construction.

12.6.16 Table 12-9 indicates that none of the sample receptors were predicted to experience an adverse impact at night-time.

12.6.17 A more detailed commentary on the predicted construction noise levels and the associated effects at each of the sample receptors are provided in Appendix 12.5.

12.6.18 All of the construction activities would require the movement of heavy vehicles within the construction site. Such on-site movements have been included within the noise model. The haul routes were defined for each construction activity. Given the already substantially high traffic flows on these roads, it was considered that the subsequent increase in noise and vibration on the A19 would be minimal.

Construction Vibration

12.6.19 Construction activities proposed which have the potential to give rise to largest levels of vibration at receptors would be associated with vibratory earthwork compacting works and percussive piling activities. Such works would be associated with the construction of structures and earthworks.

12.6.20 Within the information that the construction contractor provided, the Caterpillar CS 76 self-propelled was identified for use in the embankment construction team.

12.6.21 Table 12-10 details predicted vibration levels for earth compaction associated with the construction works. The predictions were derived using the techniques contained with BS 5228-2, predicted at the nearest sensitive receptors to the proposed embankment construction areas. The equations contained within BS 5228-2 include scaling factors relevant to the probability of the predicted vibration level being exceed (i.e. 5%, 33% and 50% probability). This assessment presents predictions using the 5 % and 50 % scaling factors, for both the 'steady state' and 'start up and run down' operation of the plant.

12.6.22 The differences in prediction between a 5 % probability and 50 % probability of the predicted value being exceeded gives an indication of the uncertainty of the predicted levels. It should be noted that the 5 % probability was considered a representative worst-case assumption.

Table 12-10: Predicted ground-borne vibration from vibratory soil compaction plant

Receptor	Nearest distance to vibratory soil compaction (m)	Predicted ground-borne vibration level (PPV, mm/s)			
		Steady state		Start up and run down	
		50 % probability	5 % probability	50 % probability	5 % probability
33 Boston Crescent	80	0.2	0.9	0.5	1.4
45 Boston Crescent	60	0.4	1.4	0.7	2.0
The Chalet	60	0.4	1.4	0.7	2.0

12.6.23 Table 12-10 shows that should vibratory compaction construction techniques be adopted at 80 m from 33 Boston Crescent, then initial predictions demonstrate that PPV levels would be 0.9 mm/s during steady-state operation (with a 5 % probability of the predicted value being exceeded), increasing to 1.4 mm/s (with a 5 % probability of the predicted value being exceeded) during start-up and rundown transient conditions. At 45 Boston Crescent and The Chalet, initial predictions demonstrate that PPV levels would be 1.4 mm/s during steady-state operation (with a 5 % probability of the predicted value being exceeded), increasing to 2.0 mm/s (with a 5 % probability of the predicted value being exceeded) during start-up and rundown transient conditions.

12.6.24 As vibration passes through the foundations of a building, the level alters as an effect of the transfer function. Such transfer functions differ between properties; however, a general reduction in vibration from free-field to foundations of 60 % is often applied[104]. However, for the purpose of this assessment no reduction has been assumed and was therefore a conservative assessment approach.

12.6.25 In terms of residential buildings, a vibration level of 2.0 mm/s ppv would likely be perceptible to residents and, in accordance with the guidance within BS 5228-2, could lead to complaint (see Table 12.3-a of Appendix 12.3).

12.6.26 When assuming a more typical probability of exceedance (50 %), a vibration level of 0.7 mm/s ppv was predicted at the worst affected receptor. In the context of a residential building, this would likely be perceptible to occupants; however, not at the point where complaints would be likely (see Table 12.3-a of Appendix 12.3).

12.6.27 In all cases, the predicted vibration levels shown in Table 12-10 fall well below the vibration levels, defined in BS 7385-2, which could give rise to cosmetic damage to buildings.

12.6.28 In considering the above, it should be noted that, given the transient nature of the soil compaction works, the worst-case level of vibration predicted in this assessment would only be experienced for a short duration (e.g. two to three days) and would not cause any damage to properties. This would be when the compaction works occur at the nearest position to the properties. The level of vibration would reduce considerable as the compaction works move away from the properties.

12.6.29 Vibration emissions from other general construction plant and equipment that would likely be used at the site (e.g. excavators and dumper trucks) shall be no greater than those of a vibratory roller. As such, no significant groundborne vibration effects were anticipated.

12.6.30 Consideration was given to the potential for adverse groundborne vibration effects resulting from percussive piling during east abutment construction activity for a period of approximately one month between November to December 2020. Groundborne vibration predictions have been undertaken using the indicative prediction algorithms contained within BS 5228-2. The predicted vibration levels at sample distances are presented within Table 12-11.

Table 12-11: Predicted groundborne vibration from piling at set distances

Distance	Predicted maximum PPV (mm/s)
5	5.7
10	2.3
20	0.9
50	0.3
100	0.1
200	0.0*
500	0.0*

* Extrapolated value, distance between receptor and construction site >110 m and outside the parameter range given within BS 5228-2

12.6.31 Table 12-12 presents the closest residential sample receptors to the proposed piling works and the predicted maximum PPV levels.

Table 12-12: Predicted groundborne vibration from piling nearest receptors

Receptor	Distance (m)	Predicted maximum PPV (mm/s)
Make-Me-Rich Farm	200	Below 0.1 *
33 Boston Crescent	300	Below 0.1 *

* Extrapolated value, distance between receptor and construction site >110 m and outside the parameter range given within BS 5228-2

12.6.32 The nearest residential receptor to the piling works, Make-Me-Rich Farm, would be located approximately 200 m north-west. At this distance, vibration due to percussive piling would be anticipated to be <0.1 mm/s PPV. Such level of vibration was considered below the threshold of human vibration perception.

Operational impacts

12.6.33 Predicted noise levels at all noise sensitive receptors, within the HD 213/11 - Revision 1 calculation area, are detailed in Table 12.6.1 in Appendix 12.6.

12.6.34 Although noise levels were predicted at all receptor locations within the calculation area, noise levels were also presented at a number of sample receptors. These were typical of other receptors in a given location.

Noise levels at sample receptors

12.6.35 Table 12-13 compares noise levels at sample receptor locations in the Do Minimum scenario in 2021 against the Do Something scenario in 2021 (short-term impact), while Table 12-13 compares the noise levels at each sample receptor location in the Do Minimum scenario in 2021 against the Do Something scenario in 2036 (long-term impact). The tables show the magnitude of noise change in accordance with the criteria presented in Appendix 12.3.

12.6.36 A list of the day and night-time noise levels at all of the receptors within the study area is presented in Appendix 12.6.

Table 12-13: Comparison of predicted noise levels at properties for Do Minimum (2021) and Do Something (2021) scenarios

Receptor	Do Minimum 2021, $L_{A10,18h}$ (dB)	Do Something 2021, $L_{A10,18h}$ (dB)	Noise Level Change (dB)	Magnitude of Change
Make-Me-Rich Farm	64.5	64.6	+0.1	Negligible Adverse
River Don LWS	63.2	63.3	+0.1	Negligible Adverse
35 Benton Avenue	55.3	55.3	0.0	No Change
33 Boston Crescent	60.4	60.3	-0.1	Negligible Beneficial
53 Boston Crescent	64.7	64.6	-0.1	Negligible Beneficial
128 Baltimore Avenue	64.3	64.4	+0.1	Negligible Adverse
58 Baltimore Avenue	64.4	64.3	-0.1	Negligible Beneficial
Playing Fields	55.0	54.9	-0.1	Negligible Beneficial

[104] Measurement & Assessment of Groundborne Noise & Vibration, The Association of Noise Consultants, 2001

Receptor	Do Minimum 2021, $L_{A10,18h}$ (dB)	Do Something 2021, $L_{A10,18h}$ (dB)	Noise Level Change (dB)	Magnitude of Change
The Chalet	57.7	57.9	+0.2	Negligible Adverse

12.6.37 Table 12-13 shows that the majority of sample receptors would experience negligible impacts, whilst one receptor would have no change.

12.6.38 The noise changes in the short-term are highlighted in Figure 12.4 Do Minimum 2021 versus Do Something 2021, which shows the noise change contours in terms of the magnitude of impacts. The contours illustrate the areas where changes in noise levels would occur as a result of the Scheme.

Table 12-14: Comparison of predicted noise levels at properties for Do Minimum (2021) and Do Something (2036) scenarios

Receptor	Do Minimum 2021, $L_{A10,18h}$ (dB)	Do Something 2036, $L_{A10,18h}$ (dB)	Noise Level Change (dB)	Magnitude of Change
Make-Me-Rich Farm	64.5	N/A*	-	-
River Don LWS	63.2	64.2	+1.0	Negligible Adverse
33 Benton Avenue	55.3	56.4	+1.1	Negligible Adverse
33 Boston Crescent	60.4	61.1	+0.7	Negligible Adverse
53 Boston Crescent	64.7	65.4	+0.7	Negligible Adverse
128 Baltimore Avenue	64.3	65.0	+0.7	Negligible Adverse
58 Baltimore Avenue	64.4	65.2	+0.8	Negligible Adverse
Playing Fields	55.0	N/A*	-	-
The Chalet	57.7	N/A*	-	-

* These sample receptors were not anticipated to exist in 2036 due to the IAMP Development

12.6.39 Table 12-14 shows that no sample receptors would experience perceptible adverse or beneficial effects in the long-term with the Scheme in place. All sample receptors were expected to experience negligible change with the Scheme in place, in the long-term.

12.6.40 As part of the IAMP Two development being built by 2036, The Chalet, Playing Fields and Make-Me-Rich Farm would no longer exist; therefore, these receptors were not included as part of the long-term operational noise assessment.

12.6.41 The noise changes in the long-term are highlighted in Figure 12.6 'Do Minimum 2021 versus Do Something 2036', which shows the noise change contours in terms of the magnitude of impacts. The contours illustrate the areas where changes in noise levels would occur as a result of the Scheme.

HD 213/11 - Revision 1 summary tables

12.6.42 Tables 12-15, 12-16 and 12-17 provide the noise level change comparisons in accordance with the reporting requirements for a Detailed Assessment within HD 213/11 - Revision 1; see paragraph 12.3.20 and Appendix 12.3 for more information on the classification of noise impacts.

12.6.43 Table 12-18 provides the hourly night-time noise level change comparison in 2021 between the hours of 05:00 and 06:00.

Table 12-15: Short-term traffic noise comparison, Do Minimum (2021) against Do Something (2021)

Scenario/Comparison: Do Minimum 2021 against Do Something 2021			
Change in noise level (with magnitude of impact category)		Daytime	
		Number of dwellings	Number of other sensitive receptors
Increase in noise level $L_{A10,18h}$	0.1 – 0.9 (negligible)	116	1
	1.0 – 2.9 (minor)	0	0
	3.0 – 4.9 (moderate)	0	0
	5+ (major)	0	0
No Change	0	461	9
Decrease in noise level $L_{A10,18h}$	0.1 – 0.9 (negligible)	852	17
	1.0 – 2.9 (minor)	0	0
	3.0 – 4.9 (moderate)	0	0
	5+ (major)	0	0

12.6.44 Table 12-15 shows that no receptors were predicted to experience perceptible noise level increases or decreases (1.0 dB $L_{A10,18h}$ or more) in the short-term following the introduction of the Scheme.

12.6.45 In the short-term the majority of properties were predicted to experience noise level decreases, with 852 properties experiencing 'negligible' decreases. 116 dwellings were predicted to experience 'negligible' increases in noise levels.

12.6.46 There were 17 other sensitive receptors predicted to experience 'negligible' noise level decreases in the short-term with the Scheme in place. There was one other sensitive receptor predicted to experience 'negligible' noise level increases.

12.6.47 Overall, in the short-term most receptors were predicted to experience imperceptible noise level changes. Hence, the effect of the Scheme can be considered neutral in the short-term.

12.6.48 Table 12-16 shows the long-term noise level predictions without the Scheme in place. The majority of receptors were predicted to experience negligible noise level increases in both the daytime and night-time. These increases in noise level were generally as a result of increases in traffic flow in Do Minimum 2036.

12.6.49 Table 12-16 also shows that six other sensitive receptors were predicted to experience perceptible noise levels increases. All these receptors are office areas associated with the IAMP development. The increases in noise result from an anticipated large increase in traffic flow on the internal IAMP road network.

Table 12-16: Long-term traffic noise comparison, Do Minimum (2021) against Do Minimum (2036)

Scenario/Comparison: Do Minimum 2021 against Do Minimum 2036				
Change in noise level (with magnitude of impact category)		Daytime		Night-time
		Number of dwellings	Number of other sensitive receptors	Number of dwellings (>55 dB)
Increase in noise level $L_{A10,18h}$	0.1 – 2.9 (negligible)	1,420	20	131
	3.0 – 4.9 (minor)	0	5	0
	5.0 – 9.9 (moderate)	0	1	0
	10+ (major)	0	0	0
No Change	0	0	0	0
Decrease in noise level $L_{A10,18h}$	0.1 – 2.9 (negligible)	0	0	0
	3.0 – 4.9 (minor)	0	0	0
	5.0 – 9.9 (moderate)	0	0	0
	10+ (major)	0	0	0

12.6.50 The long-term Do Minimum noise level changes are demonstrated in Figure 12.5, which shows the noise change contours between the Do Minimum 2021 and Do Minimum 2036.

12.6.51 The noise level predictions for the long-term scenario with the Scheme in place, Do Something 2036 vs Do Minimum 2021, are shown in Table 12-17.

Table 12-17: Long-term traffic noise comparison, Do Minimum (2021) against Do Something (2036)

Scenario/Comparison: Do Minimum 2021 against Do Something 2036				
Change in noise level (with magnitude of impact category)		Daytime		Night-time
		Number of dwellings	Number of other sensitive receptors	Number of dwellings (>55 dB)
Increase in noise level $L_{A10,18h}$	0.1 – 2.9 (negligible)	1,420	22	126
	3.0 – 4.9 (minor)	0	4	0
	5.0 – 9.9 (moderate)	0	0	0
	10+ (major)	0	0	0
No Change	0	2	0	0

Scenario/Comparison: Do Minimum 2021 against Do Something 2036				
Change in noise level (with magnitude of impact category)		Daytime		Night-time
		Number of dwellings	Number of other sensitive receptors	Number of dwellings (>55 dB)
Decrease in noise level $L_{A10,18h}$	0.1 – 2.9 (negligible)	0	0	0
	3.0 – 4.9 (minor)	0	0	0
	5.0 – 9.9 (moderate)	0	0	0
	10+ (major)	0	0	0

12.6.52 As with the long-term predictions without the Scheme in Table 12-16, the long-term noise level predictions with the Scheme in place consider the installation of Low Noise Road Surface (LNRS) on the A19 by 2036. Figure 12.6 shows the noise change contours between the Do Minimum 2021 and Do Something 2036.

12.6.53 In the daytime with the Scheme, 1,420 dwellings and 22 other sensitive receptors were predicted to experience 'negligible' noise level increases. There would be four other sensitive receptors predicted to have perceptible noise level increases in the long-term. As observed in the Do Minimum 2021 versus Do Minimum 2036 comparison above, these would be again those associated with the IAMP development and the increases would be associated with increased traffic on the IAMP internal road network. Thus, these increases can be considered to not directly result from the Scheme.

12.6.54 In the night-time 126 properties would experience noise level increases, although these changes would be 'negligible' and not perceptible.

12.6.55 Overall, the effect of the Scheme was considered to be 'neutral' in the long-term.

Table 12-18: Short-term traffic noise comparison for 05:00 – 06:00, Do Minimum (2021) against Do Something (2021)

Scenario/Comparison: Do Minimum 2021 against Do Something 2021			
Change in noise level (with magnitude of impact category)		05:00 – 06:00 hours	
		Number of dwellings	Number of other sensitive receptors
Increase in noise level $L_{A10,1h}$	0.1 – 0.9 (negligible)	515	10
	1.0 – 2.9 (minor)	6	0
	3.0 – 4.9 (moderate)	0	0
	5+ (major)	0	0
No Change	0	144	5
	0.1 – 0.9 (negligible)	700	12
	1.0 – 2.9 (minor)	64	1

Scenario/Comparison: Do Minimum 2021 against Do Something 2021			
Change in noise level (with magnitude of impact category)		05:00 – 06:00 hours	
		Number of dwellings	Number of other sensitive receptors
Decrease in noise level $L_{A10,1h}$	3.0 – 4.9 (moderate)	0	0
	5+ (major)	0	0

12.6.56 The noise level changes in Table 12-18 show that the majority of receptors were predicted to experience a 'negligible' difference with the Scheme in place.

12.6.57 There were six dwellings are predicted to experience 'minor' noise level increases between 05:00 to 06:00 hours. The Chalet was predicted to experience an increase of 1.2 dB $L_{A10,1hr}$ with the Scheme in place and 1 to 5 Usworth Cottages were predicted to experience an increase of 1.0 to 1.1 dB $L_{A10,1hr}$. These predicted noise level changes marginally exceed the threshold of perceptibility during this one-hour period. It should be noted that the HD213/11 advice regard perceptibility strictly relates to the prolonged day-time periods (06:00 to 00:00 hours) and night-time periods (23:00 – 07:00). Whether such a relationship would apply to a one-hour period is uncertain. The predicted changes were due to the increased number of vehicles on Downhill Lane near IAMP One between 05:00 and 06:00 with the Scheme in place.

12.6.58 It shall be noted that when using the TRL report '*Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping*', the predicted $L_{A10,1hr}$ noise levels for the above six dwellings would all fall below 55 dB $L_{Aeq,1hr}$. Therefore, it can be determined that the total night-time noise level would fall below the threshold criteria (55 dB $L_{night,outside}$), as per HD 213/11, for inclusion within night-time noise impact assessments. In addition, it should be noted that, when considered over the full night-time period, there would be negligible noise level change given that the traffic moves from one hour to another within the night-time period (i.e. the total predicted night-time $L_{night,outside}$ noise level would not alter).

12.6.59 There were 64 dwellings and 1 other sensitive receptor predicted to experience 'minor' noise level decreases. These receptors were located adjacent to Washington Road which between the hours of 05:00 and 06:00 would experience fewer vehicles and percentage of heavy vehicles with the Scheme in place. The overall night-time noise levels for these properties would be below the HD 213/11 – Revision 1 threshold for determining night-time noise impacts.

12.6.60 In considering the above, it was considered that residents would be unlikely to perceive the increase in night-time noise levels resulting from the traffic flow changes between 5:00 and 6:00 hours.

12.6.61 The night-time noise change contours for 05:00 – 06:00 between the Do Minimum 2021 and Do Something 2021 are shown in Figure 12.7.

Noise nuisance

12.6.62 Noise nuisance is explained in Appendix 12.3. Note that this relates to noise nuisance as defined in DMRB and is not related to statutory nuisance. In summary, it is related to the percentage of people 'bothered very much or quite a lot' by traffic noise. Calculations of the change in noise nuisance have been undertaken for all dwellings within the HD 213/11 - Revision 1 calculation area for the assessment of permanent traffic noise impacts. Table 12-19 provides the results of the noise nuisance assessment.

12.6.63 Table 12-19 shows that with the Scheme in place 1,313 dwellings would experience an increase of less than 10 % in noise nuisance compared to 1,429 dwellings without the Scheme. There were 116 dwellings predicted to experience increases in nuisance levels greater than 10 %, but less than 20 %, with the Scheme in place.

12.6.64 Table 12-19 also shows that no dwellings were predicted to experience decreases in nuisance levels with the Scheme and without the Scheme.

Table 12-19: Traffic noise nuisance

Noise Nuisance Assessment			
Change in nuisance level		Do Minimum	Do Something
		Number of dwellings	Number of dwellings
Increase in nuisance level	<10%	1,429	1,313
	10<20%	0	116
	20<30%	0	0
	30<40%	0	0
	>40%	0	0
No Change	0	0	0
Decrease in nuisance level	<10%	0	0
	10<20%	0	0
	20<30%	0	0
	30<40%	0	0
	>40%	0	0

Basic noise level changes

12.6.65 Consideration has also been given to likely noise impacts at dwellings along the wider road network, outside the HD 213/11 - Revision 1 calculation area. Table 12-20 provides predicted basic noise levels for affected routes outside the calculation area. The levels in brackets are the differences between the Do Minimum in the baseline and the Do Something scenarios considered. Figure 12-1 shows the location of the affected links.

Table 12-20: Basic noise levels for affected routes outside the calculation area

Road	Sensitive Receptors within 50 m	Basic Noise Level dB $L_{A10,18h}$		
		DM2021	DS2021	DS2036
A1231 Sunderland Highway westbound sliproad	1	60.5	59.4 (-1.1)	59.9 (-0.6)

12.6.66 Table 12-20 shows that there would be one property located within 50 m of a beneficially affected link. This link has a predicted 'minor' reduction in noise levels in 2021 and 'negligible' in 2036.

Noise Action Plan Important Areas

12.6.67 There is one Noise Important Area identified within the study area. The predicted impact of the Scheme in terms of noise change is shown in Table 12-21.

Table 12-21: Noise action planning Important Areas and expected changes in noise level with the Scheme in place

Important Area	Important Area ID(s)	Do Minimum 2036	Do Something 2036
Along the A19 and Ferryboat Lane in close proximity to Crieff Square	6637	"Negligible" beneficial change in the noise level (-0.2 dB $L_{A10,18h}$)	"Negligible" adverse change in the noise level (+0.9 dB $L_{A10,18h}$)

12.6.68 Table 12-21 demonstrates that 'negligible' changes in noise levels were predicted at Important Area 6637. The negligible increase in noise level in the future Do Something scenario results from general traffic increases in the area. In fact, the future Do Minimum noise level is slightly higher than that predicted for the Do Something, suggesting the negligible increase does not result from the Scheme. Therefore, no adverse effects, as a result of the Scheme, would be expected at the Defra Noise Mapping Important Areas contained within the HD 213/11 - Revision 1 Calculation Area.

Noise Insulation Regulations assessment

12.6.69 An assessment has been carried out using the predicted noise levels obtained from the noise modelling exercise, and no receptors would be eligible for noise insulation as a result of the Scheme. This is because no properties meet the criteria set out in the Noise Insulation Regulations 1975 (as amended), which are explained in Section 12.2E of Appendix 12.2 in Volume 3 of this ES.

Vibration nuisance

12.6.70 Changes in vibration nuisance have been calculated for all dwellings within 40 m of those roads contained within the HD 213/11 - Revision 1 calculation area. Table 12-22 below provides the results of the vibration nuisance assessment undertaken.

12.6.71 Table 12-22 shows that 136 properties would experience an increase of less than 10 % in airborne vibration nuisance with and without the Scheme.

Table 12-22: Traffic airborne vibration nuisance reporting table

Vibration Nuisance Assessment			
Change in nuisance level		Do Minimum	Do Something
		Number of dwellings	Number of dwellings
Increase in nuisance level	<10%	136	136
	10<20%	0	0
	20<30%	0	0
	30<40%	0	0
	>40%	0	0
No Change	0	3	3
Decrease in nuisance level	<10%	0	0
	10<20%	0	0
	20<30%	0	0
	30<40%	0	0
	>40%	0	0

Ground-borne vibration

12.6.72 HD 213/11 - Revision 1, paragraph A5.26 states, "*Significant ground-borne vibrations may be generated by irregularities in the road surface. Such vibrations are unlikely to be important when considering disturbance from new roads and the assessment will only be necessary in exceptional circumstances*." Further to this, Figure 3 from 'Transport and Road Research Laboratory (TRRL) Report No RR53 - Ground Vibration Caused by Civil Engineering Works[105]' provides a summary of measurements, taken by the TRRL, that indicate the relative effects of various construction related sources. This figure indicates that, for a heavy lorry on a poor road surface at 8 m, a PPV of 0.1 mm/s would be expected.

12.6.73 The shortest horizontal distance between a sensitive receptor and the running surface of the Scheme would be greater than 50 m. Therefore, given the distances between the nearest sensitive receptors and the proposed road running surface, ground-borne vibration was not considered to have a likely significant effect.

12.7 Design, mitigation and enhancement measures

Mitigation for construction impacts

12.7.1 All work would be undertaken to the guidance detailed in BS 5228: 2009+A1:2014 – Code of Practice for noise and vibration control on construction and open sites, Part 1: Noise and Part 2: Vibration. It is anticipated that the following mitigation measures would be employed on site as part of a Construction Environmental Management Plan (CEMP) so noise and vibration levels would be attenuated as far as possible:

- using 'best practicable means' during all construction activities;
- avoiding unnecessary revving of engines and making sure plant and equipment is switched off when it is not in use for long periods of time;
- keeping haul roads well maintained and avoid steep gradients;

[105] Transport and Road Research Laboratory (TRRL) Report No RR53 – Ground Vibration Caused by Civil Engineering Works

- starting up plant and equipment sequentially rather than all together;
- selecting low noise emitting plant where available and suitable;
- using audible reversing warning systems on mobile plant and vehicles of a type which, whilst still giving proper warning, have a minimum noise impact on persons outside sites;
- establishing appropriate controls for undertaking significantly noisy works, vibration-causing operations close to receptors or working outside of normal construction hours (assumed to be 07:30 to 18:00 Monday to Friday and 08:00 to 13:00 on Saturday- see further paragraph 4(2)(c) of Schedule 2 to the draft DCO for the circumstances in which works may take place outside of this period);
- should it be necessary to work outside of the parameters set out in Schedule 2 of the DCO, consultation shall be undertaken with the Environmental Health Departments of South Tyneside Council and Sunderland City Council to agree such hours and where necessary noise and vibration limits, and nearby residents would be notified in advance of the works;
- programming works so that the requirement for working outside normal working hours is minimised (taking into account the highway authority's statutory duties under the Traffic Management Act 2004);
- setting vibration soil compaction plant to a low amplitude setting when operating in close proximity to sensitive receptors;
- using low noise emission plant where possible;
- making sure all piling would be rotary;
- developing and maintaining good relations with people living and working in the vicinity of site operations;
- implementing an efficient complaints procedure;
- where viable, using temporary noise screens around particularly noisy activities (or stationary plant such as generators); and
- regularly maintaining plant.

12.7.2 The majority of the above are considered good practice measures, which local authorities would likely require as part of a 'best practice approach.'

12.7.3 The use of temporary noise screens adjacent to plant can, if positioned effectively, provide noise reductions of 10 dB or more. For such benefits to occur, it would typically require no line of sight between the receptor and noise source. There are a number of other variables which determine the actual attenuation that would result for individual receivers (e.g. noise spectrum content of the plant, whether plant is mobile or stationary, ground conditions, material of screens).

12.7.4 There are also practical considerations when implementing noise screens, particularly where mobile plant is used or where the works are particularly transient. For example, installing screens adjacent to excavation works is unlikely to be practical given the day-to-day movement of such works. When considering this, with the indicative nature of the construction information at this time, it was not possible to accurately predict the likely noise benefits at a given location from the potential of such noise screens. The practicality of using noise screens would require further consideration at the construction stage.

12.7.5 It is anticipated that a programme of noise and vibration monitoring, for during construction, would be developed in consultation with the Environmental Health Departments of South Tyneside Council and Sunderland City Council. This would likely contain a schedule of monitoring and noise and vibration limits.

Mitigation for operational impacts

12.7.6 HD 213/11 - Revision 1 recommends that noise increases in excess of 1 dB(A) in the short-term and 3 dB(A) in the long-term should be mitigated, if possible. Predicted noise levels show that, other than the IAMP commercial receptors, no receptor was expected to experience noise increases in the 1 dB(A) or 3 dB(A) in the short-term and long-term, respectively. Therefore, no further noise mitigation was proposed for the Scheme. As observed in Section 12.6 of this ES, the increase in noise at the IAMP receptors does not directly result from the Scheme.

Achieving improvement for Noise Important Areas

12.7.7 This chapter identifies that no adverse impacts would result at one Noise Important Area (NIA) contained within the study area (ID 6637). Nevertheless, it is the responsibility of the Highway Authority, where feasible, to reduce noise levels for NIAs, regardless of the noise level change predicted from a proposed development. In relation to this EIA, any such works would represent enhancement or environmental improvement rather than mitigation, as the works would be aimed at addressing issues not arising from the effects of the Scheme.

12.7.8 In considering the above, a review has been undertaken of the NIA to determine potential improvement options that could be considered at the detailed design stage. It was concluded that it would not be practicable to provide improvement measures as part of the Scheme, because the NIA lies beyond the limits of the Scheme. Any improvement works would potentially require additional land, which could not be legally justified in terms of the needs of the Scheme or mitigation of the environmental effects of the Scheme.

Monitoring and maintenance

Construction phase

12.7.9 It is anticipated that, as part of the CEMP, a scheme of noise and vibration monitoring would be drafted and consulted upon with South Tyneside Council and Sunderland City Council before being formally approved by the Secretary of State. This would contain a schedule of monitoring and agreed noise and vibration limits.

Operational phase

12.7.10 No further monitoring is proposed.

12.8 Assessment of effects

Construction phase

12.8.1 The predicted worst-case construction noise levels indicated the potential for significant effects at those properties and other sensitive receptors closest to the construction of the Scheme. In order to control the potential noise impacts, localised mitigation measures would be implemented as part of a 'best practice approach.' With the implementation of suggested 'best practice approach' mitigation measures, and the application of a CEMP, any impact would be minimised. However, despite this, it is possible that significant construction noise levels would likely occur for short durations.

12.8.2 The use of noise screens has the potential to reduce noise levels by up to 10 dB when compared to those contained within Tables 12-8 and 12-9. However, there are a number of practicality considerations required to determine whether the use of such measures would be an effective and/or efficient mitigation measure. Where the implementation of noise screens was determined to be practical, this could result in reductions in noise such that significant noise levels do not arise at a number of sensitive receptors. Further consideration of the use of noise screens would be undertaken at the construction stage.

12.8.3 Based on the analysis undertaken, perceptible vibration due to soil compaction activities would be a possibility on occasion at those properties closest to the Scheme. The levels of vibration could be perceptible to residents and could lead to complaint. However, such levels can be tolerated if prior warning and explanation has been given to residents and the vibration is experienced for a short duration. Therefore, it was considered that vibration arising from construction activities would not result in a significant effect for any receptor location considered.

Operational phase

12.8.4 The significance of operational effects has been assessed using the method detailed in Appendix 12.3 of the ES, based on both the magnitude of change in noise and the resulting absolute noise level, in relation to criteria defined in terms of the 'lowest observed adverse effect level' (LOAEL) and the 'significant observed adverse effect level' (SOAEL).

12.8.5 One property, 39 Ferryboat Lane, was predicted to experience a potentially significantly adverse effect in the long-term with the Scheme in place. This receptor showed a noise level increase in the long-term of 1.1 dB $L_{A10,18hr}$ with noise levels exceeding the SOAEL threshold. However, it should be noted that in the short-term, the noise level at this property was predicted to reduce by 0.1 dB $L_{A10,18hr}$ with the Scheme. In addition, the predicted 2036 Do-Minimum noise level for this property was 0.1 dB $L_{A10,18hr}$ in excess of the 2036 Do-Something noise level. As such, it was evident that the noise level change of 1.1 dB $L_{A10,18hr}$ in the long term was not associated with the introduction of the Scheme; therefore, the potential significant effect can be discounted.

Inter-relationship effects between topics

12.8.6 In relation to inter-relationship effects, no significant long-term noise and vibration impacts have been identified. Therefore, it was considered very unlikely that any adverse inter-relationship effects would occur with other environmental changes (such as air quality or visual effects).

Shared use of the A19 Testo's scheme main site compound

12.8.7 As discussed in Section 1.5, in Chapter 1 of this ES, there is the potential that the Scheme could share use of the temporary main site compound for the Testo's scheme for the purpose of general storage, traffic management and office-based administrative purposes. If this was undertaken from the commencement of construction of the Scheme, the area of land take required for the Downhill Lane main site compound could be reduced. There would also be a period where both the Testo's and Downhill Lane junction schemes are being constructed at the same time, followed by a period where only the Scheme is under construction but still using the Testo's scheme main site compound.

12.8.8 Use by the Downhill Lane Scheme would not change the footprint of the Testo's main site compound, but there would be a slight increase in vehicle movements in and out the Testo's Scheme main site compound. However, though there would be a small number of additional HDV movements as a result of the combined use of the Testo's main site compound, the majority of the HDV movements for the Scheme would be associated with other temporary land (i.e. not associated with the Testo's Scheme) used for the storage of plant and materials to construct the Scheme. Therefore, any increase in noise effects on sensitive receptors close to the Testo's Scheme was not anticipated to be a significant change compared those outlined within Chapter 12 of the Testo's Scheme ES.

12.8.9 Though the extended use of the Testo's scheme main site compound would mean any noise effects from the Testo's main site compound continuing for a longer period, these would not be significant due to continued application of good construction practices (e.g. noise mitigation controls) and the reduction of construction activity in the Testo's compound to mainly low risk general storage, traffic management and office-based administrative purposes.

12.8.10 The reduction in the temporary land take required by the Downhill Lane Scheme main site compound would not change the Scheme ES assessment due to the lack of sensitive receptors near the Scheme compound (especially the northern end where any land take reduction would most likely occur).

12.8.11 Therefore, there would be no significant change in the noise effects outlined in Chapter 12 of both the Scheme and Testo's scheme ESs as a result of the shared and extended use of the Testo's scheme main site compound.

Cumulative effects

12.8.12 As explained in Section 5.4, in Chapter 5 of this ES, the operational assessment within this chapter uses the 2021 and 2036 Do Minimum and Do Something traffic models where the future baseline includes the road network and traffic flow changes associated with other developments. Thus, the operational noise assessment of the Scheme includes the cumulative effects with other developments, including IAMP Two and the Testo's scheme.

12.8.13 However, the operation of IAMP One and construction of the Testo's scheme form part of the baseline for the construction phase noise assessment, so the construction phase noise cumulative effects of the Scheme with other developments (incl. IAMP Two) are assessed within Chapter 15 of this ES.

CHAPTER 13 PEOPLE AND COMMUNITIES

Executive summary

This chapter covers the potential effects of the Scheme on people and communities in the vicinity of the Scheme. These include occupiers of agricultural, community and development land, owners and users of private property, users of community facilities, and stakeholder groups within the local area. The effects of the Scheme on movement between communities via all transport modes was also considered, as well as potential effects on the local economy.

The assessment addressed impacts at: the local level, in close proximity to the Scheme; the community level, including the closest communities of Town End Farm, Hylton Castle, West Boldon, Boldon Colliery and Usworth; and the regional level, including the three local authorities of South Tyneside, Gateshead and Sunderland. The assessment draws on information gathered from desk-based research, site inspections and consultation.

Most of the permanent land take, outside of the current highway boundary, required for the Scheme is currently in agricultural use of varying intensity. This moderate quality land comprises parts of three farm businesses based away from the A19 Downhill Lane junction and four other landholdings.

During construction, the Scheme would have temporary adverse effects on road users, including public transport users, due to disruptive construction activities. There are expected to be beneficial effects during operation with regard to the improved transportation and movement between communities and facilities in the area. There would also be significant adverse effects during construction for pedestrians, cyclists and equestrians due to the diversion of key NMU routes, such as Bridleway B46 (to allow for the construction of a new balancing pond) and also walkways and cycleways along Washington Road (to allow for realignment). There would be significant long-term beneficial effects for pedestrians, cyclists and equestrians during operation due to the new NMU facilities providing improved safety.

During operation of the Scheme, vehicles on the A19 and those travelling from Testo's to the north are expected to experience improved journey times during peak periods. For vehicle travellers travelling east to west through Downhill Lane junction, journey times are anticipated to increase As Downhill Lane (West) would become a left in-left out only road at its junction with the A1290 when IAMP One is constructed, those using Downhill Lane (West) via this junction would experience significant increases in journey times. Should IAMP Two be consented and constructed, then the Downhill Lane (West) connection with the A1290 would be removed and traffic would permanently re-route via the A194 (M), A184 and A19 or via the full length of the A1290. The IAMP Two local road network improvements would provide reductions in driver stress on the approaches to Downhill Lane junction.

At the local authority level, the construction of the Scheme is expected to lead to the temporary creation of approximately 109 jobs during construction. This is a beneficial effect as the area suffers from an unemployment rate that is above the national average. The permanently improved local transport network would benefit both the local and regional economies by supporting long-term employment development west of Downhill Lane junction.

13.1 Introduction

13.1.1 After some introductory text, including the setting out of the legislative background, this chapter is structured according to the following eight subheadings: land use, physical assets, non-motorised users (NMUs), community severance, community amenity, public transport users, vehicle travellers, and economy and employment.

13.1.2 For **land use**, the assessment considered the effects on community land and facilities, development land, agricultural land and farm businesses.

13.1.3 For **physical assets**, the assessment considered the effects on built assets in proximity to the Scheme, including residential, commercial, and industrial property.

13.1.4 For **NMUs**, the assessment considered effects on pedestrians, cyclists and equestrians, such as changes to the accessibility and usability of NMU routes and changes to journey lengths, as well as changes to journey amenity.

13.1.5 For **community severance**, the assessment considered any loss of all or part of a community facility or community, based on the level of direct land take, as well as any disruption in access to facilities.

13.1.6 For **community amenity**, the assessment considered the ability of people to enjoy their surroundings and the indirect effects on feelings of wellbeing amongst local stakeholder groups (namely local residents, outdoor leisure users, farmers, and community groups).

13.1.7 For **public transport users**, the assessment considered the effects on bus routes and the potential for changes to bus journey times.

13.1.8 For **vehicle travellers**, the assessment considered the effects on traffic and delay times, changes to the view from the road, and changes to the level of stress experienced by drivers.

13.1.9 For **economy and employment**, the assessment considered the effects on employment levels and general economic stimulation.

13.2 Legislative and policy framework

Legislative background

13.2.1 Key legislation relevant to this chapter includes:

- **The Localism Act (2011)**[106] – which sets out a series of measures with the potential to achieve a substantial shift in power away from central government and towards local people.
- **The Commons Registration Act 1965**[107] – which created a system for the registration and legal protection of Common Land and Town and Village Greens, although there are none in the study area.
- **The Countryside and Rights of Way (CRoW) Act 2000**[108] **and the Highways Act 1980**[109] – which are the principal pieces of legislation governing the registration and protection of public footpaths, bridleways, byways open to all traffic and restricted

106 A plain English guide to the Localism Act – Update (2011). Accessed from:http://www.communities.gov.uk/documents/localgovernment/pdf/1896534.pdf
107 UK Government (1965). Accessed from: http://www.legislation.gov.uk/ukpga/1965/64/pdfs/ukpga_19650064_en.pdf
108 UK Government (2000). Accessed from: http://www.legislation.gov.uk/ukpga/2000/37/contents
109 UK Government (1980). Accessed from: http://www.legislation.gov.uk/ukpga/1980/66

byways. The CRoW Act also provides measures to improve public access to the open countryside and registered common land.

- **Countryside Stewardship Scheme[110] –** replaced the Government's Environmental Stewardship Scheme which was closed in 2014 and aimed to make payments to farmers and landowners to enhance and conserve English landscapes, their wildlife and history and to help people enjoy them. The Countryside Stewardship Scheme has three main elements: higher tier; mid-tier and a lower tier of capital grants including the Hedgerows and Boundaries Capital Grants.

[110] UK Government (2015). Accessed from: https://www.gov.uk/government/collections/countryside-stewardship-get-paid-for-environmental-land-management

Policy background

National Policies[111]

13.2.2 National policy relevant to the scope of potential effects on People and Communities is outlined in Table 13-1.

Table 13-1: Relevant National Policies

National Policy	Relevant Paragraph	How the policy has been addressed
National Networks National Planning Policy Statement (NNNPS) (Designated January 2015)	People and communities are not covered as a specific generic impact in the NNNPS. People and communities are referred to in the following sections of the NNNPS: **Health:** paragraphs 4.79 to 4.82; **Land use,** including open space, green infrastructure and Green Belt: paragraphs 5.162 to 5.185; and **Noise:** paragraphs 5.186 to 5.200.	The NNNPS sets out the Government's vision and policy against which the Secretary of State will make decisions on applications for development consent for nationally significant infrastructure projects on the strategic road and rail networks. A full review of the Scheme against the NNNPS is set out in Appendix A of the Planning Statement (DCO application reference TR010024/APP/7.1).
National Planning Policy Framework (NPPF) (July 2018)	The NPPF sets out that the purpose of planning is to help achieve sustainable development. **Section 2** covers the role of the planning system in achieving sustainable development… "the purpose of the planning system is to contribute to the achievement of sustainable development…." Paragraph 8 states "*achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways…* • *An economic objective – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by coordinating the provision of infrastructure;* • *A social objective – to support strong, vibrant and healthy communities….fostering a well-designed and safe built environment, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and* • *An environmental objective – to contribute to protecting and enhancing our natural, built and historic environment…"* **Paragraph 10** states "*….the heart of the framework is a presumption in the favour of sustainable development….* **Section 6** (Building a strong, competitive economy) covers the Government's commitments to delivering economic growth….and also covers economic growth and prosperity in rural areas. **Paragraph 80** states that *"Significant weight should be placed on the need to support economic growth and productivity, taking into account both local business needs and wider opportunities for development.".* **Section 8** covers the requirements for promoting healthy and safe communities. **Paragraph 98** asserts that *"planning policies and decisions should protect and enhance public rights of way and access, including taking opportunities to provide better facilities for users, for example by adding links to existing rights of way networks including National Trails".* **Section 9** covers promoting sustainable transport, including the provision of cycling and pedestrian facilities. **Section 12** covers the requirement for good design in the planning process.	The People and Communities chapter covers the following: land use; physical assets; NMUs; community severance; community amenity; public transport users; vehicle travellers; and economy and employment. Section 13.8 of this ES chapter indicates that the Scheme would have a positive effect on the local economy and employment. Section 13.7 of this ES chapter details the proposed improvements to the NMU facilities, whilst Section 13.8 of this ES chapter notes how NMUs would experience long-term beneficial effects.
Planning Practice Guidance (PPG)	Planning Practice Guidance relating to relevant NPPF policies are included under 'Noise', **paragraphs 001 to 012**, 'Health and wellbeing' **paragraphs 004 to 005**, 'Open Space, sports and recreation facilities, public rights of way and local green space' **paragraphs 003, 004, 007, 010-011, 017-018.**	

[111] Department for Transport. (2014).National Policy Statement for National Networks. Accessed from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/387222/npsnn-print.pdf

13.2.3 Local planning policy relevant to the scope of potential effects on People and Communities is outlined in Tables 13-2 and 13-3.

Table 13-2: Relevant Policies within the South Tyneside statutory Development Plan

South Tyneside Local Development Framework	Relevant Policy	How the policy has been addressed
Core Strategy (June 2007)	**Policy ST1 Spatial Strategy for South Tyneside** *"The spatial strategy for South Tyneside, as shown on the Key Diagram, is to:* **C)** *promote opportunities along the A19 Economic Growth Corridor"* **Policy E1 Delivering Economic Growth and Prosperity** covers investment in education and training.	Sections 13.6 'Potential Impacts' and 13.8 'Assessment of effects' describe the positive effects of the Scheme on the local economy and employment.
Development Management Policies (December 2011)	**Policy DM1 Management of Development** addresses residential amenity, design of external spaces, linkage to wider green infrastructure, prioritisation of movement by pedestrians and cyclists and the needs of all users for access into and around buildings for public use. **Policy DM 5 Gypsies and Travellers and Travelling Showpeople Caravan Sites** covers proposals for provision of accommodation for gypsies, travellers and travelling showpeople.	Section 13.8 of this ES chapter indicates how the Scheme would affect the amenity for some stakeholders during construction and during operation. The Scheme would include improvements to NMU routes.

Table 13-3: Relevant Policies within the Sunderland statutory Development Plan

Sunderland City Council	Relevant Policy	How the policy has been addressed
City of Sunderland Unitary Development Plan: Saved Policies (March 2007)	**Policy CF13 Loss of Community Facilities:** *"The loss of necessary community facilities will be a material consideration in assessing development proposals".* **Policy L10 Countryside Recreation** covers the improvement and promotion of countryside recreational activities and access to them, including measures relating to the improvement of the rights of way network, signposting, facilities for people with disabilities, public transport, car parking, the great north forest, limiting noisy sports, equestrian activities and access to wildlife sites. **Policy B19 User Friendly Environment** addresses measures to ensure that facilities to which the public have access have ease of access for pedestrians, including those with impaired mobility, shopping trolleys, pushchairs etc.; provide protection from weather; and assist community safety and protection from crime.	There would be no loss of community facilities as part of the Scheme. Section 13.7 of this ES chapter details the proposed improvements to the NMU facilities, whilst Section 13.8 of this ES chapter summarises the beneficial effects of the Scheme. Section 13.7 of this ES chapter notes how the Scheme would minimise the adverse effects from the temporary and permanent loss of some Grade 3b agricultural land.
Development Management Policies (December 2011)	**Policy DM1 Management of Development** addresses residential amenity, design of external spaces, linkage to wider green infrastructure, prioritisation of movement by pedestrians and cyclists and the needs of all users for access into and around buildings for public use.	Section 13.8 of this ES chapter discusses the effects on amenity for some stakeholders during construction and operation. The Scheme would include improvements to NMU routes.

13.3 Assessment methodology

Guidance

13.3.1 This chapter was developed with reference to the following parts of DMRB Vol 11: Section 3[112]:

- Part 6 Land Use;
- Part 8 Pedestrians, Cyclists, Equestrians & Community Effects; and
- Part 9 Vehicle Travellers.

13.3.2 In addition, DMRB Interim Advice Note 125/15[113] sets out the requirement to combine the current DMRB Vol 11 Section 3 parts 6, 8 and 9 into one chapter entitled People & Communities.

13.3.3 The available published guidance does not include methods for determining the magnitude of impacts considered, or for measuring the sensitivity of the receptors to these impacts. Where there is no DMRB assessment method then professional judgement is used to determine whether the impacts are:

- adverse or beneficial;
- long-term or short-term;
- related to construction or operation; and
- significant or not significant.

13.3.4 The Homes and Communities Agency's Additionality Guide[114] was used in the assessment of employment impacts. The assessment of driver stress uses a descriptive scale of 'high', 'medium' and 'low' as specified in DMRB.

13.3.5 Impacts on Agricultural Land Classification grades and soils are addressed in Chapter 10 of this ES.

Data sources and methods

Land use

13.3.6 Data on land use within the study area were collected via existing GIS data layers and information compiled during previous phases of the project, including online cartographic sources such as Ordnance Survey maps, MAGIC online maps, and the South Tyneside Council and Sunderland City Council websites.

13.3.7 All previously collected data, from 2014 and 2016, was verified and updated with current GIS datasets and desk-based research, including online searches.

Physical assets

13.3.8 Data on the physical receptors present within the study area were collected via existing GIS data layers and information compiled during several previous phases of the project, including Ordnance Survey data and aerial photography. All previously collected data were verified and updated with current GIS datasets and desk-based research, including online searches. Agricultural surveys and consultation with landowners were undertaken.

Non-motorised users (NMUs)

13.3.9 Baseline data were derived from the NMU Context Report (Appendix 13.1) and NMU survey (Appendix 13.2), supplemented by publicly available information provided by South Tyneside Council and Nexus (Tyne and Wear Passenger Transport Executive).

13.3.10 Surveys of NMU traffic were carried out at five locations surrounding the junction during both the winter and summer periods in 2016, and consultation meetings were held with the Tyne and Wear Local Access Forum and user groups in December 2016, June 2017, September 2017 and November 2017 to identify their aspirations and concerns relating to the junction and consult on the NMU Options outlined in Section 3.3 in Chapter 3 of this ES. Further consultation was undertaken in August 2018 as a result of the proposal to move the Pegasus crossing along the A1290, with most responses supporting this change.

13.3.11 Traffic model data were used to determine Average Annual Daily Traffic (AADT) at points throughout the local transport network. Results for the percentage change in traffic around the Scheme were used to assess improvements in accessibility.

Community severance

13.3.12 Key community facilities were identified from a combination of aerial imagery and information from local authority websites.

13.3.13 The assessment of effects on communities and community facilities has taken into account:

- increases or reductions in community severance, both within and between communities;
- changes in the accessibility of community facilities;
- demolition of community facilities;
- loss of land used by the community; and
- potential changes in the ongoing viability of local businesses and employment opportunities within the local communities.

13.3.14 In line with DMRB Volume 11, Section 3, Part 8 community facilities include doctors' surgeries, hospitals, aged person's homes, schools, shops, post offices, churches, parks, play areas and sports centres.

13.3.15 In relation to the assessment of community assets, judgements have been made in light of the following considerations:

- The extent to which a given community is 'self-contained'. Self-contained communities are those in which all essential local facilities are located within the area of the community, whereas communities that are not self-contained are dependent on access to facilities located elsewhere.
- The extent to which a given community asset is essential to the well-being or self-contained nature of the local community.
- The extent to which a given community asset is duplicated by alternative facilities to which members of the community have equally easy access.

112 DMRB Volume 11 Section 3 - http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3.htm
113 Highways England (2015). Accessed from: http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian125r2.pdf
114 Homes and Communities Agency (2014). Additionality Guide Fourth Edition. Accessed from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/378177/additionality_guide_2014_full.pdf

- The extent of the catchment area served by a given community asset, and the principal mode of transport used to access the facility.

Community amenity

13.3.16 The impact on community amenity was assessed based on the findings of other relevant chapters, namely: air quality, noise, visual and landscape. Where there is potential for several different types of individual impacts, there is potential for a significant community amenity effect.

Public transport users

13.3.17 The bus stops likely to be affected by the Scheme were identified based on their location in relation to the Scheme and the construction works, using information from Go North East on bus routes in the vicinity of the Scheme[115] and the Scheme footprint as outlined on Figure 2.4.

13.3.18 Two bus stops to the west of the Scheme were included within the study area (see Figure 13.5). There are additional bus stops on Washington Road, but these would not be affected by the footprint of the Scheme.

13.3.19 Consideration was also given to bus routes that pass through Downhill Lane junction, but do not have any stops nearby, such as the X9/X10 express service between Middlesbrough and Newcastle and route 50A between South Shields and Durham.

Vehicle travellers

13.3.20 Baseline traffic flow information for the operational assessment of vehicle travellers was derived entirely from the output of a SATURN traffic model, which included traffic flows and vehicle speeds for an Opening Year (2021) and Design Year (2036).

13.3.21 As described in Section 5.4, in Chapter 5 of this ES, the driver stress and journey time assessments are based on the 2021 and 2036 do-minimum and do-something scenarios within the SATURN traffic model. The future baseline underlying the do-minimum and do-something scenarios include the different road network and traffic flow changes associated with the Testo's scheme and IAMP One and IAMP Two developments for 2021 and 2036. All of these developments were assumed to be operational in 2036, but IAMP Two was not assumed to be operational in 2021. For clarity, the assessment scenarios were:

- 2021 – IAMP One is operational. Road infrastructure for IAMP Two, including Washington Road Bridge, is not operational, but road infrastructure for the Testo's Scheme would be operational.
- 2036 – IAMP Two and all associated road infrastructure (including Washington Road Bridge)_assumed to be operational.

13.3.22 The assessment of construction phase effects on vehicle travellers is a qualitative assessment and assumes only IAMP One has been built and is operational when the Scheme starts construction; cumulative construction effects with the Testo's scheme and IAMP Two development being built at the same time as the Scheme are considered in Chapter 15 of this ES.

13.3.23 The SATURN traffic model splits the road network into links, principally where a change in characteristics of the road occur. This may be at a junction, for example between two main roads, where a side road joins a main road, or where the road goes from a single lane to two lanes.

13.3.24 The potential environmental effects for vehicle travellers as a result of the Scheme were considered through three assessments; journey times, driver stress and travellers' views from the road. To provide robust assessments, changes in journey times and driver stress were considered on a section-by-section basis within the study area (see Table 13-4 and Figure 13.1) to assess the changes at a localised level, and on the basis of 'key' journeys, which are those that pass through Downhill Lane junction (see Table 13-5 and Figure 13.2). The key journeys were defined based on current traffic movements and to capture the experiences of vehicle travellers negotiating Downhill Lane junction. Each section and journey consists of multiple links that were extracted from the SATURN traffic model.

13.3.25 Driver stress and journey times were calculated for each link within the study area for the following:

- do-minimum scenario (i.e. without the Scheme) in 2021;
- do-something scenario (i.e. with the Scheme) in 2021;
- do-minimum scenario (i.e. without the Scheme) in 2036; and
- do-something scenario (i.e. with the Scheme) in 2036.

13.3.26 Junction modelling for the Scheme indicated that there could be capacity issues at the A19 Downhill Lane junction during 2021. As a result, a Highway Operation Management Plan (HOMP) was produced that assumes a one-hour shift pattern offset between IAMP ONE and the Nissan Plant (referred to as Scenario TA1 within the Transport Assessment). This scenario was used for assessment in 2021.

13.3.27 Traffic modelling scenario TA3 was used for the 2036 driver stress and journey time assessments.

13.3.28 The assessments adopted the following assumptions, which were derived based on the Scheme proposals and the current assumptions associated with IAMP One and IAMP Two:

- The road between Follingsby Lane / Downhill Lane (West)[116] junction and A1290 / Follingsby Lane junction was only open to vehicular traffic in the 2012 baseline scenario. This would become a NMU route during IAMP One construction and stopped for vehicle access by 2021.
- The A1290 would operate as a single carriageway until early 2022. As part of IAMP Two, the A1290 would be upgraded to a dual carriageway between Downhill Lane junction and the A1290 / Nissan Manufacturing Plant junction.
- During the 2012 baseline and the 2021 do-minimum scenarios, vehicles can make all turning movements between the A1290 and Downhill Lane (West). However, during the 2021 do-something scenario, the A1290 was assumed to operate as a dual carriageway with a central reservation; therefore, Downhill Lane (West) was assumed to operate as a left in / left out only link.
- Vehicles turning right from Downhill Lane (West) to travel south on the A1290 during the 2021 do-something scenario were assumed to travel via Downhill Lane junction.

[115] https://www.gonortheast.co.uk/maps/ accessed 23/3/2018 10:57

[116] Downhill Lane (West) is a link to the west of the A19 between the A1290 and Follingsby Lane.

Downhill Lane (West) would be severed by IAMP Two in the 2036 do-minimum and 2036 do-something scenarios;

- Based on the assumption in bullet point three during the 2021 do-something scenario, traffic turning right from the A1290 onto Downhill Lane (West) as part of journeys five and eight (representing journeys to the Downhill Lane (West) / Follingsby Lane junction, see Table 13-5), was assumed to use the following route:
  - continue southbound on the A1290 to the A1290/ Glover Road / Sulgrave Road mini roundabout;
  - 'U' turn at the A1290 / Glover Road / Sulgrave Road mini roundabout; and
  - travel northbound along the A1290 to make the left turn onto Downhill Lane (West).

13.3.29 For journeys 10 and 11 (representing journeys to the Follingsby Lane / Wardeley D.P. site access junction to the east of Follingsby Park, see Table 13-5), traffic is assumed to:

- turn right at the A19 Downhill Lane junction and travel northbound on the proposed link road between the A19 Downhill Lane junction and the A19 Testo's junction;
- turn left at the A19 Testo's junction and travel westbound on the A184 Newcastle Road;
- turn left at the A184/ A194 (M) junction and travel southbound on the A194 (M) to junction 2;
- turn left at the A194 (M) junction 2 and travel northbound on Follingsby Lane; and
- turn right at the Follingsby Lane / Follingsby Avenue junction and continue eastbound until the Follingsby Lane / Wardeley D.P. site access junction.

- For journey 12 (representing journeys between the Downhill Lane (West) / Follingsby Lane junction and the A1290 / Nissan Manufacturing Plant traffic signal junction, see Table 13-5), traffic during the 2021 do-minimum scenario is assumed to:
  - travel eastbound along Downhill Lane (West); and
  - turn right at the Downhill Lane (West) / A1290 priority junction and continue southbound to the A1290/ Nissan Manufacturing Plant traffic signal junction.
- During the 2021 do-something scenario, traffic on journey 12 is assumed to:
  - travel eastbound along Downhill Lane (West);
  - turn left at the Downhill Lane (West) / A1290 priority junction and travel northbound to the A19 Downhill Lane junction;
  - 'U' turn at the A19 Downhill Lane junction using the circulatory; and
  - travel southbound on the A1290 to the A1290 / Nissan Manufacturing Plant traffic signal junction.
- Journeys five and eight were not assessed in the 2036 do-minimum and 2036 do-something scenarios because Downhill Lane (West) would be severed by IAMP Two; and
- Washington Road Bridge would not be constructed by 2021. Therefore, this was not assessed as part of the 2021 do-minimum and 2021 do-something scenarios.

13.3.30 Downhill Lane (West) is only included within the SATURN model as a baseline link. However, this link would operate in the 2021 do-minimum and 2021 do-something scenarios. Therefore, the baseline characteristics (i.e. modelled vehicle speed, number of lanes) were adopted for these scenarios.

13.3.31 As Downhill Lane (West) was not present within the SATURN model in the 2021 do-minimum or 2021 do-something scenarios, traffic that would normally travel along Downhill Lane (West) would be distributed across other links. Based on professional judgement, it was assumed that this traffic would be diverted via the A194 (M), A184 Newcastle Road and the A19 Testo's junction to access the A19 Downhill Lane junction because this would be the shortest alternative route. Traffic was re-distributed for the 2021 do-minimum and 2021 do-something scenarios using the following methodology:

- obtaining the 2012 baseline peak hour flows, by direction, along Downhill Lane (West);
- identifying the links that traffic would have been re-distributed along based on the assumption made in paragraph 13.3.31; and
- adding/ removing traffic accordingly using the baseline peak hour flows.

13.3.32 This chapter focuses primarily on the changes in journey times and driver stress over the key journeys listed in Table 13-5 and uses the section-based assessment to provide detail at a localised level, where required.

Table 13-4: Sections assessed as part of the journey time and driver stress assessments

Section Number	Section Description
1	A184 Newcastle Road from A184 / A19 Leam Lane to A19 Testo's junction
2	A184 Newcastle Road from A19 Testo's junction to speed limit change on A184 Boldon Bridge
3	A184 Boldon Bridge speed limit change to Hylton Lane / A184 Addison Road junction
4	Hylton Lane / A184 Addison Road junction to Hylton Lane / Dipe Lane junction
5	Hylton Lane / Dipe Lane junction to Hylton Lane / Kingsway Road junction
6	Hylton Lane / Kingsway Road junction to Hylton Lane / Washington Road junction
7	Barrons Quay Road / Fawcett Terrace junction to Washington Road/Craigavon Road junction
8	Wessington Way / Barrons Quay Road junction to Barrons Quay Road / Fawcett Terrace junction
9	A1231 / A19 / Wessington Way junction to Wessington Way / Colima Avenue junction

Section Number	Section Description
10	A1231 / Pattinson Road junction to A1231 / A19 / Wessington Way junction
11	Wessington Way / Ferryboat Lane junction to speed limit change on Ferryboat Lane (outside Sunrise Enterprise Park entrance)
12	Speed limit change on Ferryboat Lane (outside Sunrise Enterprise Park entrance) to Washington Road / Ferryboat Lane junction
13	Washington Road / Ferryboat Lane junction to Washington Road / Craigavon Road junction
14	Washington Road / IAMP Development Link Road junction to Washington Road/ Ferryboat Lane junction
15	A19 Downhill Lane junction to Washington Road / IAMP Development Link Road junction
16	Washington Road/ Downhill Lane (East) junction to speed limit change south of Downhill Lane / Lawn Drive junction
17	Speed limit change south of Downhill Lane / Lawn Drive junction to Downhill Lane / A184 Boldon Bridge junction
18	A19/ A1231 Wessington Way junction to A19 Downhill Lane junction
19	A19 Downhill Lane junction to A19 Testo's junction
20	A19 Testo's junction to A19 / Leam Lane junction
21	A19 Downhill Lane junction
22	A1290/ IAMP Development Link Road junction to A19 Downhill Lane junction
23	A1290 Downhill Lane / Nissan Sunderland Plant Access to A1290 / IAMP Development Link Road junction
24	A1290 Downhill Lane/ Nissan Sunderland Plant Access to A1290 / IAMP One (south) junction
25	A1290/ IAMP One (south) junction to A1290 / Glover Road / Sulgrave Road junction
26	IAMP Development (Washington Bridge Link Road)
27	Downhill Lane / Downhill Lane junction (North Moor Farm) to Downhill Lane/ A1290 Downhill Lane junction
28	From Downhill Lane / A1290 Downhill Lane junction to the Follingsby Lane / Wardeley D.P. site access road
29	From Follingsby Lane / Wardeley D.P. site access road to Follingsby Park
30	From Follingsby Park to A194 (M) Junction 2
31	From A194 (M) Junction 2 to A194 (M) / A184 / Leam Lane junction

Table 13-5: Key journeys assessed as part of the journey time and driver stress assessments

Journey Number	Journey Description	Notes
1	On the A19 northbound, starting at the A19 / A1231 Wessington Way junction northbound on-slip and ending at the A19 Testo's junction northbound approach.	
2	On the A19 southbound, starting from the north of Testo's junction and ending where the A19 Downhill Lane junction southbound on-slip meets the A19 mainline carriageway.	Reverse of Journey 1
3	On the A19 northbound, starting at the A19 / A1231 Wessington Way junction northbound on-slip and ending at the A1290 / Nissan Plant traffic signal junction.	
4	On the A1290 eastbound, starting at the A1290 / Nissan Plant traffic signal junction and ending where the A19 Downhill Lane junction southbound on-slip meets the A19 mainline carriageway.	Reverse of Journey 3
5	On Washington Road westbound, starting at the Washington Road / Ferryboat Lane junction and ending at the Downhill Lane (West) / Follingsby Lane junction.	
6	On A1290 eastbound, starting from the A1290 / Washington Road Link Road junction and ending at Downhill Lane (East).	
7	On the A19 southbound, starting from the north of Testo's junction and ending at the A1290 / Nissan Plant traffic signal junction.	
8	Starting from Downhill Lane (East) and ending at the Downhill Lane (West) / Follingsby Lane junction.	

Journey Number	Journey Description	Notes
9	On A1290 eastbound, starting at the A1290/ Nissan Plant traffic signal junction and ending at Downhill Lane (East).	
10	On Washington Road westbound, starting at the Washington Road/ Ferryboat Lane junction and ending at the Follingsby Lane / Wardeley D.P. site access to the east of Follingsby Park.	
11	Starting from Downhill Lane (East) and ending at the Follingsby Lane / Wardeley D.P. site access to the east of Follingsby Park.	
12	Starting from the Downhill Lane (West) / Follingsby Lane junction and ending at the A1290 / Nissan Manufacturing Plant Traffic Signal junction.	

Journey Times

13.3.33 Motorised users potentially affected by changes in journey times are those making private and work-related journeys in private vehicles, including passengers. Public transport users potentially affected by changes in journey times are those reliant on public transport, in this case bus services.

13.3.34 Changes in motorised journey times can occur because of new speed limits enforced by the local highway authority or temporary traffic management measures on the road network. Based on guidance in DMRB Volume 11, Section 3, Part 8: Pedestrians, Cyclists, Equestrians and Community Effects, changes in journey times are assessed as significant if they increase by 30 % (minor), 60 % (moderate) or 90 % (major).

13.3.35 Vehicle travellers would have different sensitivities to delays. Vulnerable drivers (i.e. novice drivers, elderly drivers and those using mopeds or motorcycles) may be more adversely affected by changes in journey times than commuters. To reflect a worst-case scenario, it was assumed that all drivers would be of high sensitivity towards delays, based on the knowledge that the junction is a key commuter route for the Nissan Plant. Bus passengers were considered to be of high sensitivity to delays given their reliance on set journey times and patterns.

13.3.36 To provide a robust assessment, changes in journey times were considered on a section-by-section basis and along key journeys as described in Tables 13-4 and 13-5.

13.3.37 A spreadsheet was produced to calculate journey times, using the speed and distance calculation below. For the purposes of this assessment, modelled vehicle speeds from the SATURN traffic model were used. These speeds included junction delay for each link during each scenario and peak hour. Therefore, the change in journey times for each link was determined by the changes in modelled link speed for each peak hour and scenario.

$$Journey\ Time = \frac{Link\ Length\ (metres)}{Modelled\ Link\ speed\ (\frac{metres}{seconds})}$$

Driver stress

13.3.38 Driver stress is defined as the adverse mental and physiological effects experienced by a driver traversing a road network; such stress can be caused by frustration, route uncertainty or drivers' fear of accidents. Frustration may be caused by traffic flows, vehicle speeds and the characteristics of the road.

13.3.39 Driver stress was calculated by comparing one-way peak hour flows along each link and average vehicle speed during morning (AM) and evening (PM) peak hours against thresholds (i.e. urban/ rural classifications) provided in DMRB guidance for single carriageways, dual carriageways and motorways. For the purposes of this assessment, the average vehicle speed was based on modelled vehicle speeds from the SATURN traffic model for each link.

13.3.40 The assessment applied different criteria for motorway, dual carriageway and single carriageway roads, as shown in Table 13-6, Table 13-7 and Table 13-8 respectively. Hourly traffic flows from the SATURN traffic model were examined together with typical vehicle speeds to characterise each assessed link as providing 'high', 'moderate' or 'low' levels of driver stress over routes that are at least one kilometre in length.

Table 13-6: Driver Stress criteria for motorway roads

Average peak hourly flow per lane, in flow units/1 hour[1]	Average Journey Speed (Km/hr)		
	Under 75	75-95	Over 95
Under 1200	High[2]	Moderate	Low
1200-1600	High	Moderate	Moderate
Over 1600	High	High	High

Table 13-7: Driver stress criteria for dual carriageway roads

Average peak hourly flow per lane, in flow units/1 hour[1]	Average Journey Speed (Km/hr)		
	Under 60	60-80	Over 80
Under 1200	High[2]	Moderate	Low
1200-1600	High	Moderate	Moderate
Over 1600	High	High	High

Table 13-8: Driver stress criteria for single carriageway roads

Average peak hourly flow per lane, in flow units/1 hour[1]	Average Journey Speed (Km/hr)		
	Under 50	50-70	Over 70
Under 600	High[2]	Moderate	Low
600-800	High	Moderate	Moderate
Over 800	High	High	High

Note 1: A car or light van equals one flow unit. A commercial vehicle over 1½ tons unladen weight or a public service vehicle equals three flow units.

Note 2: 'Moderate' in urban areas

13.3.41 To provide a robust assessment, changes in driver stress were considered on a section-by-section basis and along key journeys as outlined in Tables 13-4 and 13-5, respectively.

13.3.42 As part of the section-by-section analysis, the result for the link with the highest driver stress rating is reported for each section, which in the majority of cases is not representative of all the links within that section. This represents a reasonable worst-case scenario and would not necessarily reflect the change in driver stress for a whole section.

13.3.43 To address the fact that section results were not representative of a whole route, changes in driver stress along a journey were calculated based on a weighted average using the formula below. This approach provided the level of driver stress that was likely to be experienced by vehicle travellers along the majority of their journey.

$$Weighted\ Driver\ Stress\ Rating = \frac{(Driver\ Stress\ Rating\ for\ each\ Link\ x\ Link\ Length\ (metres))}{Overall\ Length\ of\ the\ Journey\ (metres)}$$

Views from the road

13.3.44 The 'view from the road' is defined in DMRB, Volume 11, Section 3, Part 9: Vehicle Travellers as the "*extent to which travellers, including drivers, are exposed to different types of scenery through which a route passes*". The quality of views from a road can positively or adversely influence a drivers' experience along a route.

13.3.45 The purpose of the assessment is to compare the nature and quality of views likely to be experienced by travellers as a result of the Scheme with those currently experienced along the existing roads within the study area.

13.3.46 The assessment of views from the road included:

- types of scenery or the landscape character as described and assessed for the baseline studies;
- the extent to which travellers may be able to view the scenery and landscape; and
- the quality of the landscape as assessed for the baseline studies.

13.3.47 When assigning a view to the surrounding landscape, four categories were used:

- no view – road in deep cutting or contained by earth bunds, environmental barriers or adjacent structures;
- restricted view – frequent cuttings or structures blocking the view;
- intermittent view – road generally at ground level, but with shallow cuttings or barriers at intervals; and
- open view – view extending over many miles, or only restricted by existing landscape features.

13.3.48 Views from the road were assessed as beneficial, neutral or adverse, reflecting the change expected as a result of the Scheme.

Assessment of effects

13.3.49 The following section describes the criteria used to evaluate the effects on journey times, driver stress and views from the road.

13.3.50 For the purposes of this assessment, the following periods were defined based on professional judgement:

- short-term – activities and/or effects that would be experienced over a period of up to two-years;
- medium-term – activities and/or effects that would be experienced over a period of between two to five-years; and
- long-term – activities and/or effects that would be experienced over a period of longer than five years.

Identification of receptors

13.3.51 The receptors for the journey time, driver stress and views from the road assessments were selected based on the potential for direct or indirect effects from the construction and operation of the Scheme. The groups of receptors are as follows:

- vehicle (e.g. car, moped, motorbike) drivers/passengers using the existing transport network; and
- public transport users on the road network.

Value or sensitivity of receptors

13.3.52 Sensitivity is generally focused on the vulnerability of receptors and the degree to which they can tolerate, adapt to or recover from changes in transport conditions.

13.3.53 Table 13-9 sets out the criteria used to assign a level of value or sensitivity to receptors. These criteria were based on the guidance in DMRB.

Table 13-9: Criteria for determining the value of receptors

Value (Sensitivity)	Assessment criteria
High	Users of highest sensitivity or vulnerability to change. These can comprise drivers, pedestrians, cyclists and equestrians who are inexperienced, young, elderly or disabled.
Medium	Users of moderate sensitivity or vulnerability to change. These can comprise drivers, pedestrians, cyclists and equestrians who may be unfamiliar with existing routes or who make infrequent journeys.
Low	Users with low sensitivity or vulnerability to change. These can comprise drivers, pedestrians, cyclists and equestrians who are frequent users of rural roads and Public Rights of Way.
Negligible	Users of limited sensitivity or vulnerability to change. These can comprise experienced drivers, pedestrians, cyclists and equestrians with considerable knowledge of the locality, and professional drivers.

Magnitude of change

13.3.54 The magnitude of change is independent of the value of the receptor(s) affected. The criteria used to determine the magnitude of change are set out in Table 13-10, based on criteria in DMRB.

Table 13-10: Criteria for determining magnitude of change

Value (Sensitivity)	Assessment criteria
Large	• Substantial changes to the landscape, affecting drivers' view from the road. • Alteration to existing driver stress levels, such that the driving experience is substantially affected or improved. • Alteration to existing journey times, such that the driving experience is substantially affected or improved.
Medium	• Moderate changes to the landscape, affecting drivers' view from the road. • Alteration to existing driver stress levels, such that the driving experience is moderately affected or improved. • Alteration to existing journey times, such that the driving experience is moderately affected or improved.
Small	• Minor changes to the landscape, affecting drivers' view from the road. • Alteration to existing driver stress levels, such that there would be a measurable change, but one where the driving experience is not noticeably diminished or improved. • Alteration to existing journey times, such that there would be measurable change, but one where the driving experience is not noticeably diminished or improved.
Negligible	• Very little appreciable change to the landscape, affecting drivers' view from the road. • Very little appreciable change to existing driver stress levels, not considered enough to diminish or improve the driving experience. • Very little appreciable change to existing journey times, not considered enough to diminish or improve the driving experience.

Assessment of significance

13.3.55 The journey time, driver stress and views from the road assessments were based on the significance criteria outlined in Table 13-11, based on criteria in DMRB.

Table 13-11: Criteria for determining significance

Significance category	Assessment criteria
Major	These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.
Moderate	These beneficial or adverse effects may be important, but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
Minor	These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process, but are important in enhancing the subsequent design of the project.
Negligible	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

Economy and employment

13.3.56 The assessment of effects on the economy and employment used construction cost and labour spend estimates produced for the Scheme by Highways England. In addition, multipliers and other factors were used in the assessment, sourced from the Additionality Guide[117] and the Office for National Statistics.

13.3.57 The Additionality Guide method was used to estimate net employment benefits. The Additionality Guide provides multipliers for leakage, displacement and deadweight, which are defined in the context of an assessment of employment as follows:

- *Leakage*: The proportion of benefits that accrue to those outside of the target group. Here, this refers to jobs that go to those who live outside of South Tyneside, Sunderland and Gateshead.
- *Displacement*: In terms of this project, this refers to those who are already employed and change jobs in order to take roles with the project.
- *Deadweight* (or the reference case): This refers to what proportion of the effects would arise without this Scheme. In an employment impact assessment this can be seen as jobs going to those unemployed workers who would soon get a different job, such as high-demand workers.
- *Economic multiplier effects*: Further economic activity associated with additional local income and supplier purchases as a result of the Scheme. These are known as the indirect and induced effects.

13.3.58 Additionality is calculated as:

AI = [GI x (1-L) x (1-Dp) x (1-S) x M] – GI*x (1-L*) x (1-S*) x M*]

Where:
AI = Net additional impact
GI = Gross impact
L = Leakage
Dp = Displacement
S = Substitution
M = Multiplier

[117] Additionality Guide: A standard approach to assessing the additional impact of interventions (2008), English Partnerships available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/191511/Additionality_Guide_0.pdf

13.3.59 Note that '*' donates a reference case and hence deadweight; as the reference case is not building the Scheme; the deadweight is '0'.

13.3.60 There are no published criteria relating to the significance of economic effects, therefore this has been assessed using professional judgement in the context of baseline conditions. Professional judgement has been used to distinguish between significant and insignificant impacts, but different levels of significance have not been assessed.

Study area

13.3.61 The study areas for each individual sub-topic are described in the following sections.

Land use

13.3.62 Land use effects were considered where a portion of a land-holding would be affected by the Scheme's permanent and/or temporary land-take requirements. This may involve a loss of land or severance of access to land and resulting alteration in the way the land is used or a change in the viability of use.

13.3.63 With regard to the agricultural assessment, the study area comprises all land managed, or capable of being managed, under agricultural or related land use occupations and adjoining the A19, A1290 and Downhill Lane (West and East) in the vicinity of Downhill Lane junction.

Physical assets

13.3.64 When considering physical assets, the study area was consistent with that for NMUs. This was felt to be practical given the importance of the junction in the local area to access industrial, commercial and community facilities.

13.3.65 Private property was categorised as residential, commercial, industrial or agricultural.

Non-motorised users

13.3.66 The NMU study area, as shown in Figure 13.8, stretches 500 m north of Downhill Lane towards Testo's junction. To the west, it incorporates Downhill Lane and Town End Farm and to the east it includes the A1290 and Downhill Lane. It extends 500 m to the south of Downhill Lane towards the Nissan Plant and Hylton Castle Estate.

Community severance and community facilities

13.3.67 The study area takes into account the location of community facilities and also the administrative boundaries of the communities directly affected by the Scheme. The study area contains the communities of Town End Farm, Hylton Castle, Boldon Colliery (including East and West Boldon & surrounding areas), Fellgate and Hedworth and Usworth.

13.3.68 Although there are only two communities (Town End Farm and Hylton Castle) adjacent to the Scheme, the other communities have been included due to significant NMU movements from these communities through Downhill Lane junction, particularly in the direction of the Nissan Plant and for IAMP One.

Public transport users

13.3.69 Two bus stops, serving bus routes 56 and 50, to the west of Downhill Lane on the A1290 were included within the study area. These bus stops provide links to Sunderland, Gateshead, Chester-le Street and Newcastle.

13.3.70 Several bus routes pass through Downhill Lane junction, so effects on these journeys were considered:

- X9 and X10 use the A19 mainline through Downhill Lane junction, and are express services between Middlesbrough and Newcastle.
- Bus route 50A also uses the A19 mainline through Downhill Lane junction.
- Bus route 29/X36 runs between Newcastle and Sunderland, through Town End Farm; this service has stops on Washington Road, approximately 800 m south-east of the Scheme.

Vehicle travellers

13.3.71 The study area for the driver stress and journey time assessments were defined based on an understanding of likely changes in traffic volumes on the existing road network. This approach focused the assessment on those routes and locations that would likely experience significant effects.

13.3.72 The extent of the study area was also informed by consideration of Committed Developments (e.g. Testo's and IAMP see Chapter 5 of this ES for more detail), which comprise developments unrelated to the Scheme that have valid planning consent and the potential to affect future traffic flows and, therefore, driver stress or journey times.

13.3.73 For the section-based assessment, the study area was subdivided into 31 sections as shown in Figure 13.1 and listed in Table 13-4, which were identified based on the number of lanes, speed limit and road type (i.e. single carriageway or dual carriageway). The SATURN traffic model Link ID plan was used to match model links to the sections. Data for those links were extracted from the model to inform the assessment. As the road network was split into links some sections may comprise more than one link.

13.3.74 For the journey-based assessment, the SATURN traffic model Link ID plan was used to match model links to the journeys identified in Table 13-5 and Figure 13.2. Data for those links were extracted from the model to inform the assessment. Each journey was defined based on current traffic movements and to capture the experience of vehicle travellers negotiating the junction.

13.3.75 The A19 slip roads were not considered as part of the section-based assessment based on the assumption that the change in driver stress on the slip roads would be the same as on the A19 mainline carriageway.

13.3.76 For drivers' views from the road, the study area was the same as that used for the journey time and driver stress assessments (Figure 13.1 and 13.2), but with the addition that drivers' views extend to the visible skyline.

Economy and employment

13.3.77 Effects on the economy from investment in the Scheme were assessed at a high level with the use of output multipliers derived by the Office for National Statistics (ONS) to reflect the total level of economic stimulation from spending on the Scheme.

13.3.78 The assessment of employment follows the Additionality Guide, and utilised estimates of displacement, leakage and substitution that are based on the assessed baseline employment profile of the area. Knock-on effects were assessed through the use of multipliers.

13.4 Assessment assumptions and limitations

13.4.1 The assessment of driver stress was based on the outputs of a traffic model and was therefore subject to the assumptions applied to, and limitations of, the model (see Section 5.4, in Chapter 5 of this ES).

13.4.2 The owners of two plots of land located in the north-eastern part of the study area could not be contacted. Based on the desk study of published information and data held from previous surveys, together with a visual inspection of the fields from outside the boundaries, it was assumed that these blocks of land were in or capable of agricultural use and they were included in the agricultural baseline on this basis. This would be consistent with the approach of assuming the 'worst-case' scenario based on current available knowledge.

13.5 Baseline conditions

13.5.1 Information relating to vehicle travellers within this chapter was based on the traffic model defined baseline for the Scheme, based on 2012 datasets; Section 5.4, in Chapter 5 of this ES, demonstrates how the use of 2012 data has been validated.

13.5.2 Those sections of this chapter relating to land use and communities were based on a future baseline of conditions defined as the environment in 2017/18 with the addition of IAMP One, assumed to be built and operational by January 2020 prior to construction of the Scheme.

Land use

Community land and facilities

13.5.3 Community land is defined by DMRB as land used by the community and includes common land, town and village greens and general public open spaces; community facilities includes places of worship, medical centres and hospitals, schools, and shops. It also includes land designated in Local Plans as Public Open Space.

13.5.4 There are two areas of land used by the community within the study area that are covered by the DMRB definition. These are shown on Figure 13.2:

- land adjacent to the River Don, approximately 1 km to the north-east of the Scheme, designated as public open space; and
- land used as playing fields to the east of the A1290 and to the north of Washington Road, covering approximately 1.8 hectares.

13.5.5 The key communities in the study area are:

- Town End Farm, Sunderland, located adjacent to Downhill Lane junction to the south-east;
- Hylton Castle Estate, Sunderland, located to the south of Washington Road;
- West Boldon, South Tyneside, north-east of Downhill Lane junction;
- Boldon Colliery, New Town, Felgate and Hedworth, South Tyneside to the north of Testo's Junction; and
- Usworth, south-west of Downhill Lane Junction.

13.5.6 These are discussed in greater detail in the community and community facilities section below.

13.5.7 The communities of Boldon Colliery, New Town, West Boldon, Felgate and Hedworth would be located on the edge of the study area for the Scheme and community facilities within these locations would not be likely to be impacted by the Scheme. The remainder of the locations closest to the Scheme within the administrative area of South Tyneside are predominately open countryside.

13.5.8 There are a range of community facilities located within Town End Farm and Hylton Castle estates.

Development land

13.5.9 Development land is defined in DMRB as:

- land covered by local planning authorities' future development land use designations as indicated in adopted and emerging development plans; or
- land upon which planning permission has been granted for developments that have not yet been built, such as for housing development.

13.5.10 Table 13-12 shows development land identified through desk-based research, along with the relevant planning policies that relate to it.

Table 13-12: Land use allocations

Planning Policy Document	Allocation Type and Location	Relevant Policy and Implications
International Advanced Manufacturing Park (IAMP) Two area action plan prepared partly in parallel with the Local Plan DPD	Proposal for a strategic employment site north of the Nissan Plant.	International Advanced Manufacturing Park joint development plan document by Sunderland City Council and South Tyneside Council in support of the Sunderland and South Tyneside City Deal.
South Tyneside Local Plan: Core Strategy (2007)	Employment Land at Boldon Colliery, to the north of Downhill Lane Junction.	E1- Delivering Economic Growth and Prosperity. 40ha of land allocated to meet economic development requirements, including 35ha for new employment land and employment uses within mixed development sites. Land set aside at Boldon Colliery includes Cotswold Lane/Hutton Street (1.10); North of Brooklands Way, Boldon Business Park (0.60); West of 16 Brooklands Way, Boldon Business Park (0.61).
South Tyneside Local Plan: Core Strategy (2007)	Transport links along the A19 Economic Growth Corridor.	A1 – Accessibility. Priority given to improving accessibility, particularly by encouraging and promoting public transport improvements, both within the borough and between the borough and the A19 Economic Growth Corridor, including the major employment area at Boldon Colliery.
South Tyneside Local Plan: Core Strategy (2007)	Green belt land immediately west of the A19.	EA1- Local Character and Distinctiveness. B) Focus on protecting and enhancing the openness of the green belt.

Planning Policy Document	Allocation Type and Location	Relevant Policy and Implications
South Tyneside Local Plan: Core Strategy (2007)	Residential villages to the north of the A19 Downhill Lane Junction	EA1- Local Character and Distinctiveness. C) Preserving the special and separate characters of urban fringe villages, including; Boldon Colliery, West Boldon and East Boldon.
South Tyneside Site-Specific Allocations (2012)	1.1 Hectares of Economic Development Land at Boldon Business Park, Brooklands Way	SA3-C-ix. Priority economic development site to be developed by 2016. Assumed to be equal mix business, general industrial and storage and distribution.
South Tyneside Site-Specific Allocations (2012)	Gypsy and Traveller Caravan Accommodation. Green belt land at West Pastures, to the north of Downhill Lane Junction	SA10-A. Allocated to provide for 13 permanent gypsy and traveller caravan pitches with opportunity for transit accommodation.
Sunderland Draft Core Strategy Proposals Plan (2015-2033)	Primary Employment area 4 (Sunrise Business Park) 11 (Nissan), 12 (Turbine Park), 13 (Hillthorn Park)	EP2 – allocated as Primary Employment Areas and safeguarded for B1 (Business), B2 (General and Industrial) and B3 (Storage and Distribution) employment use.

Agricultural land and businesses

13.5.11 Farm structure[118] in the study area comprises a mix of tenanted (long and short-term Farm Business Tenancy agreements) and contract-farmed landholdings, farmed from land elsewhere.

13.5.12 Some permanent pasture fields located south-west and north-east of Downhill Lane junction are used for horses, either grazing or haymaking. One field west of the junction is used in connection with a dog-agility enterprise. Other small fields east of the A19 did not appear to be under active agricultural management at the time of the survey.

13.5.13 The agricultural land in the study area is mainly managed for arable crop production. The crops grown comprise combinable crops of winter sown cereals (mainly wheat) and oilseed rape in rotation. There is some grassland used for grazing and hay/silage making; some of this is associated with a horse enterprise on one of the farms.

13.5.14 Most farms use the local road network, comprising the A1290 and Downhill Lane (West and East), for access to and from the fields. No farms have field access gateways directly off the A19.

13.5.15 No farms in the study area were known to be entered in Natural England's Stewardship Scheme.

13.5.16 The known extent of the agricultural units in the study area are outlined on Figure 13.3 and summarised in Table 13-13 below.

Table 13-13: Agricultural property baseline

Farm ref.	Farm business	Approximate total area of land farmed	Farm type or land use
1	Wheathill Farm, Whitburn	650 ha (1600 acres)	Mixed – beef suckler herd plus arable, with cereals land rented and contract farmed at Downhill Lane Junction
2	West Fellgate Farm, Wardley	325 ha (800 acres)	Arable and grass cropping with horses held on livery; land at Downhill Lane (East) rented for horse hay/haylage
3	Mount Pleasant Farm, West Boldon	N/A	Arable farming – all land cropped with cereals
4	Land at Downhill Lane Junction (1), West Boldon	1.4 ha (3.5 acres)	Grassland
5	Land at Downhill Lane Junction (2), West Boldon	4.5 ha (11 acres)	Grassland
6	Land at Downhill Lane (3), West Boldon	1.3 ha (3 acres)	Grassland for dog agility enterprise
7	Land at Downhill Lane (4), West Boldon	1.5 ha (7 acres)	Grassland for horse grazing
8	Land east of A1290	2.3 ha (5.7 acres)	Grassland for horse grazing

Physical assets

13.5.17 Local receptors in proximity of the Scheme are the focus of the sub-topic on physical assets. These impacts were assessed in terms of the receptors discussed below. The receptors are shown on Figure 13.1.

Residential property

13.5.18 One residential property is located close to the west side of the existing A19: Make-Me-Rich Farm House. The farmhouse is located on a small holding approximately 75 m west of the A19 mainline highway boundary and 300 m north of the existing highway boundary surrounding Downhill Lane junction.

13.5.19 There would be a number of residential properties to the south of the Scheme. The nearest would be at Town End Farm, which is a dense residential area approximately 350 m to the

[118] 'Farm structure' refers to the general arrangement of farms through such factors as location, size, buildings and fixed equipment, tenure, cropping and/or stocking etc

south-east of the junction, and over 80 m east of the existing A19 highway boundary. The Chalet and Usworth Cottages are located over 800 m to the south-west of Downhill Lane junction.

13.5.20 The Chalet is a private property located approximately 50 m west of the A1290 and north of Washington Road, just north of the Nissan Plant. Usworth cottages are located adjacent to and south of the Chalet and consist of five individual properties.

Commercial property

13.5.21 There are two active commercial properties within the study area for the Scheme.

13.5.22 The Three Horse Shoes pub is a venue for community events, located to the south of the A1290, to the north of Washington Road adjacent to the Nissan Plant.

13.5.23 Directly to the north of the Nissan Plant is the area of IAMP One, which is the first phase of a planned wider manufacturing park. IAMP One comprises nine industrial units, with associated offices and car parking. The site will be accessed along the A1290 to the south of the existing Downhill Lane (West) and at the south end of the A1290, to the east of the existing Nissan Plant entrance.

Industrial property

13.5.24 The Nissan Plant, approximately 1 km south of Downhill Lane junction and operated by Nissan Manufacturing UK Ltd, is the largest employer in the region, employing in the region of 6,700 people[119] and is a major stakeholder in the Scheme. Past NMU surveys showed that large numbers of Nissan employees commute to and from the plant from West Boldon / Boldon Colliery, Fellgate and Hedworth, using the rights of way, cycle paths and roads in or near the study area (in particular, Bridleway B46 (the 'Don Valley Footpath'), passing through Downhill Lane junction.

Non-motorised users (NMUs)

Public rights of way, cycle routes and roads

13.5.25 Figure 13.8 shows the NMU routes connected to the Scheme.

13.5.26 Downhill Lane junction is a significant crossing over the A19 for equestrians, recreational walkers and, in particular, for commuting and recreational cyclists. There are various footpaths, bridleways and cycle routes in the study area. Of specific note, Bridleway B46 (the 'Don Valley Footpath') runs north-south from the A184 to Downhill Lane immediately to the east of the A19 and southbound off-slip road. By 2020 the IAMP One development would have created a new NMU route running through the IAMP One area along the line of the old Follingsby Lane, between Hylton Grove Farm and the A1290.

Table 13-14: Existing PRoW, cycle routes and roads

ID	Description/Comments
Footpaths	
B27	East-west footpath linking West Pastures Lane (located to the west of A19). B27 is severed by the A19 south of Testo's but not formally stopped up, making crossing at grade through the central reservation dangerous due to the high volumes and speeds of traffic on the A19 and the lack of signage. The footpath has relatively low usage; pedestrian use was recorded but not crossing the A19. It is suggested that users are also accessing the route from across fields.
B29	North-south field path linking the A184 Newcastle Road and West Pastures Lane.
B22	Field path linking Follingsby Lane and West Pastures Lane.
-	By 2020 the IAMP One development would have created a new NMU route along the line of the old Follingsby Lane, between Hylton Grove Farm and the A1290. This will links with existing provision on the A1290.
Bridleways	
B46 'The Don Valley Way'	Located east of the A19 and runs north-south from the A184 / B1298 Abingdon Way roundabout, located east of Testo's junction to Downhill Lane. The bridleway is in good condition and is a well-used route by a variety of NMU users, particularly by cyclists as a commuter route.
Cycleways	
A1290 northbound to Washington Road	There is an existing cycleway running along the A1290 across Downhill Lane junction and down Washington Road to the east of the A19.
Roads	
A19	There are no footways along the A19. There was evidence of cyclists and pedestrians using the A19 on-slip road at Downhill Lane junction as a short cut to and from the B46 by climbing over the safety fence. There has been one recorded collision involving a cyclist on the slip road.
A184	The A184 connects Boldon to Gateshead and then to the A1018 to Sunderland. Downhill Lane connects to the A184 to the east of Testo's junction near West Boldon. The east bound carriageway is a popular route for cyclists in both directions. Much of the NMU traffic originates from and/or leaves the A184 at Abingdon Way.
B1298 Abingdon Way	Abingdon Way links Boldon Colliery to the A184 east of Testo's and also links to Bridleway B46, which then runs south to Downhill Lane.

[119] **Nissan** *Life at Nissan Sunderland* [on-line] Available at: https://careersatnissan.co.uk/life-nissan-sunderland-nmuk-plant/ (Accessed 25/03/2018)

ID	Description/Comments
West Pastures Lane	Runs north-south linking Downhill Lane with the A184 to the north, west of Testo's junction. It also provides access to the West Pastures Travellers and Gypsy site.
Downhill Lane, as part of 'Great North Forest Heritage Trail'	Downhill Lane links north-eastwards back towards Boldon and south-westwards towards the Nissan Plant and Washington. To the west of Downhill Lane junction it links to Follingsby Lane (at North Moor Farm) and continues west towards the A194(M) / A195 junction. To the south of this junction, by 2020 there will be an NMU route through IAMP One, which heads south towards the A120. Downhill Lane itself is part of a recreational route known as the 'Great North Forest Heritage Trail'; although the funding and local authority partnership promoting the trail have lapsed and the route is no longer classified as a Long Distance Footpath. The B46 exits onto Downhill Lane to the east of Downhill Lane junction. There were a large number of cyclists recorded turning east from the B46 onto Downhill Lane.
A1290 and Washington Road	The A1290 runs south-west from Downhill Lane junction towards Washington whilst across the A19 at Downhill Lane junction it runs alongside the southbound carriageway towards Sunderland before becoming Washington Road. This provides access to the residential areas of Town End Farm and Hylton Castle. There is an existing footpath on this road, east of the A19, heading south from the junction of Ferryboat Lane, which is linked by the Washington Road footbridge across the A19. There are no footpaths from this point heading north towards Downhill Lane junction. On the west there are footpaths at the south end of the A1290 near the Nissan Plant. There is a cycleway alongside the A1290 heading south-west from Downhill Lane junction. There are no separate footpaths heading north towards Downhill Lane junction.

13.5.27 NMU survey counts of pedestrians, cyclists and equestrians were undertaken between 31st January and 2nd February 2016 and 8th June and 27th August 2016 at a total of five locations, shown on Figure 13.7 and included in Appendix 13.2. The count and direction of pedestrian, cyclists and equestrian journeys at each location was recorded.

13.5.28 Survey results showed significant cyclist use of Downhill Lane junction, using Downhill Lane (East), Bridleway B46 and also the A1290, particularly in the direction of the Nissan Plant. There was also significant pedestrian and equestrian use of Bridleway B46 in addition to the cyclists. This indicated that there was a strong desire line between the residential areas to the north-east, such as West Boldon and Boldon Colliery, and the Nissan Plant.

13.5.29 Surveys undertaken as part of the Testo's scheme, during 2014 / 2015, suggested that, with the exception of Bridleway B46, there was generally low usage of the NMU network by pedestrians and equestrians, but higher usage by cyclists, particularly for commuting. This is believed to be as a result of limited connectivity between and along the existing routes and because the existing crossing facilities are perceived as dangerous for NMUs.

13.5.30 Pedestrian, cyclist and equestrians' desire lines are outlined in the NMU Context Report in Appendix 13.1.

Communities and community facilities

13.5.31 The communities included for this assessment were Town End Farm, Hylton Castle, Boldon Colliery and Fellgate and Hedworth. Town End Farm and Hylton Caste would be the two closest communities to the Scheme; however, given that there would be significant NMU traffic from the Boldons (East and West Boldon and Boldon Colliery) and potentially from Fellgate and Hedworth, these have also been included in the assessment. Community facilities are shown on Figure 13.5.

13.5.32 In addition to those located within Town End Farm, there are also the following:

- The North East Land, Air and Sea Museums is a volunteer-run museum located between the A1290 and the A19, to the north of Washington Road. It occupies an area of approximately 1.4 hectares and is adjacent to the Gateshead College Skills Academy, approximately 150 m south-west from the Scheme.
- The Gateshead College Skills Academy is a department of Gateshead College focusing on sustainable manufacturing and innovation. It is located to the east of the A1290 and to the south of Washington Road, and lies approximately 150 m south of the Scheme. It covers an area of approximately 0.8 hectares.
- The Air Training Corps centre is located adjacent to the North East Land, Air and Sea Museums, approximately 160 m east of the A1290 and to the north of Washington Road.

13.5.33 Located to the rear of the North East Land, Air and Sea Museums is an area of playing fields, with football pitches. This does not appear on the Sunderland Unitary Development Plan and not officially designated as recreational space within the plan.

13.5.34 Adjacent to the Nissan Plant is the Nissan Sports and Leisure Complex, this sports and recreational facility is located to the south of Washington Road and is available for current and former Nissan employees and their families.

Town End Farm

13.5.35 Town End Farm would be the closest community to the Scheme, lying directly south-east of the junction and to the north of Washington Road. It is a residential area within the administrative boundary of Sunderland City Council, with a wide range of community facilities located within the area, including:

- Two Academies (Bexhill and Town End), providing secondary education, located on Bexhill Road and Baxter Road respectively.
- Two primary schools, St John Bosco RC School, located to the north of Town End Farm on Bradford Avenue and Washington Primary Care Centre, located on the same site as Bexhill Academy.
- Sunderland North Community Business Centre, also located to the north of Town End Farm on Baxter Road.
- One doctor's surgery at Bunny Hill Primary Care Centre, located to the south-east of Town End Farm on Hylton Lane. This also includes a pharmacy.
- One leisure facility, Bunny Hill Wellness Centre, located on Hylton Lane.

- One intermediate care facility, providing health care support for the elderly, located on Brentford Avenue to the south of Town End Farm.
- A range of food outlets / fast food restaurants, including: fish and chip shops, Indian takeaways / restaurants, coffee shops and pizza places.
- Town End Farm has a range of shops and other amenities, including: convenience stores, newsagents, William Hill betting, hairdressers and tanning salons.

13.5.36 Town End Farm is a relatively self-contained community with access to key facilities within its boundaries, such as shops, a post office, primary schools and secondary schools and healthcare facilities. However, it is not completely self-contained as there are no large supermarkets located within the estate. The nearest are located at Boldon Colliery to the north (Asda) or further south on the A19 along Wessington Way (Aldi, Sainsbury's).

13.5.37 The community is serviced on public bus routes by Bus 50A, which can be used to access facilities in South Shields, Washington and Durham; buses 29/X36 provide access to Newcastle, Gateshead and Heworth railway stations and Sunderland / Silksworth. Bus route 50/56 runs along Washington Road to the south of Town End Farm and provide access to Sunderland, Newcastle and Gateshead.

13.5.38 To the south of Town End Farm at the junction of Washington Road and Ferryboat Lane, there is an existing NMU route[120] linking Town End Farm with the Nissan Plant via the Washington Road footbridge across the A19.

Hylton Castle

13.5.39 To the south of Washington Road is the residential area of Hylton Castle. As with Town End Farm it is a relatively self-contained community with access to community facilities as follows:

- one primary school, Hylton Castle Primary, located on Caithness Road;
- the New Bridge Academy, providing secondary education, located on Craigshaw Road;
- the Cheadle Centre, a pupil referral unit[121], located on Caithness Road;
- Sacred Heart & St John Bosco RC Church, located on Chiswick Road;
- Hylton Castle and Hylton Castle play area, located on Craigavon Road; and
- a range of shops and other facilities, including convenience stores, a Cooperative supermarket, Post Office, pubs and fast food outlets.

13.5.40 While Hylton Castle is relatively self-contained, it is not completely self-contained as large supermarkets (Aldi, Sainsbury's) are located to the north at Boldon Colliery or further south along the A19 on Wessington Way.

13.5.41 The community is served by bus route 3 between Hylton Castle, Sunderland and Farringdon, bus route 4 between Downhill and Sunderland and route 135/136 between Town End Farm and Sunderland. None of these services use Downhill Lane junction.

Boldon Colliery

13.5.42 North of the Scheme, near the Testo's junction, are the residential communities of Boldon Colliery and West Boldon and a commercial area at Boldon Business Park.

13.5.43 Community facilities within Boldon Colliery include the Boldon Village Hall and Housing Office as well as a cinema. Restaurants, a large supermarket, a parade of local shops, a post office, primary school and secondary school. These facilities are mainly located to the north of the A184 and east of the A19, mainly in and around Boldon Business Park.

13.5.44 The community is serviced on public bus routes by: Bus X34, which can be used to access facilities in South Shields, Gateshead and Newcastle; Bus 50A providing access to South Shields, Washington and Durham; Buses 29/X36 providing access to Newcastle, Gateshead and Heworth railway stations and Sunderland/Silksworth; Bus 50 providing access to South Shields, Washington and Durham; Buses 5 and 9 providing access to South Shields or Sunderland, Jarrow and North Shields; and Bus 558 providing access to Whitburn and Fellgate. There are Metro stations at Brockley White, to the north of Boldon Colliery, and East Boldon. These stations provide a link to Sunderland, Gateshead and Newcastle and Newcastle Airport.

Fellgate and Hedworth

13.5.45 The ward of Fellgate and Hedworth comprises two built-up residential areas located approximately 2 km north-west of Downhill Lane junction, and a large rural area bisected by the A184. This area contains several farms and other isolated properties, including Make-Me-Rich Farm, West House Farm and Elliscope Farm. The built-up areas are self-contained communities with access to local facilities such as shops, post offices, primary schools, the Hedworthfield Community Association Community centre and the Fellgate Metro Station. There is no existing connectivity between the built-up areas and the rural areas.

13.5.46 The community is serviced on public bus routes by Buses 5 and 9, which can be used to access facilities in South Shields or Sunderland, Jarrow and North Shields, and bus route 558, which can be used to access facilities in Whitburn. It is also serviced by Fellgate Metro station with connections to Sunderland, Gateshead, Newcastle and Newcastle Airport, providing an alternative means of transportation.

13.5.47 Within the local study area, a number of general stakeholder groups include:

- residents in the local communities;
- residents of farmhouses in close proximity to the Scheme;
- farmers and others working on the agricultural land of the area;
- commuters, including those using the public right of way and road network to access employment;
- recreational users of the public rights of way in close proximity to the Scheme;
- local road users who use the roads for access more generally; and
- community groups, such as social and education groups within the local area.

Public transport users

13.5.48 A number of buses operate within the area of Downhill Lane junction providing routes into Sunderland, Newcastle, Gateshead, Durham and Middlesbrough.

13.5.49 Bus route numbers 50 and 56 are the only two routes to actually stop close to Downhill Lane junction. There are two stops (northbound and southbound), both on the west side of the

[120] This lies outside the scope of the NMU context report.

[121] A pupil referral unit is a school catering for pupils aged 4-16, who are at risk of exclusion from mainstream schools, or who have been permanently excluded. http://www.sunderland.gov.uk accessed 25/03/2018.

junction, located on the A1290. On the east side bus route number 50 has a stop on Downhill Lane (East), but this would not be in the area affected by the Scheme. Bus route 56 has stops along Washington Road, although these would not be in the area affected by the Scheme. The number 50 has a 30-minute frequency from Monday to Saturday and 60-minute frequency on Sunday. The number 56 runs every 15 minutes from Monday to Saturday and every 20-30 minutes on Sunday.

13.5.50 Bus routes X9/X10 and 50A travel through Downhill Lane junction on the A19 mainline, but do not have stops near the junction.

Vehicle travellers

13.5.51 The following describes the 2012 baseline underlying the traffic model used for the vehicle traveller impact assessments. However, the future baseline underlying the Do Minimum and Do Something scenarios account for the following road network changes:

- 2021 - the new Testo's scheme and IAMP One development road networks are operational.
- 2036 - IAMP Two's additional road network changes would be operational, including the addition of Washington Road Bridge over the A19 and closure of Downhill Lane (West) between Hylton Bridge and Downhill Lane junction.

Journey times

13.5.52 Analysis of traffic recorded in the traffic model's baseline scenario was undertaken to establish existing journey times on the key journeys within the study area, based on the methodology outlined in Section 13.3 of this chapter.

13.5.53 A review of the traffic model's baseline conditions suggested that drivers using the A19 currently experience some delays and congestion at Downhill Lane junction and Testo's junction. The A19 is a dual carriageway with a speed limit of 70 mph, which allows traffic to overtake slower vehicles (e.g. Heavy Goods Vehicles). Downhill Lane junction experiences heavy congestion both before and after shift changeover periods at the Nissan Plant, with the highest existing traffic flows occurring as traffic bound for Nissan queues on the A19 Downhill Lane slip roads. These queues regularly block the A19 mainline carriageway, increasing congestion.

13.5.54 The A1290 is a derestricted single carriageway and drivers using this route experience congestion during the shift changeover periods at the Nissan Plant. The increase in traffic from the Nissan Plant impacts on the operation of Downhill Lane junction, which struggles to cope with the additional traffic demand, causing congestion and therefore increasing journey times for drivers.

13.5.55 Washington Road is a derestricted single carriageway and drivers using this route experience congestion during both peak periods, which is associated with the shift changeover periods at the Nissan Plant. During this period, the volume of traffic travelling through the A19 Downhill Lane junction increases, especially from the A19 slip roads, and reduces the number of gap seeking opportunities for right turning vehicles on the Washington Road approach who are travelling along Downhill Lane (East). This results in higher delays, which increases journey times for drivers.

13.5.56 Drivers travelling westbound along Downhill Lane (East) are required to join Washington Road to travel through Downhill Lane junction. Right turning vehicles on Downhill Lane (East) are required to give way to traffic travelling in both directions on Washington Road. A storage reservoir on Washington Road allows right turning vehicles from Downhill Lane (East) to clear eastbound traffic on Washington Road; however, there is only sufficient storage for one vehicle and right turning traffic queues on Downhill Lane (East). There are restricted gap seeking opportunities for right turning traffic on Downhill Lane (East), which increases vehicular delay; the queue also blocks vehicles turning left from Downhill Lane (East). The storage reservoir creates conflict between right turning vehicles from Downhill Lane (East) and from Washington Road, as the reservoir is shared by both movements.

13.5.57 Table 13-15 shows the modelled journey times for the 12 key journeys for the baseline scenario.

Table 13-15: Baseline journey times in the AM and PM peaks

Journey		2012 baseline journey times (mm:ss)	
		AM peak	PM peak
1	On the A19 northbound, starting at the A19 / A1231 Wessington Way junction northbound on-slip and ending at Testo's junction northbound approach.	03:47	03:46
2	On the A19 southbound, starting from the north of Testo's junction and ending where Downhill Lane junction southbound on-slip meets the A19 mainline carriageway.	03:05	03:37
3	On the A19 northbound, starting at the A19/ A1231 Wessington Way junction northbound on-slip and ending at the A1290 / Nissan Plant traffic signal junction.	03:13	03:30
4	On the A1290 eastbound, starting at the A1290/ Nissan Plant traffic signal junction and ending where Downhill Lane junction southbound on-slip meets the A19 mainline carriageway.	01:28	01:28
5	On Washington Road westbound, starting at the Washington Road / Ferryboat Lane junction and ending at the Downhill Lane (West) / Follingsby Lane junction.	02:08	02:32
6	On A1290 eastbound, starting from the A1290 / Washington Road Link Road junction and ending at Downhill Lane (East).	00:35	00:38
7	On the A19 southbound, starting from the north of Testo's junction and ending at the A1290/ Nissan Plant traffic signal junction.	04:34	05:10
8	Starting from Downhill Lane (East) and ending at the Downhill Lane (West) / Follingsby Lane junction.	01:52	02:25
9	On A1290 eastbound, starting at the A1290/ Nissan Plant traffic signal junction and ending at Downhill Lane (East).	01:17	01:17
10	On Washington Road westbound, starting at the Washington Road / Ferryboat Lane junction and ending at the Follingsby Lane / Wardeley D.P. site access to the east of Follingsby Park.	03:37	04:24

Journey		2012 baseline journey times (mm:ss)	
		AM peak	PM peak
11	Starting from Downhill Lane (East) and ending at the Follingsby Lane / Wardeley D.P. site access to the east of Follingsby Park.	02:40	02:49
12	Starting from the Downhill Lane (West) / Follingsby Lane junction and ending at the A1290 / Nissan Manufacturing Plant Traffic Signal junction.	01:48	02:02

Driver stress

13.5.58 Analysis of traffic recorded in the traffic model's baseline scenario was undertaken to establish existing levels of driver stress on routes within the study area, based on the methodology outlined in Section 13.3 of this chapter.

13.5.59 A review of the traffic model's baseline conditions suggested that drivers using the A19 currently experience some delays and congestion at Downhill Lane junction, Testo's junction to the north and A1231 / A19 / Wessington Way junction to the south. The congestion was considered to be a source of frustration to drivers because it creates a situation where the driver does not feel in control, especially when they are required at a destination by a particular time. The A19 is a dual carriageway with a speed limit of 70 mph, which allows traffic to overtake slower vehicles (e.g. Heavy Goods Vehicles). However, Downhill Lane junction experiences heavy congestion both before and after the shift changeover periods at the Nissan Plant, with the highest existing traffic flows occurring as traffic bound for Nissan queues on the Downhill Lane junction slip roads. These queues regularly block the A19 mainline carriageway, increasing congestion and therefore driver stress. Outside of the shift changeover periods, driver stress on the A19 mainline carriageway at the junction was considered to be low.

13.5.60 Drivers travelling northbound on the A1290 also experience congestion during the shift changeover periods, which increases driver frustration on this route. The A1290 is a derestricted single carriageway and congestion affects drivers' ability to travel at a speed that is consistent with their expectations, causing frustration. Additionally, there is limited warning and direction signage on the A1290 approach to the existing junction, creating route uncertainty for drivers.

13.5.61 On the A184, congestion frequently occurs at Testo's junction, which was considered to be a source of frustration for drivers. West of Testo's junction, the A184 is a derestricted dual carriageway that allows drivers to travel at 70 mph and overtake slower moving vehicles. To the east, the A184 is currently restricted to 40 mph, reducing to 30 mph through settlements. The A184 is a high quality single carriageway road and therefore the speed restrictions outside of settlements could be a source of frustration to drivers, affecting their ability to drive at a speed consistent with their expectations.

13.5.62 On local roads, which includes 'B' roads, 'C' roads and 'U' roads, drivers currently using these routes do not experience lengthy delays or queuing at junctions. However, large sections of these roads are bounded by residential or commercial properties, which increases the volume of pedestrians on footways adjacent to the carriageway, restricting speed limits on these routes. Consequently, due to the increase in pedestrian footfall, these routes increase drivers' fear of accidents.

13.5.63 Table 13-16 shows the existing driver stress conditions for the 12 key journeys for the baseline scenario.

Table 13-16: Baseline driver stress conditions in the AM and PM peaks

Journey		2012 baseline driver stress	
		AM peak	PM peak
1	On the A19 northbound, starting at the A19/ A1231 Wessington Way junction northbound on-slip and ending at Testo's junction northbound approach.	Low	Low
2	On the A19 southbound, starting from the north of Testo's junction and ending where Downhill Lane junction southbound on-slip meets the A19 mainline carriageway.	Moderate	High
3	On the A19 northbound, starting at the A19/ A1231 Wessington Way junction northbound on-slip and ending at the A1290 / Nissan Plant traffic signal junction.	Moderate	Moderate
4	On the A1290 eastbound, starting at the A1290 / Nissan Plant traffic signal junction and ending where Downhill Lane junction southbound on-slip meets the A19 mainline carriageway.	Moderate	Moderate
5	On Washington Road westbound, starting at the Washington Road/ Ferryboat Lane junction and ending at the Downhill Lane (West) / Follingsby Lane junction.	Low	Moderate
6	On A1290 eastbound, starting from the A1290 / Washington Road Link Road junction and ending at Downhill Lane (East).	Moderate	Moderate
7	On the A19 southbound, starting from the north of Testo's junction and ending at the A1290 / Nissan Plant traffic signal junction.	Moderate	High
8	Starting from Downhill Lane (East) and ending at the Downhill Lane (West) / Follingsby Lane junction.	Moderate	Moderate
9	On A1290 eastbound, starting at the A1290 / Nissan Plant traffic signal junction and ending at Downhill Lane (East).	Moderate	Moderate
10	On Washington Road westbound, starting at the Washington Road / Ferryboat Lane junction and ending at the Follingsby Lane / Wardeley D.P. site access to the east of Follingsby Park.	Low	Low
11	Starting from Downhill Lane (East) and ending at the Follingsby Lane / Wardeley D.P. site access to the east of Follingsby Park.	Low	Low

Journey		2012 baseline driver stress	
		AM peak	PM peak
12	Starting from the Downhill Lane (West) / Follingsby Lane junction and ending at the A1290 / Nissan Plant traffic signal junction.	High	Moderate

Views from the road

13.5.64 The A19 is bounded by trees on the following sections, which act as a screen from the views of residential and commercial developments on either side of the carriageway. On other sections of the A19, drivers experience open views of mixed arable and pastoral land to the north of the A19 Downhill Lane junction:

- Section 18 - A1231 / A19 / Wessington Way junction to Downhill Lane junction; and
- Section 20 - Testo's junction to A19 / Leam Lane junction.

13.5.65 Drivers travelling between Downhill Lane junction and Testo's junction experience open views of mixed arable and pastoral fields separated by hedgerows with some partially-mature trees, rolling fields and localised valleys.

13.5.66 Drivers on the A1290 experience open views of mixed arable and pastoral fields, with rolling fields and localised valleys between Downhill Lane junction and the A1290 / Nissan Plant traffic signal junction. The southern verge of the A1290 is bounded by trees to restrict views of the Nissan Plant to the west of the traffic signal junction.

13.5.67 The route between the A184 Newcastle Road / Leam Lane junction and Testo's junction is bounded by trees on both sides of the carriageway. The trees screen views of isolated residential and commercial developments along this route, but also restricts views of mixed arable and pastoral fields. Additionally, drivers travelling along the A184 between Testo's junction and the A184 / Hylton Lane junction experience open views of commercial and residential developments to the north and intermittent views of arable and pastoral fields to the south prior to West Boldon. The presence of commercial and residential developments along the route detracts from views of the landscape to the south.

13.5.68 On local roads to the east of the A19, the majority of roads are bounded by residential properties on both sides of the carriageway with little variance in scenery. The exceptions to this landscape are:

- Section 5 (Hylton Lane / Dipe Lane junction to Hylton Lane / Kingsway Road junction) – drivers experience open views of arable and pastoral fields, rolling fields to the west and views of hedgerows, shrubs and Boldon golf course to the east.
- Sections 14 and 15 (Washington Road / Ferryboat Lane junction to Downhill Lane junction) – the majority of this route is bound by trees on both sides of the carriageway to restrict views of residential developments to the east and the A19 mainline carriageway to the west.
- Section 16 (Washington Road/ Downhill Lane (East) junction to speed limit change south of Downhill Lane / Lawn Drive junction) – drivers experience open views of mixed arable and pastoral fields separated by hedgerows with some partially-mature trees, rolling fields and localised valleys. Views to the south become more intermittent as drivers approach West Boldon.
- Section 27 (Downhill Lane / Downhill Lane junction (North Moor Farm) to Downhill Lane / A1290 Downhill Lane junction) – this route is bound by hedgerows and a mixture of arable and pastoral fields on both sides of the carriageway. Therefore, drivers travelling in both directions generally experience views of arable and pastoral fields; hedgerows on the carriageway verge occasionally restrict these views.

Economy and employment

13.5.69 The economy and employment sub-topic focuses on the wider region surrounding the A19. The impact assessment focuses on the three-relevant regional local authorities: South Tyneside, Sunderland and Gateshead.

13.5.70 Table 13-17 shows key relevant statistics from the 2011 Census for the three local authorities.

Table 13-17: Key statistics from the 2011 Census[122]

Indicator	South Tyneside	Sunderland	Gateshead	North East	England
Population	148,127	275,506	200,214	2,596,886	53,012,456
Population density (number of persons per hectare)	23.0	20.0	14.1	3.0	4.1
Households	67,167	119,758	89,154	1,129,935	22,063,368
Proportion of households – property owned outright/with mortgage/loan	57.1%	59.8%	58.2%	61.8%	63.4%
Proportion of people in good/very good health	75.8%	75.5%	76.5%	77.3%	81.4%
Economic inactivity rate	6.6%	5.8%	5.0%	5.4%	4.4%

13.5.71 Table 13-18 shows Gross Value Added (GVA) by industry for 2015. The NUTS3[123] area of Tyneside covers the local authorities of Newcastle-upon-Tyne, Gateshead, South Tyneside and North Tyneside, but, along with Sunderland, is the closest approximation to the local study area that is available.

Table 13-18 Industry share of GVA by area, 2015[124]

Industry	Tyneside (%)	Sunderland (%)	North East (%)	England (%)
Agriculture, forestry and fishing	0.1	0.1	0.7	0.6
Production	1.6	7.7	3.9	2.5
Manufacturing	10.3	22.3	14.0	9.7

122 Nomis (2013). Census 2011 data. Accessed from: https://www.nomisweb.co.uk/census/2011.

123 Nomenclature of Units for Territorial Statistics (NUTS) is a hierarchical classification of administrative boundaries. NUTS3 refers to an administrative level comprising countries or groups of unitary authorities with a population size ranging from 150,000 to 800,000.

124 ONS (2016). Regional gross value added. Accessed from: https://www.ons.gov.uk/economy/grossvalueaddedgva/datasets/regionalgrossvalueaddedincomeapproach

Industry	Tyneside (%)	Sunderland (%)	North East (%)	England (%)
Construction	5.6	6.0	6.2	5.9
Distribution; transport; accommodation and food	17.4	15.8	17.5	18.9
Information and communication	7.6	4.1	4.9	7.1
Financial and insurance services	4.8	4.9	3.8	7.6
Real estate activities	10.5	9.0	11.2	13.0
Business service activities	10.4	5.4	8.8	12.9
Public administration; education; health	27.9	22.4	25.9	17.8
Other services and household activities	3.8	2.4	3.0	4.1
All industries (£ million)	18,224	5,745	49,677	1,433,164

13.5.72 Table 13-19 shows the share of employment by industry in 2015.

Table 13-19: Proportion of employee jobs by industry, 2015[125]

Industry	South Tyneside (%)	Sunderland (%)	Gateshead (%)	North East (%)	England (%)
Agriculture, forestry and fishing	0.0	0.0	0.0	0.3	0.6
Production	0.6	3.1	0.6	1.2	1.1
Manufacturing	11.0	17.7	12.3	10.9	8.1
Construction	5.0	3.8	6.1	4.8	4.5
Distribution; transport; accommodation and food	25.9	23.5	29.1	25.3	27.5
Information and communication	1.5	2.5	4.1	3.1	4.4
Financial and insurance services	0.8	4.2	1.3	2.1	3.6
Real estate activities	2.0	1.5	1.5	1.5	1.7
Business service activities	15.4	10.5	16.4	13.8	17.8
Public administration; education; health	33.0	30.3	26.6	33.0	26.1
Other services and household activities	2.2	1.5	1.3	1.9	2.1
Total (number of jobs)	45,000	119,000	98,000	1,071,000	24,867,000

Deprivation

13.5.73 South Tyneside has a relatively high level of deprivation, being ranked 31st out of 326 local authorities in the Index of Multiple Deprivation (IMD), 2015. In 2010, South Tyneside was ranked 47th out of 326, of the most deprived local authorities, indicating that relative deprivation has worsened in recent years.

13.5.74 Sunderland is also relatively deprived, ranking 38th out of 326 local authorities in the IMD, 2015. The level of deprivation in Sunderland has remained the same since 2010.

13.5.75 Gateshead is ranked 80th out of 326 local authorities in the IMD, 2015. Gateshead's standing in the deprivation ranking has improved substantially since 2010, with Gateshead previously being ranked as the 42nd most deprived local authority. Deprivation levels are shown on Figure 13.6.

Local Economic Context

13.5.76 The area around Town End Farm is relatively deprived, containing Lower Super Output Areas (LSOAs) within the 1st, 2nd and 3rd deciles of the most deprived in England[126] based on the IMD. Hylton Castle also falls within the 2nd decile of the IMD.

13.5.77 Along the eastern edge of the A19 extending towards Boldon Colliery is a LSOA in the 5th decile of the IMD, 2015. The neighbourhoods around Boldon Colliery and East Boldon are relatively less deprived, while those around West Boldon are relatively more deprived, including two wards in the 2nd decile of most deprived in England.

13.5.78 Along the western side of the A19 extending north to Fellgate, the Scheme lies along a LSOA with an IMD, 2015[109] in the 6th decile of deprivation for all wards within England in 2015 (i.e. relatively low deprivation). Fellgate itself comprises a LSOA of lower deprivation, while Hedworth comprises LSOAs of relatively high deprivation, in the 2nd decile.

13.6 Potential impacts (without mitigation)

Construction impacts

Land use

Community land and facilities

13.6.1 The designated public open space land adjacent to the River Don, approximately 1 km from the Scheme, would not be affected by the construction works, given the distance from the Scheme. The Scheme would also have no impact on the land used for playing fields within Town End Farm to the north of Washington Road or on the playing fields located to the north of the North East Land, Air and Sea Museums.

13.6.2 There are a number of community facilities within the residential area of Town End Farm and Hylton Castle. Both of these communities are relatively self-contained, so the majority of the people using these facilities would be unaffected by the construction of the Scheme. Temporary road closures and diversions required during the construction period could affect people using these facilities from outside of the Town End Farm and Hylton Castle areas; for example, from the small number of residential properties at The Chalet and Usworth Cottages,

125 Nomis (2016). Business Register and Employment Survey. Accessed from: https://www.nomisweb.co.uk/articles/971.aspx

126 Department for Communities and Local Government (2015). Accessed from https://www.gov.uk/government/statistics/english-indices-of-deprivation-2015

who would need to use the A1290 and Downhill Lane junction to access facilities as there are no shops located near these properties.

13.6.3 There would be potential disruption for the communities of Town End Farm and Hylton Castle in accessing the community facilities to the north of the Scheme at Boldon Colliery, such as a supermarket and cinema, as they would need to travel through Downhill Lane junction to access these. There are alternative large supermarkets located to the south, along the A19 and A1231 Wessington Way, which could be accessed without the need to traverse the junction.

13.6.4 Temporary road closures and diversions during construction would also impact on the community facilities of the North East Land, Air and Sea Museums, the Air Training Corps Centre and the Gateshead Skills Academy, which are all located at the junction of the A1290 and Washington Road south of the Scheme.

13.6.5 No demolition of any community facilities is proposed for the Scheme.

Development land

13.6.6 An objective of the Scheme is to increase capacity at the junction to support large scale development west of Downhill Lane junction and north of the Nissan Plant, such as the IAMP Two development.

13.6.7 Land allocated for IAMP Two lies adjacent to the west of Downhill Lane junction, with land to the north and west of Downhill Lane (West); IAMP Two is currently planned to be constructed after the Scheme.

13.6.8 The Scheme is being designed in consultation with the IAMP developer and local authorities so the design complements IAMP One and Two during construction and operation. The potential cumulative impacts between IAMP Two and the Scheme are addressed in Chapter 15, whilst IAMP One forms part of the baseline for the main assessment.

Agricultural land and businesses

13.6.9 As indicated in Figure 13.3, agricultural land extending to 12.45 ha in total on six landholdings would potentially be required for temporary uses during the construction period.

13.6.10 The temporary uses would include the main site compound and materials storage, soil storage, haul routes and land which would be required for utility diversions. The areas required are outlined under 'Other effects before mitigation' in Table 13-23.

13.6.11 The temporarily used areas would be out of agricultural production for some or all of the construction period, but would be progressively returned to agricultural use on completion of their use during the construction period and replacement of soils. Although included in the draft DCO boundary for temporary acquisition, the intention would be to return these sites to the owner on completion of the restoration.

Physical assets

13.6.12 The Scheme would not require the demolition of any properties; however, there would be some disruption to properties in close proximity to the Scheme, particularly Make-Me-Rich Farm House, The Chalet and Usworth Cottages and Town End Farm residential estate. There would be potential disruption to access to the farmhouse, which is currently accessed from Downhill Lane (West) to the west of the junction as a result of construction activity in the vicinity. The proposed construction works include a new means of access from Make-Me-Rich Farm onto the realigned Downhill Lane (West).

13.6.13 The Scheme would not require the demolition of any industrial or commercial properties, including the Nissan Plant or the Three Horseshoes pub. There would be a small amount of temporary land take during construction from the IAMP One area. The Scheme has been designed in consultation with the IAMP developer so that the Scheme design complements the IAMP development.

13.6.14 During construction, temporary road closures and diversions would be required, which would have an impact on traffic flows in the area. Given the proximity of the Nissan Plant, the Testo's scheme and IAMP One, there would be the potential for disruption to freight deliveries and commuting traffic for this and other commercial businesses in the area as a result of traffic delays.

Non-motorised users

13.6.15 Proposed changes to the existing NMU routes and facilities (footways, cycleways and public rights of way, roads used by NMUs and crossing facilities) surrounding the Scheme are described in Chapter 2 and illustrated on Figure 2.7, in Volume 2 of this ES.

13.6.16 During construction, there would be some disruption to existing NMU routes because of works to divert statutory services, highways works, works to improve the NMU facilities themselves or construction of new NMU facilities; these would be additional to similar effects by the Testo's scheme to the north. It is anticipated that all existing NMU provision would be kept open during construction through the DCO boundary area, although diversions may be required in some places. Consequently, journeys between community facilities, residential properties and industrial zones are likely to increase in length and duration during temporary, localised diversions. Bridleway B46 is a particularly well-used commuter route from residential communities to the north of Downhill Lane junction to the Nissan Plant and users of this route currently cross the A19 at Downhill Lane.

13.6.17 East-west travel along the A1290 through Downhill Lane junction is expected to remain open during the construction period. There would be temporary road side footpath closures with appropriate diversion provisions provided.

13.6.18 Users of the walkway along Washington Road would also experience disruption due to the temporary diversion of this route to allow for the realignment of Washington Road. The existing NMU provision connecting Town End Farm and the Nissan Plant would not be impacted by the construction of the Scheme.

13.6.19 The impacts on NMUs would be temporary in nature during construction; however, due to the strong use of Downhill Lane junction and surrounding roads and footpaths / cycleways as a commuter route to the Nissan Plant and also towards Sunderland, the effects on NMUs during construction would be adverse and significant.

Community severance

13.6.20 All the larger communities identified within the study area for the Scheme are relatively self-contained and have access to a range of community facilities, without the need to use the A19 or Downhill Lane junction, with the exception of the small number of properties at The Chalet and Usworth Cottages.

13.6.21 The Town End Farm and Hylton Castle residential communities, located to the south-east of the site, would be the most likely communities to experience a severance effect during construction. The scale of effect would be largely determined by construction impacts upon Washington Road, which provides a direct link between these communities and Downhill Lane

junction. This link provides access from the community to wider community facilities located to the north at Boldon Business Park.

13.6.22 Downhill Lane junction and Washington Road also provide a link to community facilities within Town End Farm that may be accessed from other private properties in the area (e.g. Make-Me-Rich Farm and Hylton Bridge Farm) and The Chalet and Usworth Cottages.

13.6.23 Given the relatively self-contained nature of the communities, that access would be maintained for all apart from ad hoc overnight closures and that the effects would be temporary in nature, it was considered that the impacts relating to community severance would be adverse but not significant.

Community amenity

13.6.24 During construction, the amenity of community members who live near or use land in proximity to the site would be adversely affected by disruption caused by construction activities due to increased congestion and reduced visual amenity caused by temporary traffic management measures associated with both the Scheme and the Testo's scheme.

13.6.25 There could also be an effect on noise and air quality during the construction works; these effects are discussed within Chapters 6 and 12 of this ES. Visual effects on local residents and communities are discussed in Chapter 8 of this ES.

Public transport users

13.6.26 During construction, the Scheme would have temporary adverse impacts on road users, including public transport users, due to disruptive construction activities by both the Scheme and Testo's scheme. However, these effects would be temporary and therefore were considered not significant.

13.6.27 The presence of the Scheme's construction works would cause some short-term disruption to local bus routes using Downhill Lane junction, particularly the 50 and 56 with stops to the west of Downhill Lane junction on the A1290, that would require temporary relocation during construction. Although these impacts adversely affect public transport users, the effects were considered to be insignificant and temporary in nature. Effects on journey times for public transport users would be consistent with those for other vehicular traffic. For the routes crossing the junction, the effect would likely be an adverse effect of minor significance, due to the presence of traffic management and temporary signals.

Vehicle travellers

Journey times

13.6.28 For the duration of the construction period, the contractor would be required to keep two lanes of traffic open in both directions on the A19 during peak periods to reduce congestion on the mainline carriageway.

13.6.29 Drivers travelling along the key journeys identified in Table 13-5 during the construction period would likely experience an increase in construction traffic, including a change in traffic composition. This increase would likely affect the operation of Downhill Lane junction and other junctions nearby. However, traffic travelling between the main site compound and the construction site would use haul roads, wherever possible, which would minimise the requirement for construction traffic to use the existing highway network.

13.6.30 Traffic management would be present at Downhill Lane junction for the duration of the construction period, with temporary traffic signals operating for the majority of the construction works. The presence of traffic management and temporary traffic signals would increase journey times for drivers on the key journeys identified in Table 13-5.

13.6.31 The construction period would be short-term and temporary in nature. The volume of construction traffic travelling on the road network would also be mitigated through the use of haul roads between the main site compound and the construction site. However, the presence of traffic management and temporary traffic signals would increase vehicular delay during the construction period. Therefore, the predicted change in journey times would represent a large magnitude of change and an adverse effect of minor significance.

Driver stress

13.6.32 During the construction period, the presence of traffic management and temporary traffic signals would create additional delays for drivers in the vicinity of Downhill Lane junction, increasing drivers' frustration. Roadworks could also create route uncertainty for drivers if lanes are closed as part of the construction work and some drivers may choose to use an alternative route to avoid the construction of the Scheme. The change in traffic composition as a result of construction traffic may also increase drivers fear of accidents and frustration if they cannot overtake slower moving vehicles.

13.6.33 The change in driver stress levels would be short-term and temporary in nature. Due to the localised effects, the change in driver stress was considered to represent a large magnitude of change due to the additional delays but only an adverse effect of minor significance because the effect would be localised.

Views from the road

13.6.34 Construction activities would be temporary and short-term, which was considered as part of the assessment for views from the road.

13.6.35 The Scheme would be visible from the A19 mainline carriageway (Section 19) for drivers travelling in both directions, replacing existing views of arable and pastoral land to a landscape associated with the construction of the Scheme. However, the construction activities associated with the Scheme would be in view for a short period of time because vehicles would be travelling between 55 mph and 70 mph and would only change for a small section of the A19. Therefore, this represents a small magnitude of change and an adverse effect of minor significance.

13.6.36 A main site compound is proposed adjacent to Downhill Lane (Section 16), with the access road to the main site compound located to the north of Downhill Lane (East). The proposed main site compound would be noticeable to drivers travelling along both routes because their existing open views would change from arable and pastoral land to a main site compound that stores plant and construction vehicles. Drivers would also notice the change in their views while travelling towards, and negotiating, Downhill Lane junction. Therefore, for Section 16, this represents a medium magnitude of change and an adverse effect of minor significance.

13.6.37 Construction activity would also be visible from Section 27 (Downhill Lane / Downhill Lane Junction (North Moor Farm) to Downhill Lane / A1290 Downhill Lane Junction) and Section 22 (A1290) to the west of the junction, changing drivers' views of arable and pastoral land to a view of construction traffic and plant on the site of the Scheme. The Scheme would change views along this route; however, there would continue to be a mixture of arable and pastoral land around the Scheme. Therefore, for Sections 22 and 27, the change in views for drivers represents a small magnitude of change and an adverse effect of minor significance.

Economy and employment

Economy

13.6.38 Construction impacts on the three local authorities of the wider region relate to economic stimulus and employment impacts from spend on the Scheme. The Scheme would act to stimulate the local job market and increase employment both through direct jobs and indirect and induced employment. In addition, expenditure on the Scheme in the local economy would contribute to the local market, including multiplier effects so that the overall stimulus is greater than the nominal spend in the region.

13.6.39 Any economic and employment effects within the wider South Tyneside, Gateshead and Sunderland local authorities caused by disruption to commuter times would likely be minimal in respect to this regional scale.

13.6.40 Construction expenditure would come from direct spend on materials and labour for the Scheme, with indirect spend from firms supplying products and services to the Scheme. Induced spend would come from the additional money earned by those working on the Scheme.

13.6.41 The ONS produces output cost multipliers by industry which can be used to estimate the total economic stimulation of investment[127]. The published output cost multiplier for construction is 1.829 and for employment cost multiplier for construction is 2.013.

13.6.42 According to Highways England scheme cost estimates, the mid-range estimate for total construction outturn for the Scheme is £23.5 million, with a low and high estimate of £18.3 million and £32 million. Applying the output multiplier for construction, total economic stimulation would be expected to be in the range £34 million to £59 million, with a mid-range estimate of £43 million. However, these high level multipliers account for the total economic stimulation from the Scheme in the United Kingdom, and not all of it would be generated within the study area.

13.6.43 Table 13-20 shows the estimate of the total economic stimulation for the Scheme.

Table 13-20: Total economic stimulation

	Low Estimate	Mid-range Estimate	High Estimate
Construction outturn	£18.3 million	23.5 million	32 million
Output multiplier for construction	1.829		
Total economic stimulation	£34 million	£43 million	£59 million

13.6.44 The employment spend for the Scheme was estimated at between £7.3 million and £12.8 million, with a mid-range estimate of £9.5 million. This was split between staff costs, including contractor and designer site staff (£2.5 million to £4.4 million), and labour costs, including the contractor's own labour plus that of the supply chain (£4.8 million to £8.4 million), as shown in Table 13-21.

13.6.45 With the application of the construction sector employment cost multiplier to the labour cost, the Scheme would be expected to generate between £14.7 million and £25.7 million in economic stimulation through employment spend on labour. However, as for total construction spend, these high level multipliers account for the total economic stimulation from employment spend on the Scheme in the United Kingdom, and not all benefits would be realised in the study area.

Table 13-21: Economic stimulation through employment spend

	Low Estimate (£)	Mid-range Estimate (£)	High Estimate (£)
Employment Spend (sum of staff and labour costs)	7.3 million	9.5 million	12.8 million
Staff cost	2.5 million	3.3 million	4.4 million
Labour cost	4.8 million	6.2 million	8.4 million
Employment cost multiplier for construction	2.013		
Economic stimulation through employment spend on labour local	14.7 million	18.9 million	25.7 million

13.6.46 Note also that the assessment of employment spend is highly related to the job creation assessment below, with a strong degree of overlap; as such, the results should not be interpreted as cumulative benefits as they are largely inclusive of each other, and to do so would be double counting.

Employment

13.6.47 As described in the methodology section, additionality was applied to estimate the level of employment that could be temporarily captured within the local area, namely the local authorities of South Tyneside, Sunderland and Gateshead, as summarised in Table 13-22.

13.6.48 Additionality seeks to determine the level of impact from investment that is additional to what would otherwise be present. As such it considered direct and indirect employment, along with leakage, or jobs filled from those outside of the study area, namely the three local authorities, and displacement, or employment merely transferred from elsewhere in the area without any job creation.

13.6.49 The workforce would likely be sourced from both local and national suppliers; the Scheme would seek to maximise the opportunities for local workers, such as engaging with the local small and medium sized supply chain companies and with local labour agencies.

13.6.50 The duration of the construction programme was estimated to be 21 months. Over this period, a total of 21 Full Time Equivalent (FTE) jobs are expected for designer and contractor staff, and 82 FTE for the contractor's own labour and that of the supply chain/sub-contractors. This amounts to a total of 103 FTE jobs over the course of the 21 month programme.

13.6.51 Applying the assumptions detailed in the table below and rounding to the nearest whole number, it was estimated that the 103 construction jobs would result in a direct net increase in local jobs of 58. Indirect employment was estimated at 51 jobs for the local area, combining to give total net jobs (all sectors) of 109 for the local area.

[127] https://www.ons.gov.uk/economy/nationalaccounts/supplyandusetables/datasets/ukinputoutputanalyticaltablesdetailed

Table 13-22: Employment captured within the local area during construction

	Local	Description/Assumption
Gross direct jobs	103	FTE jobs over the course of the 104 week programme.
Leakage	25 %	It was expected that a reasonably high proportion of the benefits would be retained within the local area and that 25 % of jobs would 'leak' to Newcastle-Upon-Tyne and North Tyneside, which border the study area to the north.
Displacement	25 %	Displacement was assumed to be low as the labour requirement for the Scheme would be somewhat limited in respect to the size of the overall labour market in the area, and unemployment in the area is higher than the national average
Substitution	0%	Substitution effects were considered unlikely.
Multiplier	1.88	Construction employment multiplier from the UK input-output multipliers 2010[128].
Deadweight	0 %	All the benefits were expected to be as result of the Scheme.
Net local direct effects	58	Additionality calculation.
Indirect and induced employment	51	Additionality calculation.
Total net jobs captured locally (all sectors)	109	Additionality calculation.

13.6.52 As noted above, this benefit was also captured in the economy sub-section above; double counting of employment spend and job creation should be avoided.

Operational impacts

Land use

Community land and facilities

13.6.53 There would be no impact from the operation of the Scheme on the two areas of community land identified due to their distance from the Scheme.

13.6.54 There would be beneficial effects on access to wider community facilities at Boldon Business Park and also in access to community facilities within Town End Farm and Hylton Castle from outside of these communities as a result of improved access provided by the Scheme.

13.6.55 There would also be beneficial effects for the community facilities located to the north of the Nissan Plant near the A1290, again as a result of improved access.

Development land

13.6.56 Operational impacts on development allocations and planning applications would largely be beneficial due to the improved access provided by the Scheme. In particular, the Scheme would be beneficial for the existing Nissan Plant and the IAMP Two development, west and south of Downhill Lane junction.

Agricultural land and businesses

13.6.57 Two farm businesses (Wheathill Farm and Mount Pleasant Farm) would be affected by permanent land take for the Scheme, losing 2.12 and 3.36 ha of rented or contract farmed arable farmland. West Fellgate Farm would only be affected by temporary land take of rented grassland and would therefore experience no operational effects.

13.6.58 One other smaller holding of agricultural land in the study area (No. 6 in Table 13-23) would be affected by permanent land take, losing 0.32 ha of grassland.

13.6.59 Make-Me-Rich farm, although located close to Downhill Lane junction, would not have any permanent or temporary land take associated with the Scheme. The alterations to the access for the farm would not require any land take from this property.

13.6.60 The retention of the local road network and use of Downhill Lane junction would allow continued access to land on both sides of the A19 at this location for all farms.

13.6.61 However, without mitigation, the existing access to agricultural land east of the A1290, south of Downhill Lane junction, would be lost due to the closure of the existing field accesses. In the north-east, access would be lost to a grass field (No. 4 in Table 13.23).

13.6.62 The impacts of land take and other effects on each farming business and landholding affected by the Scheme are summarised in Table 13-23. Apart from farm access, the impacts include the effects of severing land such as creation of small, awkwardly shaped fields and cutting of land drainage systems.

13.6.63 The impacts outlined are in the absence of mitigation; proposed mitigation of the effects on farm businesses is described in Section 13.7 of this chapter.

Table 13-23: Agricultural property land take

Number/ Name	Permanent land-take required		Description of permanent land taken	Other effects before mitigation
	hectares	% farm area		
1. Wheathill Farm, Whitburn	3.36	0.52%	Western, northern and eastern parts of arable fields adjoining A1290 and A19 northbound carriageway, immediately south of Downhill Lane Junction	Loss of access gateways off A1290. Severance of land drainage systems. Approximately 4.24 ha additional temporary use of land during construction, for return to agriculture.

[128] https://www.ons.gov.uk/ons/about-ons/business-transparency/freedom-of-information/what-can-i-request/published-ad-hoc-data/econ/december-2014/provisional-estimates-of-type-uk-employment-multipliers-and-effects.xls

Number/ Name	Permanent land-take required		Description of permanent land taken	Other effects before mitigation
	hectares	% farm area		
2. West Fellgate Farm, Wardley	0.00	N/A	No permanent land take	Approximately 2.81 ha temporary use of land during construction (e.g. as the contractor's main site compound, for return to agriculture).
3. Mount Pleasant Farm, West Boldon	2.12	N/A	Western part of arable field adjoining A19 southbound slip road, south of Downhill Lane	Severance of land drainage systems. Approximately 3.75 ha temporary use of land during construction, for return to agriculture.
4. Land at Downhill Lane junction (1), West Boldon	0.00	N/A	No permanent land take	Loss of access gateway off Downhill Lane (East).
5. Land at Downhill Lane junction (2), West Boldon	0.00	N/A	No permanent land take	Approximately 1.06 ha temporary use of land during construction, for return to agriculture.
6. Land at Downhill Lane junction (3), West Boldon	0.32	24.62%	Strips of land in north of grass field, south of Downhill Lane and west of A1290	Approximately 0.35 ha temporary use of land during construction, for return to agriculture.
7. Land at Downhill Lane junction (4), West Boldon	0.03	N/A	Strip of land in north-east and east of grass field, west of A1290	Approximately 0.09 ha temporary use of land during construction, for return to agriculture.
8. Land east of A1290	0.00	N/A	Small area of land in north-west corner of grass field	Approximately 0.01 ha temporary use of land during construction, for return to agriculture

Physical assets

13.6.64 There would be some change in access to the A1290 from Make-Me-Rich Farm due to the junction with Downhill Lane and the A1290 being moved south slightly. The existing access to Downhill Lane junction with the A1290 would be stopped up as public highway and re-created as private access for Make-Me-Rich Farm.

13.6.65 For commercial and industrial properties, in particular the Nissan Plant, IAMP One and the Three Horseshoes pub, operation of the Scheme would likely have a slight beneficial effect due to the improvements provided by the Scheme, for both vehicle and NMU users.

Non-motorised users

13.6.66 Existing footpaths, cycleways, bridleways and minor roads within the vicinity of the Scheme are shown on Figure 13.5. New NMU provision, as a result of the Scheme, is shown on Figure 2.7 in Volume 3 of the ES.

13.6.67 There would be no direct impact on footpaths B27, B29 and B22 as a result of the Scheme. There may be some cumulative improvement in connectivity with these footpaths and Bridleway B46 as a result of improvements being provided by IAMP One and the Testo's scheme; connectivity improvements associated with other developments, such as IAMP Two, are considered in Chapter 15 (Cumulative Effects).

13.6.68 Bridleway B46 would be improved and a new at-grade crossing provided on Downhill Lane (East), providing a safer crossing point for cyclists and pedestrians continuing south to the Nissan Plant, thus reducing the fear of accidents. This would also link with the new NMU route being provided from Downhill Lane (East) to the A1290.

13.6.69 The new NMU route would provide greater separation of vehicular and NMU traffic, by providing a dedicated NMU route over the A19 via a new NMU bridge and connecting with the existing provision on the A1290. This would also connect to the NMU route through IAMP One, along the line of the old Follingsby Lane, via a signalised (Pelican) crossing. This would increase the safety of NMUs by removing the need to physically navigate Downhill Lane junction. The new route within the footprint of the Scheme would be lit, using low level lighting, which could lead to a sense of personal safety for users and amenity.

13.6.70 For the key east to west movement across Downhill Lane (i.e. from the A1290 to Downhill Lane (East)) and Bridleway B46, there would be an increase in the distance travelled by NMU users as the NMU route does not follow the existing desire line. There may also be some visual effects of the new NMU bridge and the lighting of the NMU route, which are discussed in Chapter 8 (Landscape and Visual Effects). The increase in distance would not necessarily result in an increase in journey time as NMU traffic would not be held at stop points throughout the junction, with the new route having only two signalised crossings.

13.6.71 On balance it was considered that the effect would be significantly beneficial for NMUs as a whole.

Community severance

13.6.72 Improved crossing facilities at the junction would improve access to the wider countryside and to the bus stops on the west side of the junction on the A1290. Accessing wider community facilities during operation may be easier as a result of improvements to the network; however, this was not considered to be significant given that most of the communities are relatively well self-contained.

Community amenity

13.6.73 Operation of the Scheme would have minimal impact on community amenity, as the new road layout primarily follows the general footprint of the existing roads. The provision of new NMU routes would provide greater safety and less fear of accidents for commuters.

13.6.74 Improved road traffic flow and economic and demographic growth over time would increase the volume of traffic, but the Scheme would also be expected to reduce congestion.

Public transport users

13.6.75 The northbound stop on the A1290 for the numbers 50 and 56 bus routes may require permanent relocation due to the proximity to the junction for the A1290 and Downhill Lane (West). If required, as this bus stop is not currently recessed into a layby it would be possible to relocate this further south on the A1290, in discussion with relevant stakeholders.

13.6.76 The provision of an at-grade crossing from the revised NMU route would potentially increase accessibility to these bus stops for NMU users in the area, which could increase the use of these bus services. This would be due to the increased connectivity between the new route and the existing NMU routes used within the area.

13.6.77 The effect on journey length for key bus routes 50/56 has been included in the assessment of vehicle travellers below. The key journeys would be Journey 4 and Journey 6 as both were predicted to have increased journey lengths in both the 2021 and 2036 do-something scenarios, which have been assessed to be significant adverse.

13.6.78 For those public transport services which use the A19 mainline, the effects would be consistent with journeys 1 and 2 in Tables 13-24 and 13-26. These both experience slight beneficial reductions in journey time, although this is not significant.

Vehicle travellers

Journey Times

2021 Journey Times

13.6.79 Table 13-24 summarises the journey time results for the 12 key journeys during the 2021 do-minimum and 2021 do-something AM and PM peak hours. Full journey time results are provided in Appendix 13.3.

Table 13-24: Predicted changes in journey times for the 2021 do-minimum and 2021 do-something

Journey		2021 do-minimum		2021 do-something		Change in journey time	
		AM peak	PM peak	AM peak	PM peak	AM peak	PM peak
1	On the A19 northbound, starting at the A19 / A1231 Wessington Way junction northbound on-slip and ending at Testo's junction northbound approach.	03:52	03:53	03:51	03:51	0%	-1%
2	On the A19 southbound, starting from the north of Testo's junction and ending where the A19 Downhill Lane junction southbound on-slip meets the A19 mainline carriageway.	02:45	02:50	02:43	02:48	-1%	-1%
3	On the A19 northbound, starting at the A19 / A1231 Wessington Way junction northbound on-slip and ending at the A1290 / Nissan Plant traffic signal junction.	03:53	03:48	03:14	03:27	-17%	-9%
4	On the A1290 eastbound, starting at the A1290 / Nissan Plant traffic signal junction and ending where Downhill Lane junction southbound on-slip meets the A19 mainline carriageway.	02:08	02:26	03:03	03:08	43%	29%
5	On Washington Road westbound, starting at the Washington Road/ Ferryboat Lane junction and ending at the Downhill Lane (West) / Follingsby Lane junction.	02:47	03:01	11:00	11:53	295%	294%
6	On A1290 eastbound, starting from the A1290 / Washington Road Link Road junction and ending at Downhill Lane (East).	00:38	00:36	01:17	01:07	103%	86%
7	On the A19 southbound, starting from the north of Testo's junction and ending at the A1290 / Nissan Plant traffic signal junction.	04:46	05:16	04:40	04:33	-2%	-14%
8	Starting from Downhill Lane (East) and ending at the Downhill Lane (West) / Follingsby Lane junction.	02:20	02:09	10:30	11:06	350%	416%
9	On A1290 eastbound, starting at the A1290 / Nissan Plant traffic signal junction and ending at Downhill Lane (East).	02:05	02:46	02:37	02:49	26%	2%
10	On Washington Road westbound, starting at the Washington Road / Ferryboat Lane junction and ending at the Follingsby Lane / Wardeley D.P. site access to the east of Follingsby Park.	03:11	03:11	09:23	09:24	195%	195%
11	Starting from Downhill Lane (East) and ending at the Follingsby Lane / Wardeley D.P. site access to the east of Follingsby Park.	01:21	01:25	08:54	08:39	559%	511%
12	Starting from the Downhill Lane (West) / Follingsby Lane junction and ending at the A1290/ Nissan Plant traffic signal junction.	03:21	02:19	05:33	04:28	66%	93%

13.6.80 Drivers travelling on Journeys 4, 5, 6, 8, 10, 11 and 12 would be anticipated to experience significant increases in journey time during the 2021 do-something AM and PM peak hours. A summary of the potential significant effects is provided below.

Journey 4

13.6.81 Eastbound traffic would be required to clear more stop lines using the Scheme layout, which would be signalised, in comparison to the do-minimum junction layout. During the AM Peak, journey times were forecast to increase by 55 seconds (43%) because the dominant traffic flow would be travelling westbound through the Scheme to access the Nissan Plant and IAMP One as part of the shift changeover period. Therefore, the signal timings would reduce the amount of green time allocated to eastbound traffic, which would increase the eastbound journey time.

13.6.82 The section analysis in Appendix 13.3, in Volume 3 this ES, also predicted that there would be a 49 second (306%) increase in journey times for eastbound traffic at Downhill Lane junction (Section 21) during the AM Peak. Although the percentage increase is large, and therefore significant in environmental terms, the actual increase in journey time is small and unlikely to affect experienced drivers / commuters. However, the Scheme layout would increase the likelihood of drivers being stopped at multiple stop lines to allow westbound traffic to clear the junction. Therefore, the change in journey time for Journey 4 was considered to represent a small magnitude of change and an adverse effect of minor significance.

Journey 6

13.6.83 As identified for Journey 4, eastbound traffic would be required to clear more stop lines using the Scheme layout when compared with the do-minimum layout. During the AM Peak, journey times were forecast to increase by 39 seconds (103%) because the dominant traffic flow would be travelling westbound through the Scheme to access the Nissan Plant and IAMP One as part of the shift changeover period. Therefore, the signal timings would reduce the amount of green time allocated to eastbound traffic, which increases the overall journey time.

13.6.84 During the PM Peak, journey times were forecast to increase by 31 seconds (86%). This increase would be associated with high volumes of traffic travelling to/from the Nissan Plant and IAMP One as part of the shift changeover period. As a result, the signal timings would optimise to maximise capacity and throughput for traffic travelling in both directions through the junction. However, as more traffic would be travelling westbound, the signal timings would reduce the amount of green time allocated to eastbound traffic, thereby increasing the overall journey time.

13.6.85 Overall, the predicted increase in actual journey times during both peak periods for Journey 6 would be small. However, the change in journey times would be noticeable to drivers because the Scheme layout would increase the likelihood of drivers being stopped at multiple stop lines within the junction when compared with the do-minimum layout. This would introduce noticeable delays for drivers. Based on the predicted increase in actual journey times for Journey 6 during the AM Peak, this was considered to represent a large magnitude of change and an adverse effect of minor significance. For the PM Peak, the change was considered to represent a medium magnitude of change and an adverse effect of minor significance.

Journeys 5, 8, 10 and 11

13.6.86 Drivers travelling on Journeys 5, 8, 10 and 11 would be anticipated to experience increases in journey time during both 2021 do-something peak hours because Downhill Lane (West) would operate as a left in/left out only link with the A1290; due to new road safety restrictions on the A1290 approach to Downhill Lane junction. During both peak hours, vehicles travelling on these journeys would be required to travel on large diversions to complete their journeys, as described in Paragraph 13.3.27. These diversions would be required due to the central reservation design for the new A1290 connection into Downhill Lane junction. Therefore, the change in journey times during both peak periods for Journeys 5, 8, 10 and 11 were considered to represent a large magnitude of change and an adverse effect of major significance.

13.6.87 As the adverse effects would be of major significance over the whole journey, a review of the section analysis in Appendix 13.3 was undertaken to assess the changes in journey time at A19 Downhill Lane junction. This showed that the increase in journey times through Downhill Lane junction for westbound traffic would be 26 seconds (137%) during the AM Peak; drivers would experience a reduction of one second (-2%) in the PM Peak. Although there would be a large percentage increase in journey time during the AM Peak, the actual increase as a result of the A19 Downhill Lane junction would be small and less noticeable to drivers who are required to travel on long diversions to reach their destinations. Therefore, based on the predicted changes in journey time on Section 21 (Downhill Lane junction) for the AM Peak, this was considered to represent a large magnitude of change and an adverse effect of minor significance. For the PM Peak, this would represent no change.

Journey 12

13.6.88 Drivers travelling on Journey 12 would be anticipated to experience increases in journey time of 2 minutes and 12 seconds (66%) and 2 minutes and 9 seconds (93%) during the AM and PM Peaks respectively. The increase in journey time during both peak hours was associated with the central reservation design for the new A1290 connection into Downhill Lane junction causing Downhill Lane (West) to operate as a left in/left out only link during the 2021 do-something scenario; due to new road safety restrictions on the A1290 approach to Downhill Lane junction. Vehicles would be required to travel via Downhill Lane junction as part of their journey, which would result in delays for motorised users as well as increasing the distance travelled to reach their destination.

13.6.89 During the AM Peak, the change in journey time on Journey 12 would represent a medium magnitude of change and an adverse effect of minor significance. For the PM Peak, the change in journey time would represent a large magnitude of change and an adverse effect of minor significance. The adverse effect was considered to be minor because the diversion would be small and localised.

All other journeys

13.6.90 Other journeys within the study area would not be significantly affected by the changes in journey times associated with the Scheme. As a result, these journey times would remain the same as those experienced in the 2021 do-minimum scenario, which represents no change.

2021 Driver Stress

13.6.91 Table 13-25 summarises the driver stress results for the 12 key journeys during the 2021 do-minimum and 2021 do-something AM and PM peak hours. Full driver stress results are provided in Appendix 13.4.

Table 13-25: Predicted changes in driver stress for the 2021 do-minimum and 2021 do-something

Journey		2021 do-minimum		2021 do-something	
		AM peak	PM peak	AM peak	PM peak
1	On the A19 northbound, starting at the A19 / A1231 Wessington Way junction northbound on-slip and ending at Testo's junction northbound approach.	Moderate	Moderate	Moderate	Moderate
2	On the A19 southbound, starting from the north of Testo's junction and ending where Downhill Lane junction southbound on-slip meets the A19 mainline carriageway.	Moderate	Moderate	Moderate	Moderate
3	On the A19 northbound, starting at the A19 / A1231 Wessington Way junction northbound on-slip and ending at the A1290 / Nissan Plant traffic signal junction.	Moderate	Moderate	Moderate	Moderate
4	On the A1290 eastbound, starting at the A1290 / Nissan Plant traffic signal junction and ending where Downhill Lane junction southbound on-slip meets the A19 mainline carriageway.	Moderate	Moderate	High	High
5	On Washington Road westbound, starting at the Washington Road / Ferryboat Lane junction and ending at the Downhill Lane (West) / Follingsby Lane junction.	Moderate	Moderate	Moderate	Moderate
6	On A1290 eastbound, starting from the A1290 / Washington Road Link Road junction and ending at Downhill Lane (East).	Moderate	Moderate	High	High
7	On the A19 southbound, starting from the north of Testo's junction and ending at the A1290 / Nissan Plant traffic signal junction.	Moderate	Moderate	Moderate	Moderate
8	Starting from Downhill Lane (East) and ending at the Downhill Lane (West) / Follingsby Lane junction.	Moderate	Moderate	Moderate	Moderate
9	On A1290 eastbound, starting at the A1290 / Nissan Plant traffic signal junction and ending at Downhill Lane (East).	High	High	High	High
10	On Washington Road westbound, starting at the Washington Road / Ferryboat Lane junction and ending at the Follingsby Lane/ Wardeley D.P. site access to the east of Follingsby Park.	Low	Low	Moderate	Moderate
11	Starting from Downhill Lane (East) and ending at the Follingsby Lane / Wardeley D.P. site access to the east of Follingsby Park.	Low	Low	Moderate	Moderate
12	Starting from the Downhill Lane (West) / Follingsby Lane junction and ending at the A1290 / Nissan Plant traffic signal junction.	Moderate	Moderate	Moderate	Moderate

13.6.92 Changes in driver stress during the 2021 do-something scenario would affect vehicle travellers on Journeys 4, 6, 10 and 11 when compared with the 2021 do-minimum scenario. A summary of potential significant effects is summarised below.

Journeys 4 and 6

13.6.93 Drivers travelling on Journeys 4 and 6 during both 2021 do-something peak hours would experience an increase in driver stress from moderate to high when compared with the 2021 do-minimum scenario. The increase in driver stress on Journeys 4 and 6 would be associated with the signal optimisation, where green time would be allocated to other approaches with higher flows as traffic travels to the Nissan Plant and IAMP One as part of the shift changeover period. This would increase delays for drivers travelling eastbound and increase the likelihood of drivers being stopped at multiple stop lines within the Scheme, which would likely increase frustration.

13.6.94 The section analysis in Appendix 13.4 shows there would be an increase in driver stress (moderate to high) on section 22 (A1290 / IAMP Development Link Road Junction to Downhill Lane Junction) for traffic travelling towards Downhill Lane junction. The change in driver stress would be associated with the increase in delays at the junction, which reduces the average speed along the link. This link also forms the majority of Journeys 4 and 6, which was taken into account as part of the assessment.

13.6.95 Based on the analysis above, the increase in driver stress on Journeys 4 and 6 during the AM peak would represent a small magnitude of change and an adverse effect of minor significance.

Journeys 10 and 11

13.6.96 Drivers travelling on Journeys 10 and 11 during both 2021 do-something peak hours would experience an increase in driver stress from low to moderate when compared with the 2021 do-minimum scenario. As Downhill Lane (West) would operate as a left in / left out only link during the 2021 do-something scenario, drivers on these journeys were assumed to divert via Testo's junction, the A194 (M) and Follingsby Lane to access the Wardeley D.P. site.

13.6.97 The diversion route would provide drivers with higher quality carriageways and infrastructure (e.g. dual carriageways and grade-separated junctions) than the do-minimum journey. The diversion would also allow drivers to overtake slower moving vehicles. However, the volume of traffic would also increase significantly when compared with the do-minimum journey, which

could increase drivers' fear of accidents. The diversion route may also increase route uncertainty while drivers adapt to the new route, the characteristics of the carriageways and the volume of traffic on them.

13.6.98 Based on the analysis above, the change in driver stress during both peak periods on Journeys 10 and 11 represents a small magnitude of change and an adverse effect of moderate significance.

All other journeys

13.6.99 Other journeys within the study area would not be affected by the predicted increases in traffic associated with the Scheme. As a result, driver stress conditions would be the same as those experienced in the 2021 do-minimum scenario, which represents no change.

2021 Views from the road

13.6.100 The Scheme would be visible from the A19 mainline carriageway (section 20) for drivers travelling in both directions, disrupting intermittent views of arable and pastoral land with a view of the Scheme. Vehicles would be travelling between 55 mph and 70 mph, and the section of the A19 that the views would change for is short in length, resulting in the Scheme being in view for a short period of time. Therefore, the change in the views from the A19 (section 20) would be a small magnitude of change and adverse effect of minor significance.

13.6.101 Travellers' views on the A1290 approach (section 22) would be similar to those experienced in the 2021 do-minimum scenario apart from where the new bridge for the circulatory carriageway and NMU bridge would be installed. However, IAMP One would bound the A1290 on the northern side of the carriageway for a significant length of the approach, which would restrict travellers' views from the A1290. Therefore, the change in views for travellers on section 22 would represent a small magnitude of change and an adverse effect of minor significance.

All other journeys

13.6.102 Other journeys within the study area would not be affected by the change in views from the road. As a result, travellers' views would be similar to those experienced in the 2021 do-minimum scenario, which would represent no change.

2036 Journey Times

13.6.103 Table 13-26 summarises the journey time results for the 12 key journeys during the 2036 do-minimum and 2036 do-something AM and PM peak hours. Full journey time results are provided in Appendix 13.3.

Table 13-26: Predicted changes in journey times for the 2036 do-minimum and 2036 do-something scenarios

Journey		2036 do-minimum		2036 do-something		Change in journey time	
		AM peak	PM peak	AM peak	PM peak	AM peak	PM peak
1	On the A19 northbound, starting at the A19 / A1231 Wessington Way junction northbound on-slip and ending at Testo's junction northbound approach.	04:07	04:08	04:01	04:04	-2%	-2%
2	On the A19 southbound, starting from the north of Testo's junction and ending where Downhill Lane junction southbound on-slip meets the A19 mainline carriageway.	03:05	03:08	03:01	03:03	-2%	-3%
3	On the A19 northbound, starting at the A19 / A1231 Wessington Way junction northbound on-slip and ending at the A1290 / Nissan Plant traffic signal junction.	04:25	04:11	04:02	03:46	-9%	-10%
4	On the A1290 eastbound, starting at the A1290 / Nissan Plant traffic signal junction and ending where Downhill Lane junction southbound on-slip meets the A19 mainline carriageway.	02:26	02:27	03:33	03:01	46%	23%
5	On Washington Road westbound, starting at the Washington Road / Ferryboat Lane junction and ending at the Downhill Lane (West) / Follingsby Lane junction.	-	-	-	-	-	-
6	On A1290 eastbound, starting from the A1290 / Washington Road Link Road junction and ending at Downhill Lane (East).	00:42	00:49	01:18	01:09	86%	41%
7	On the A19 southbound, starting from the north of Testo's junction and ending at the A1290 / Nissan Plant traffic signal junction.	05:13	05:23	05:33	04:52	6%	-10%
8	Starting from Downhill Lane (East) and ending at the Downhill Lane (West) / Follingsby Lane junction.	-	-	-	-	-	-
9	On A1290 eastbound, starting at the A1290 / Nissan Plant traffic signal junction and ending at Downhill Lane (East).	02:27	03:08	03:07	02:42	27%	-14%
10	On Washington Road westbound, starting at the Washington Road / Ferryboat Lane junction and ending at the Follingsby Lane / Wardeley	10:05	10:36	09:53	10:30	-2%	-1%

Journey		2036 do-minimum		2036 do-something		Change in journey time	
		AM peak	PM peak	AM peak	PM peak	AM peak	PM peak
	D.P. site access to the east of Follingsby Park.						
11	Starting from Downhill Lane (East) and ending at the Follingsby Lane / Wardeley D.P. site access to the east of Follingsby Park.	08:25	08:13	09:23	09:26	11%	15%
12	Starting from the Downhill Lane (West) / Follingsby Lane junction and ending at the A1290 / Nissan Plant traffic signal junction.	-	-	-	-	-	-

Note: Journeys 5, 8 and 12 are not assessed in 2036 because Downhill Lane (West) was assumed to be severed by the construction of IAMP Two.

13.6.104 Drivers travelling on Journeys 4 and 6 would be anticipated to experience over 30% increases in journey time during the 2036 do-something scenario. A summary of the potential significant effects is provided below.

Journey 4

13.6.105 During the AM Peak, drivers were predicted to experience a 1 minute and 7 second (46%) increase in journey time when compared with the 2036 do-minimum scenario. This is associated with the Scheme layout, where eastbound traffic would be required to clear more stop lines compared with the do-minimum layout. The dominant traffic flow would be travelling westbound through the Scheme to access the Nissan Plant, IAMP One and IAMP Two prior to the start of the shift changeover period. Therefore, the signal timings would reduce the amount of green time allocated to eastbound traffic, which would increase the likelihood of drivers being stopped on the circulatory carriageway.

13.6.106 Based on the analysis above, the change in journey time on Journey 4 during the AM Peak would represent a small magnitude of change and an adverse effect of minor significance.

Journey 6

13.6.107 Drivers travelling on Journey 6 would be anticipated to experience increases in journey time of 36 seconds (86%) and 20 seconds (41%) during the 2036 do-something AM and PM Peaks respectively.

13.6.108 During the AM Peak, the dominant traffic flow would be travelling westbound through the Scheme to access the Nissan Plant, IAMP One and IAMP Two prior to the start of the shift change. Therefore, the signal timings would reduce the amount of green time allocated to eastbound traffic, which would increase the journey time for eastbound traffic.

13.6.109 During the PM Peak, the volume of traffic travelling eastbound would increase as traffic departs the Nissan Plant, IAMP One and IAMP Two as part of the shift changeover period. There would also be a significant increase in traffic flows travelling westbound to the Nissan Plant, IAMP One and IAMP Two during the same peak hour to start the next shift. Therefore, the signal timings at Downhill Lane junction would optimise to maximise the capacity of both movements; however, delays would occur due to the volume of traffic negotiating the junction during the peak hour.

13.6.110 Although the actual increase in journey time would be small during both peak hours, drivers would be likely to notice the increases in delay due to the Scheme layout and as a result of being stopped at circulatory stop lines as they negotiate the roundabout. For the AM Peak, the change in journey time on Journey 6 represents a large magnitude of change and an adverse effect of minor significance. For the PM Peak, the change in journey time represents a small magnitude of change and an adverse effect of minor significance.

All other journeys

13.6.111 Other journeys within the study area would not be affected substantially by the changes in journey times associated with the Scheme. As a result, these journey times would remain similar to those experienced in the 2036 do-minimum scenario, which represents no change.

2036 Driver stress

13.6.112 Table 13-27 summarises the driver stress results for the 12 key journeys during the 2036 do-minimum and 2036 do-something AM and PM peak hours. Full driver stress results are provided in Appendix 13.4.

Table 13-27: Predicted changes in driver stress for the 2036 do-minimum and 2036 do-something scenarios

Journey		2036 do-minimum		2036 do-something	
		AM peak	PM peak	AM peak	PM peak
1	On the A19 northbound, starting at the A19 / A1231 Wessington Way junction northbound on-slip and ending at Testo's junction northbound approach.	Moderate	Moderate	Moderate	Moderate
2	On the A19 southbound, starting from the north of Testo's junction and ending where Downhill Lane junction southbound on-slip meets the A19 mainline carriageway.	Moderate	High	Moderate	Moderate
3	On the A19 northbound, starting at the A19 / A1231 Wessington Way junction northbound on-slip and ending at the A1290 / Nissan Plant traffic signal junction.	Moderate	Moderate	Moderate	Moderate
4	On the A1290 eastbound, starting at the A1290 / Nissan Plant traffic signal junction and ending where Downhill Lane junction southbound on-slip meets the A19 mainline carriageway.	High	High	High	High
5	On Washington Road westbound, starting at the Washington Road / Ferryboat Lane junction and ending at	-	-	-	-

Journey		2036 do-minimum		2036 do-something	
		AM peak	PM peak	AM peak	PM peak
	the Downhill Lane (West) / Follingsby Lane junction.				
6	On A1290 eastbound, starting from the A1290/ Washington Road Link Road junction and ending at Downhill Lane (East).	High	High	High	High
7	On the A19 southbound, starting from the north of Testo's junction and ending at the A1290 / Nissan Plant traffic signal junction.	High	High	High	Moderate
8	Starting from Downhill Lane (East) and ending at the Downhill Lane (West) / Follingsby Lane junction.	-	-	-	-
9	On A1290 eastbound, starting at the A1290 / Nissan Plant traffic signal junction and ending at Downhill Lane (East).	High	High	High	High
10	On Washington Road westbound, starting at the Washington Road / Ferryboat Lane junction and ending at the Follingsby Lane / Wardeley D.P. site access to the east of Follingsby Park.	Moderate	Moderate	Moderate	Moderate
11	Starting from Downhill Lane (East) and ending at the Follingsby Lane/ Wardeley D.P. site access to the east of Follingsby Park.	Moderate	Moderate	Moderate	Moderate
12	Starting from the Downhill Lane (West) / Follingsby Lane junction and ending at the A1290 / Nissan Plant traffic signal junction.	-	-	-	-

Note: Journeys 5, 8 and 12 are not assessed in 2036 because Downhill Lane (West) was assumed to be severed by the construction of IAMP Two.

13.6.113 Changes in driver stress during the 2036 do-something scenario would affect vehicle travellers on Journeys 2 and 7 during the PM peak when compared with the 2036 do-minimum scenario. A summary of potential significant effects is summarised below.

Journey 2

13.6.114 Drivers travelling on Journey 2 during the PM peak would be likely to experience a decrease in driver stress when compared with the 2036 do-minimum scenario. Fewer vehicles would travel on the A19 mainline carriageway because a new link road would be constructed between Testo's junction and Downhill Lane junction as part of the Scheme. This link road would be used by traffic bound for Nissan, IAMP One and IAMP Two, which would remove a significant proportion of vehicles from the mainline carriageway during the PM peak hour. Therefore, the reduction in driver stress on Journey 2 represents a small magnitude of change and a beneficial effect of minor significance.

Journey 7

13.6.115 Drivers travelling on Journey 7 during the PM peak would be likely to experience a decrease in driver stress when compared with the 2036 do-minimum scenario. A new link road would have been constructed between Testo's junction and Downhill Lane junction, which would separate traffic bound for Nissan, IAMP One and IAMP Two from the A19 mainline carriageway. The Scheme would be designed to modern standards, which would reduce drivers fear of accidents. The traffic signals at Downhill Lane junction would also optimise in favour of the dominant traffic flow travelling southbound on the A19; therefore, drivers would not experience significant delays, which would reduce frustration.

13.6.116 Based on the analysis above, the reduction in driver stress on Journey 7 represents a small magnitude of change and a beneficial effect of minor significance.

All other journeys

13.6.117 Other journeys within the study area would not be affected by the predicted increases in traffic associated with the Scheme. As a result, driver stress conditions would be the same as those experienced in the 2036 do-minimum scenario, which represents no change.

2036 Views from the road

13.6.118 Travellers' views on the A1290 approach (section 22) would be similar to those experienced in the 2036 do-minimum scenario apart from where the new bridge for the circulatory carriageway and NMU bridge would be installed. However, IAMP One and IAMP Two would bound the A1290 on both sides of the carriageway for a significant length of the approach, which would restrict travellers' views from the A1290. Therefore, the change in views for travellers would be neutral, as they would not notice significant changes in the landscape. Therefore, this would represent no change.

Economy and employment

13.6.119 Other journeys within the study area would not be affected by the change in views from the road. As a result, travellers' views would be similar to those experienced in the 2036 do-minimum, which would represent no change.

Economy

13.6.120 The wider benefits of the Scheme justifying its construction were not assessed in depth within the EIA, but would include benefits of increased access to labour markets and supply chains for local businesses, plus increased access to employment and retail for local residents. These would be expected to be beneficial contributions to the local region during the operation of the Scheme. Wider economic benefits of the Scheme are assessed within the Transport Assessment Report.

13.6.121 These economic benefits would be especially pertinent for the deprived areas of the local study area, such as at the south end of the Scheme, as well as the local region in general.

Employment

13.6.122 The wider benefits of the Scheme would include benefits of increased access to employment for local residents, and access to a wider labour market for local businesses. These effects would be expected to benefit the local region.

13.7 Design, mitigation and enhancement measures

Mitigation for construction impacts

Land use

Community Land and Facilities

13.7.1 The nearest community land to the Scheme would be unaffected by the construction of the Scheme, therefore no mitigation was proposed.

13.7.2 A Traffic Management Plan (TMP) would be implemented for the Scheme, which would help minimise any disruption from any necessary diversions and temporary road closures.

Development land

13.7.3 It was not anticipated that the Scheme would impact on any development land during construction. While IAMP Two is planned to be constructed after completion of the Scheme, the design team have worked closely with the IAMP developers to design the Scheme, while taking into account the IAMP proposals. This is already embedded into the Scheme, so no further mitigation was proposed.

Agricultural land and businesses

13.7.4 The permanent loss of 5.83 ha of Grade 3b agricultural land[129] would be unavoidable and would be subject to compulsory acquisition procedures under the Development Consent Order, therefore no additional mitigation was proposed.

13.7.5 A plan for sustainable use of soil resources where possible within the Scheme (a 'Soil Management Plan') would be devised. This would include the restoration to agricultural use of approximately 12.45 ha of temporarily used agricultural land, where possible, and the sustainable use of any surplus topsoil produced by the construction process.

13.7.6 Access to farmed land during the works would be maintained wherever possible to enable continued farming on all the holdings affected by construction. Disruption to farms would be minimised through measures which would be adopted in the contractor's CEMP (see Chapter 11 (Materials)), such as measures to reduce dust and construction site runoff and temporary access arrangements.

Physical assets

13.7.7 The effects of construction on businesses in the vicinity, for example the Nissan Plant, Three Horseshoes Public House and at Boldon Business Park, would be minimised or avoided through measures in a traffic management plan (TMP). These could include restrictions on the routes of construction traffic and careful timing / design of diversions and/or temporary road closures.

13.7.8 Access to Make-Me-Rich Farmhouse would be maintained throughout the construction period through construction of an access road, which would make for a new means of permanent access. This access is embedded in the design of the Scheme and no further mitigation was proposed, above that controlled by the TMP.

Non-motorised users (NMUs)

13.7.9 During the construction phase dust would likely be generated which could have a negative effect on NMUs. These effects would be minimised or avoided through measures in the CEMP; these measures are detailed in Chapter 6 (Air Quality).

Community severance

13.7.10 The implementation of a TMP would control diversions and help minimise disruption during the construction period.

Community amenity

13.7.11 The CEMP would address environmental effects, including on air quality and noise; this would provide mitigation for the reduction in amenity levels caused by works during the construction phase.

Public transport users

13.7.12 Temporary relocation of the northbound bus stop for route 50/56 would be required during construction. The new location of the bus stop would be agreed with the relevant stakeholders to minimise disruption to public transport users.

13.7.13 The TMP would provide measures for traffic management to minimise any negative effects resulting from road diversions during construction.

Vehicle travellers

13.7.14 During the construction phase, there would be a significant increase in traffic on routes within the study area, which would negatively affect driver stress. Therefore, the following traffic and transport mitigation measures could be implemented to form the basis of a construction TMP:

- designated construction access route to/from the Scheme for all construction traffic and deliveries;
- Heavy Goods Vehicle delivery window; and
- use of internal haul roads to minimise the number of trips associated with transporting plant across the site.

Economy and employment

13.7.15 Effects on the wider region from the construction of the Scheme in terms of the economy and employment would be expected to be positive in terms of job creation and expenditure; so no mitigation is required. No specific measures to enhance these benefits have been identified at this time.

[129] Grade 3b agricultural land is considered by the Department for Environment, Food and Rural Affairs system of Agricultural Land Classification as being of moderate versatility and quality.

Mitigation for operational impacts

Land use

Community land and facilities

13.7.16 There would be no significant adverse effect on any community land or facilities as a result of the operation of the Scheme, so no mitigation would be required.

Development land

13.7.17 There would be no significant adverse effect on any development land as a result of the operation of the Scheme; the design team have worked closely with the IAMP developers to design the Scheme taking into account the IAMP proposals. This is already embedded into the Scheme; therefore, no further mitigation was proposed.

Agricultural land and businesses

13.7.18 Agricultural land quality and farm systems in the study area depend upon effective land drainage in winter for sustainable farming operations. The detailed design of the Scheme would take this into account in order to minimise the impact on agriculture through provision of outfalls for land drainage systems. Further work would be undertaken to design and install new land drains on retained or reinstated farmland by agreement as accommodation works.

13.7.19 The agricultural land areas, totalling 12.45 ha, affected by temporary uses including the main site compound would be out of production during all or part of the construction period, but would be returned to agriculture on completion. To help reinstate these areas back to agriculture, a Soil Management Plan would be prepared and followed.

13.7.20 Suitable replacement access points would be required to severed fields and areas where existing access is lost to enable continued operation of farm units. Without this mitigation two farm units would experience a greater land loss than discussed above and subsequently a greater adverse impact than detailed in the section below.

13.7.21 A private means of access track would be provided to maintain access to the severed northern and southern fields of Wheathill Farm, east of the A1290 as part of the Scheme design.

13.7.22 An access gateway would be created from the northern attenuation pond site for the otherwise severed grassland to the west and new field gateways would be provided on Downhill Lane (East and West) as part of the Scheme design.

13.7.23 The Scheme design would include suitable discharge points for agricultural land drainage systems severed by the new works. This is particularly required for all land on the west side of the A19 between Downhill Lane junction in the north and for the southern attenuation pond.

13.7.24 A new access road would be constructed for Make-Me-Rich farmhouse connecting to Downhill Lane (West) as part of the Scheme design.

Physical assets

13.7.25 Mitigation options for air quality, landscape and noise and vibration impacts are outlined in Chapters 6, 8 and 12 respectively.

Non-motorised users (NMUs)

13.7.26 Throughout the Scheme design, consideration has been given to the NMU strategy through close iterative engagement between the EIA team and the highway designers, and mitigation has already been incorporated as part of the design. Feedback from consultation with the local authorities and user groups was also fed into the design. All new or altered facilities have been designed with reference to relevant Highways England guidance and the Disability Discrimination Act.

13.7.27 See Section 2.10, in Chapter 2 of this ES, for a description of mitigation measures through design related to NMU provision.

13.7.28 With the mitigation measures and enhancements already included in the design, no further mitigation measures were identified.

Community severance

13.7.29 There would be no significant adverse effects on severance, therefore no further mitigation was proposed.

Community amenity

13.7.30 The Scheme is anticipated to have a beneficial effect on community amenity during operation; therefore, no mitigation was proposed.

Public transport users

13.7.31 The northbound bus stop for the 50/56 bus route on the A1290 may require permanent relocation due to the proximity with the revised Downhill Lane (West)/ A1290 junction. If relocation required, the revised location of this bus stop would be identified in discussion with relevant stakeholders. No further mitigation is proposed.

Vehicle travellers

13.7.32 As part of the Scheme, road signs and traffic signals would be used to explain route changes and to direct drivers, with the aim of reducing route uncertainty, delays and driver stress for those drivers using the new road layout. The improved section of the A19 would also be designed to a higher highway standard than the existing road, which would help reduce route uncertainty, fear of accidents and driver stress.

Economy and employment

13.7.33 Effects on the wider region from the operation of the Scheme would be expected to be positive and do not require mitigation.

Maintenance

13.7.34 It is currently assumed that rights of way outside of the highway boundary would become the responsibility of the local authority. Rights of way within the boundary of the Highways Estate, including the new NMU route from Downhill Lane (East) and the NMU footbridge across the A19 and the NMU route connecting to a new A1290 Pelican crossing would be the responsibility of Highways England.

13.8 Assessment of effects

Land use

Community land and facilities

13.8.1 Community land and facilities affected by the Scheme are assessed in Table 13-28 below. There are only two areas of open space land in proximity to the Scheme (public open space adjacent to the River Don 1 km north-west and playing fields between the A1290 and A19), but both are unaffected by the construction or operation of the Scheme.

Table 13-28: Community land and facilities

Receptor	Description	Impact	Mitigation	Description of residual impact
Community facilities within Town End Farm	There are a variety of community facilities within Town End Farm.	Potential impact if facilities are used by residential properties outside of Town End Farm during construction (e.g. Make-Me-Rich Farm or The Chalet and Usworth Cottages). During operation the Scheme should provide connectivity benefits.	Implementation of a suitable TMP	Construction: Slight adverse - Not significant Operation: Beneficial - Not significant
Community facilities within Hylton Castle	There are a variety of community facilities within Hylton Castle.	Potential impact if facilities are used by residential properties outside of Hylton Castle during construction (e.g. Make-Me-Rich Farm or The Chalet and Usworth Cottages). During operation the Scheme should provide connectivity benefits.	Implementation of a suitable TMP	Construction: Slight adverse - Not significant Operation: Beneficial – Not significant
Community facilities at Boldon Colliery	Large supermarket and cinema located at Boldon Business Park.	Potential impact during construction. During operation the Scheme should provide connectivity benefits	Implementation of a suitable TMP	Construction: Adverse - Not significant Operation: Beneficial – Not significant
North East Land, Sea and Air Museums	A volunteer aviation museum, located between the A1290 and the A19, to the north of Washington Road. It occupies an area approx. 1.4 hectares.	Some disruption during construction as a result of diversions and roads closures. During operation the Scheme should provide connectivity benefits	Implementation of a suitable TMP	Construction: Adverse - Not significant Operation: Beneficial – Not significant
Gateshead Skills Academy	A department of Gateshead college for sustainable manufacturing and innovation. Located to the east of the A1290 approx. 150 m south of the Scheme.	Some disruption during construction as a result of diversions and roads closures. During operation the Scheme should provide connectivity benefits	Implementation of a suitable TMP	Construction: Adverse - Not Significant Operation: Beneficial – Not significant
Air Training Corps	Located adjacent to the Aircraft Museum approximately 160 m east of the A1290.	Some disruption during construction as a result of diversions and roads closures. During operation the Scheme should provide connectivity benefits	Implementation of a suitable TMP	Construction: Adverse - Not significant Operation: Beneficial – Not significant

Development land

13.8.2 The closest development land to the Scheme is the IAMP development. The Scheme has been designed in consultation with the IAMP developers to be complementary to the proposals as far as practicable.

Agricultural land and businesses

13.8.3 Eight individual agricultural receptors have been considered within this report and impacts have been identified for all these receptors: three farm businesses and five other agricultural land holdings (see Table 13-29 below).

13.8.4 The effects may be long-term, such as permanent loss of land, or short-term such as temporary uses of land or disruption to access during the construction period.

13.8.5 Mitigation measures would be provided by the Scheme for the farm business receptors where appropriate and feasible. These include design measures to reduce impact, construction management measures designed to minimise disruption to farm businesses, and the provision of new accesses to replace those that would be lost. However, these mitigation measures do not reduce the land-take area.

13.8.6 The restoration of temporarily disturbed land used during the construction phase, such as land used for the main site compound, would result in a reduction in the overall permanent impact.

13.8.7 The identification and assessment of impacts, taking account of mitigation where appropriate, is summarised in Table 13-29 below.

Table 13-29: Agricultural receptors

Receptor	Description	Impact	Principal Mitigation Measures	Description of residual impact
Wheathill Farm, Whitburn	Farm business	Temporary land take (4.23 ha) during construction. Permanent land take (3.36 ha), loss of access off A1290 and severance of land drainage systems.	New access arrangement off A1290 including track for northern field; new land drainage arrangements; and reinstatement of temporarily disturbed land.	Construction: Adverse – Not significant Operation: Adverse – Not significant
West Fellgate Farm, Wardley	Farm business	Temporary land take (2.80 ha) during construction. No permanent land take.	Reinstatement of temporarily disturbed land.	Construction: Adverse – Not significant Operation: Neutral
Mount Pleasant Farm, West Boldon	Farm business	Temporary land take (3.77 ha) during construction. Permanent land take (2.12 ha) and severance of land drainage systems.	New access gateway off Downhill Lane (East); new land drainage arrangements; and reinstatement of temporarily disturbed land.	Construction: Adverse – Not significant Operation: Adverse – Not significant
Land at Downhill Lane Junction (1)	Land holding	No land take but loss of access from Downhill Lane (East).	New access arrangement via north attenuation pond site.	Construction: Adverse – Not significant Operation: Neutral
Land at Downhill Lane Junction (2)	Land holding	Temporary land take (1.06 ha) during construction. No permanent land take.	Reinstatement of temporarily disturbed land.	Construction: Adverse – Not significant Operation: Neutral
Land at Downhill	Land holding	Temporary land take (0.41 ha) during construction.	Reinstatement of temporarily disturbed land.	Construction: Adverse – Not significant
Lane Junction (3)		Permanent land take (0.32 ha).		Operation: Adverse – not significant
Land at Downhill Lane Junction (4)	Land holding	Temporary land take (0.17 ha) during construction. Permanent land take (0.03 ha).	Reinstatement of temporarily disturbed land.	Construction: Adverse – Not significant Operation: Neutral
Land east of A1290	Land holding	Temporary land take (0.01 ha) during construction	Reinstatement of temporarily disturbed land.	Construction: Adverse – Not significant Operation - Neutral

Physical assets

Private property

Residential

13.8.8 There is one residential dwelling located on a farmstead near to the Scheme. The effects on this property are assessed in Table 13-30 below.

Table 13-30: Residential dwellings

Receptor	Description	Impact	Mitigation	Description of residual effect
Make-Me-Rich Farm	The house lies on a smallholding located to the north-west of the Scheme.	Changes in access to the farmstead	New access road included as part of the design (embedded mitigation)	Construction: Minor adverse Operation: Neutral

Commercial

13.8.9 Two commercial properties are located in the study area for the Scheme, namely the Three Horseshoes pub and IAMP One. Table 13-31 provides more detail on the potential impacts on commercial receptors.

Table 13-31: Commercial receptors

Receptor	Description	Impact	Mitigation	Description of residual impact
IAMP One	Located to the south-west of the Scheme and home to office buildings	Some disruption during construction as a result of diversions and roads closures. Improved access during operation.	No additional mitigation beyond the use of a TMP	Construction: Adverse - Not Significant Operation: Beneficial – Not significant
Three Horseshoes pub	Located to the south of the Scheme and host for community functions.	Some disruption during construction as a result of road closures and diversions. No impact during operation.	No additional mitigation beyond the use of a TMP	Construction: Adverse - Not Significant Operation: Neutral

Industrial

13.8.10 The main industrial property in the area is the Nissan Plant to the south of Downhill Lane junction. This is a major employer in the area and contributes to traffic and NMU user movements. Effects on these receptors are considered in Table 13-32.

Table 13-32: Industrial receptors

Receptor	Description	Impact	Mitigation	Description of residual impact
Nissan Plant	Car manufacturing plant	Some disruption during construction due to diversions and road closures and disruption to NMU facilities.	None additional beyond the use of a TMP	Construction: Adverse - Not significant Operation: Beneficial – Not significant

Non-motorised users

13.8.11 During the construction phase there would be some disruption and amenity effects on users of existing NMUs and it was anticipated that the effects during construction would be significant as a result of the importance of this junction and surrounding roads, footpaths and cycleways as a commuter route to the Nissan Plant. These effects would be temporary in nature.

13.8.12 A number of enhancements to the NMU network have been incorporated into the design for the junction improvements. These include the creation of two new at grade signalised crossings (at Downhill Lane (East) and across the A1290) and a new NMU bridge across the A19.

13.8.13 Overall, NMUs would experience a long-term beneficial effect as a result of improved connectivity (particularly with Bridleway B46), improved safety and improved amenity. The effects on individual routes are presented in Table 13-33 below.

Table 13-33: Non-motorised users

Receptor	Impact	Mitigation	Description of residual impact
Bridleway B46	Disruption and diversions, as appropriate, with increased journey times, for NMUs during construction (incl. commuting Nissan Plant workers), additional to Testo's works on Bridleway B46 to the north. New Pegasus crossing at Downhill Lane (East), improving safety. Improved linkages for users travelling south towards the Nissan Plant through link up with the new NMU route alongside Washington Road and the new NMU bridge leading to the A1290. Provides a greater degree of separation between road users and NMUs.	Maintain NMU access through DCO boundary area during construction.	Construction: Adverse - Significant Operation: Beneficial - Significant
Washington Road (and cycleway)	Stopping up and diversion of current walkways, as appropriate, with increased journey times, along Washington Road from Downhill Lane (East) to allow for construction of the realigned road.	Maintain NMU access during construction.	Construction: Adverse - Significant Operation: Neutral
East-west travel along the A1290 through Downhill Lane	Temporary road side footpath closures with appropriate diversion provisions provided, as appropriate, potentially disrupting / increasing NMU journey times.	Maintain NMU access during construction.	Construction: Adverse - Significant Operation: Beneficial - Significant
A1290 / Follingsby Lane / Downhill Lane (West)	At grade Pegasus crossing facility, to access the new IAMP One NMU route along the old Follingsby Lane providing greater segregation between vehicles and NMUs.	Maintain NMU access during construction.	Construction: Adverse - Not significant Operation; Beneficial - Significant

Receptor	Impact	Mitigation	Description of residual impact
New NMU route alongside Washington Road & A19 NMU bridge and to the A1290 / IAMP One NMU route	New shared (cycleway, footway and bridleway) running from Downhill Lane (East) alongside Washington Road heading south, crossing the A19 to the A1290 providing complete segregation of NMUs and vehicles and improved safety.	Maintain NMU access during construction.	Construction: n/a Operation: Beneficial - Significant

Community severance

13.8.14 There would be some effects from severance for users accessing community facilities within Town End Farm and also for the communities of Town End Farm and Hylton Castle to access wider community facilities located at Boldon Colliery. During construction these would be expected to be adverse, but not significant. No residual effects from severance during operation of the Scheme were anticipated.

Community amenity

13.8.15 During construction there would be some temporary loss of amenity for vehicle users and NMUs as a result of the construction works. Suitable traffic management and mitigation proposed for air quality, noise and visual receptors would help mitigate the effects, but the residual effects during construction would be significant adverse. During operation there would be amenity benefits provided by the new NMU route offering greater safety and reduction in the fear of accidents for commuters. The residual effect during operation would be significant beneficial.

Public transport users

Public transport

13.8.16 Public transport routes directly impacted by the Scheme during construction are shown in the two tables below.

Table 13-34: Public transport - Construction

Transit Route	Impact	Mitigation	Description of residual effect
Bus route 50 between Durham and South Shields	Temporary delays at Downhill Lane junction due to construction. Relocation of northbound bus stop on A1290.	Traffic Management	Adverse – Not significant
Bus route 56 between Sunderland and Newcastle	Temporary delays at Downhill Lane junction due to construction. Relocation of northbound bus stop on A1290.	Traffic Management	Adverse – Not significant

Table 13-35: Public transport - Operation

Transit Route	Impact	Description of residual effect
Bus routes 50 and 56	*Effect on journey length for key bus routes 50/56 included in Vehicle Travellers assessment for Journeys 4 and 6.*	
Bus routes 50 and 56	Potential permanent relocation of bus stop (northbound).	Adverse – Not significant
Bus routes X9/X10; 50A & 29/X36	Slight improvement in journey times.	Slight beneficial to Not significant

Vehicle travellers

Construction

13.8.17 The implementation of a construction TMP, which would include the management of construction traffic during peak hours, would help to reduce journey times and driver stress on key journeys. This was not considered to reduce the minor adverse environmental effects identified during construction, but would assist with the operation of the junction while traffic management is present. Therefore, the residual effect remains as a large magnitude of change with an adverse effect of minor significance.

13.8.18 For views from the road, the minor adverse environmental effects would be temporary during the construction period and therefore no additional mitigation was proposed.

Operation

13.8.19 During operation, new warning and directional signage on the approach to the Scheme would help reduce route uncertainty. The Scheme would also be constructed to modern standards, with improved geometric alignment and visibility. However, this was not anticipated to significantly affect driver stress. Therefore, the significant effects identified in Section 13.6 of this chapter would be the residual effects.

13.8.20 For journey times, Microprocessor Optimised Vehicle Actuation method of control would optimise cycle times and the amount of green time allocated to each approach every cycle. This could improve the operation of the junction and reduce delays, especially during peak hours; however, it is unlikely that the signal re-optimisation would have a significant effect on forecast journey times. Therefore, the significant effects reported in Section 13.6 of this chapter would be the residual effects. Although the effects reported in the Operation section would be adverse, it should be noted that there are certain journeys for which there are beneficial effects.

13.8.21 For views from the road, there would be no additional mitigation for the minor adverse environmental effect for travellers on the A19 mainline carriageway. Therefore, the residual effect would be minor adverse.

Economy and employment

13.8.22 The effects on the economy are summarised in Table 13-36. The operational economic effects are included with the Transport Assessment Report, so have not been included within the ES.

Table 13-36: Economy and employment assessment

Receptor	Impact	Mitigation	Description of residual impact
Economy in the local area (South Tyneside, Gateshead, Sunderland)	Total economic stimulation of between £14.7 million and £25.7 million.	N/A	Construction: Beneficial
Employment in the local area	109 net total jobs captured locally.	N/A	Construction: Beneficial

13.8.23 The wider benefits of the Scheme would include benefits of increased access to labour markets and supply chains for local businesses, and increased access to employment and retail for local residents. These would be expected to be beneficial contributions to the local region during the operation of the Scheme.

13.8.24 These economic benefits would be especially pertinent for the deprived areas of the local study area such as at the north and south ends of the Scheme, as well as the local region in general.

Inter-relationship effects between topics

13.8.25 Inter-relationship effects with other topics have been considered in light of these individual effects, particularly the inter-relationship with effects in: Chapter 6 (Air Quality); Chapter 8 (Landscape and Visual Effects); and Chapter 12 (Noise and Vibration). These have already been considered within the assessment of effects on community amenity, and there would be no additional inter-relationship impacts.

Shared use of the A19 Testo's scheme main site compound

13.8.26 As discussed in Section 1.5, in Chapter 1 of this ES, there is the potential that the Scheme could share use of the temporary main site compound for the Testo's scheme for the purpose of general storage, traffic management and office-based administrative purposes. If this was undertaken from the commencement of construction of the Scheme, the area of land take required for the Downhill Lane main site compound could be reduced. There would also be a period where both the Testo's and Downhill Lane junction schemes are being constructed at the same time, followed by a period where only the Scheme is under construction but still using the Testo's scheme main site compound.

13.8.27 Use by the Downhill Lane Scheme would not change the footprint of the Testo's main site compound, but there would be a slight increase in vehicle movements in and out the Testo's Scheme main site compound onto the A184, which has a cycleway. However, the majority of these vehicles would be staff cars as many HDVs movements for the Scheme would be associated with other temporary land (i.e. not associated with the Testo's Scheme) used for the storage of plant and materials to construct the Scheme.

13.8.28 Though the extended use of the Testo's scheme main site compound would mean users of the A184 and its cycleway would be exposed to vehicles moving in and out of the compound for a longer period of, the effects would not be significant due to continued application of traffic management controls and the reduction of construction activity in the Testo's compound to mainly low risk general storage, traffic management and office-based administrative purposes.

13.8.29 The reduction in the temporary land take required by the Downhill Lane Scheme main site compound would slightly reduce vehicle movements between Downhill Lane (East) and the Scheme compound, but the scale would not create a significant change.

13.8.30 Therefore, there would be no significant change in the effects on NMUs, vehicle travellers and local communities outlined in Chapter 12 of both the Scheme and Testo's scheme ESs as a result of the shared and extended use of the Testo's scheme main site compound.

Cumulative effects

13.8.31 As explained in Section 5.4, in Chapter 5 of this ES, the journey times and driver stress operational assessments within this chapter use the 2021 and 2036 Do Minimum and Do Something traffic models where the future baseline includes the road network and traffic flow changes associated with other developments. Thus, the operational journey times and driver stress assessments of the Scheme include the cumulative effects with other developments, including IAMP One, IAMP Two and the Testo's scheme.

13.8.32 For the other assessments within this chapter, the operation of IAMP One and construction and operation of the Testo's scheme form part of the baseline, but the assessment of cumulative effects of the Scheme with other developments (incl. IAMP Two) are assessed within Chapter 15 (Cumulative Effects) of this ES.

CHAPTER 14 ROAD DRAINAGE AND WATER ENVIRONMENT

Executive summary

This chapter describes the potential effects of the Scheme on the water environment and covers the following main themes: water quality, flood risk and fluvial geomorphology[130]. Water quality addresses the potential risks to the chemical and biological quality of surface waters from construction works and from routine run-off or accidental spillage during operation of the road. Flood risk covers the potential risk from the road itself becoming flooded or the Scheme increasing flood risk elsewhere. The geomorphological assessment links the effects of the Scheme to wider environmental concerns and compliance with the European Water Framework Directive. All three themes are supported by detailed appendices (see Appendices 14.1 - 14.3).

The northern, eastern and central section of the Scheme's carriageway and roundabout would discharge into the River Don to the north-east of Downhill Lane junction. The two outfalls would be located within 100 m upstream of a section of Make-Me-Rich Meadow LWS. Treatment and protection, prior to discharge to the River Don and associated designated sites, are embedded in the Scheme design in the form of attenuation ponds. One of the ponds will provide attenuation for catchment areas from both (Downhill Lane and Testo's) junctions and will be constructed as part of the Testo's Junction Improvement Scheme.

The run-off from the central-western section of the Scheme would partly drain indirectly into the River Don via the existing over the edge arrangement. There is no formal drainage proposed for this runoff from this catchment area as the existing arrangement functions will be able to accommodate the increased impermeable area and this drainage system is commonplace on rural roads. The remaining runoff would drain into the River Wear via the existing piped drainage system, with approximately 75% of this runoff passing through a ditch and attenuation pond.

Run-off from the southern section of the Scheme would drain into a new attenuation pond south-east of Downhill Lane junction. The runoff would discharge at a controlled rate via the existing highway drainage system into the River Wear.

A new NMU route is proposed as part of the Scheme. The route would pass from the north-east section of the Scheme across Downhill Lane (East), south between Washington Road and the A19 Northbound diverge and then west towards the A1290 and Follingsby Lane via a new NMU bridge over the A19. The routine run-off from the NMU route would be managed using an appropriate Sustainable Drainage System (SuDS) technique. The preferred method would be determined through design development.

This assessment concluded that there would be no residual effects to water quality, with potential for moderate beneficial effects during operation. There would be no residual flood risk during the Scheme's construction or operation and in a worst-case scenario there may be a slight adverse residual effect on fluvial geomorphology during construction and operation. The Scheme was also found to be compliant under the Water Framework Directive.

14.1 Introduction

14.1.1 This chapter addresses the potential effects of the construction and operation of the Scheme on water quality, flood risk and fluvial geomorphology. Attributes of the water environment (such as individual watercourses or floodplains) have been identified, and the effects on each of their features (such as water quality, the conveyance of flows, or flood storage) have been assessed.

14.1.2 During construction, the principal risks to the water environment relate to suspended solids in run-off from the site and accidental spillage of fuel, oil or other chemicals used on site. Construction work can also create new pathways by which pollution can reach the water environment. There may also be physical modifications to watercourses where outfalls are constructed.

14.1.3 Water pollution from road drainage generally derives from contaminants left on the road surface during its use, which are then washed from the road surface by rainwater. The main sources of contaminants in routine run-off are the deposition of contaminants from incomplete fuel combustion, small oil or fuel leaks, as well as general vehicle, tyre and road degradation. Spillages may also occur as a result of road traffic accidents and these will normally consist of oil, fuel and other pollutants.

14.1.4 Flood risk can be affected by increased areas of impermeable surfaces, construction within a floodplain, or by creating obstructions to existing flow patterns. Those existing flow patterns can include land drainage networks such as field drains and culverts.

14.2 Legislative and policy framework

National legislation

14.2.1 UK legislation for the protection of the water environment has developed over several decades, leading to a complex collection of Acts and Regulations. Key Directives, Acts, and Regulations are listed below:

- European Water Framework Directive 2000/60/EC;
- European Freshwater Fish Directive 78/659/EEC;
- Water Act 2003;
- Environmental Protection Act 1990;
- The Groundwater Regulations 2009;
- Water Environment (Water Framework Directive) (England and Wales) Regulations 2017;
- Control of Pollution (Oil Storage) Regulations 2001;
- Surface Water (Dangerous Substances) (Classification) Regulations 1989 (amended 1992, 1997 and 1998); and
- Environmental Permitting (England and Wales) Regulations 2010, as amended in 2016.

National Policy

14.2.2 National policy relevant to the scope of potential effects on Road Drainage and the Water Environment is outlined in Table 14-1.

[130] i.e. the study of the form and function of streams and their interaction with the landscape around them. 'Fluvial' refers to the processes associated with running water, 'geo' refers to the earth and 'morphology' in this case refers to channel shape.

Table 14-1: Relevant National Policies

National Policy	Relevant Paragraph	How the policy has been addressed
National Networks National Policy Statement (NNNPS) (2014)	Road drainage and the water environment is not covered as a specific generic impact in the NNNPS. Road drainage and the water environment is referred to in the following sections of the NNNPS: • Pollution control and other environmental protection regimes: **paragraphs 4.48 to 4.56**; • Flood risk: **paragraphs 5.90 to 5.115**; and • Water quality and resource: **paragraphs 5.219 to 5.231**.	The NNNPS sets out the Government's vision and policy against which the Secretary of State will make decisions on applications for development consent for nationally significant infrastructure projects on the strategic road and rail networks. A Flood Risk Assessment is provided in Appendix 14.2, in Volume 3 of this ES. A full review of the Scheme against the NNNPS is set out in Appendix A of the Planning Statement (DCO application reference TR010024/APP/7.1).
National Planning Policy Framework (NPPF) (July 2018)	Section 14 covers "*Meeting the challenge of climate change, flooding and coastal change*". Paragraph 148 states *"the planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk…*". **Paragraph 150** asserts that *"new development should be planned for in ways that… avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure".* **Paragraph 155** states that *"inappropriate development in areas at risk of flooding, should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere".* **Paragraph 163** asserts that *"when determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood risk assessment. Development should only be allowed in areas at risk of flooding where, in light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:* • *within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location;* • *development is appropriately flood resilient and resistant;* • *it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;* • *any residual risk can be safely managed; and* • *safe access and escape routes are included where appropriate, as part of an agreed emergency plan".* **Paragraph 170** states that "*planning policies and decisions should contribute to and enhance the natural and local environment by… preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of… water… pollution…Development should, wherever possible, help to improve local environment conditions such as…water quality, taking into account relevant information such as river basin management plans*".	Section 6 'Climate Change' of the Flood Risk Assessment, in Appendix 14.2 in Volume 3 of this ES, notes that any proposed mitigation measures would need to make an allowance for climate change. Section 3 'Planning Policy Review' of the Flood Risk Assessment, in Appendix 14.2 in Volume 3 of this ES, notes that the Scheme avoids inappropriate development in areas of flood risk and it shows that the Sequential Test is met. The Exception Test is not required. Latest Government guidance on climate change, published in 2016, has been incorporated into the design and considered accordingly in the assessment.

National Policy	Relevant Paragraph	How the policy has been addressed
Planning Practice Guidance (PPG)	Planning Practice Guidance relating to NPPF policies of relevance are included under Flood Risk and Coastal change **paragraphs 001-003, 006, 009-069.**	As above.

Local Planning Policy

14.2.3 Local planning policy relevant to the scope of potential effects on road drainage and the water environment is outlined in Tables 14-2 and 14-3.

Table 14-2: Relevant Policies within the South Tyneside statutory Development Plan

South Tyneside Local Development Framework	Relevant Policy	How the policy has been addressed
Core Strategy (June 2007)	**Policy ST2 Sustainable Urban Living** "*High quality in sustainable urban living will be promoted by ensuring that:* **D)** *use is made of 'sustainable urban drainage systems' and water conservation features including 'grey water recycling' and other technologies wherever possible*". EA5 Environmental Protection "*To complement the regeneration of the Borough, the Council will control new development so that it:* ……. *does not permit unsustainable schemes to be located in those areas of the coast, Tyne corridor and Don Valley where flood risk is unacceptably high*".	The proposed drainage design includes sustainable urban drainage systems. The Scheme would not be located in an area where flood risk is unacceptable high. The Flood Risk Assessment (Appendix 14.2 of this ES) indicates that there is a moderate risk from surface water and mitigation is embedded in the design (Table 4.1 of Appendix 14.2 of this ES).
Development Management Policies (December 2011)	**Policy DM1 Management of Development** *"In determining all applications under the planning Acts we will ensure that, where relevant:* ……	A Flood Risk Assessment (Appendix 14.2 of this ES) has been completed for the Scheme. The Flood Risk Assessment has considered the risk from all sources of flooding to and from the Scheme.
Site-Specific Allocations and Proposals Map (April 2012)	No relevant policies.	N/A

Table 14-3 Relevant Policies within the Sunderland statutory Development Plan

Sunderland City Council	Relevant Policy	How the policy has been addressed
City of Sunderland Unitary Development Plan: Saved Policies (March 2007)	**Policy EN11 Flooding** "*All proposals for new development (including changes of use) will be judged in accordance with the policies and proposals of this plan. Where the plan does not indicate any proposals for change, the existing pattern of land use is intended to remain; proposals for development in such areas will need to be compatible with the principal use of the neighbourhood*". **Policy EN12 Impact of Development** "*In assessing proposals for development (including changes of use), the council, in conjunction with the environment agency*	The Flood Risk Assessment (Appendix 14.2 of this ES) has considered the risk from all sources of flooding to and from the Scheme. There are no significant risks to the development. Management of the increased impermeable area through the collection and attenuation of surface water into the receiving River Don and River Wear, providing a negligible to minor benefit downstream. Pre-earthwork ditches will help manage an existing moderate risk of run-off from

South Tyneside Local Development Framework	Relevant Policy	How the policy has been addressed
	K) the development is designed to minimise and mitigate localised flood risk, both on site or elsewhere, where this has been identified by the Strategic Flood Risk Assessment, Site-Specific Flood Risk Assessment or Surface Water Management Plan. For any development proposed in a Critical Drainage Area, as identified by the Strategic Flood Risk Assessment, a full flood risk assessment and drainage impact assessment may be required. Development on any sites allocated in Flood Risk Zones will only be permitted in accordance with the findings of a Sequential Flood Risk Assessment….".	There are no significant risks to the development. Management of the increased impermeable area through the collection and attenuation of surface water within an attenuation pond and sediment tank with additional discharges restricted to greenfield rates would ultimately reduce the discharge rate of surface water into the receiving River Don, providing a negligible to minor betterment downstream.

Sunderland City Council	Relevant Policy	How the policy has been addressed
	and other interested parties, will seek to ensure that the proposal would *(i) Not be likely to impede materially the flow of flood water, or increase the risk of flooding elsewhere, or increase the number of people or properties at risk from flooding (including coastal flooding); and* *(ii) Not adversely affect the quality or availability of ground or surface water, including rivers and other waters, or adversely affect fisheries or other water-based wildlife habitats*".	agricultural land to the west of the road. Section 14.9 of this ES chapter indicates that there would be no adverse effects of the Scheme on the water environment during operation and construction. Additionally, the Scheme would treat previously unmitigated highway runoff, resulting in beneficial impacts on water quality.
Sunderland Core Strategy and Development Plan 2015-2033 (draft)	**Policy CM4 Flood risk and water management** *"The council will seek to reduce flood risk, promote water efficiency measures, and protect and enhance water quality through the following measures:* • *All developments must follow the sequential approach* • *FRAs must demonstrates that the development will not increase flood risk on site or elsewhere* • *Drainage of new development shall be designed to reduce surface water runoff rates and include the implementation of SUDS where feasible* • *Development should not adversely affect the quality or quantity of surface or groundwater."* **Policy CM5 Surface water management** *"All development proposals will be required to consider the effect of the proposed development on flood risk, on-site and off-site, commensurate with the scale and impact of the development. Development proposals must:* • *All developments must pass the sequential test.* • *FRAs must demonstrates that the development will not increase flood risk on site or elsewhere.* • *Drainage of new development shall be designed to reduce surface water runoff rates and include the implementation of SUDS where feasible.* • *Development must discharge at greenfield runoff rates.* • *Ensure adequate protection where sites may be susceptible to overland flood flows.*"	A Flood Risk Assessment (Appendix 14.2 of this ES) has been completed for the Scheme. The Flood Risk Assessment has considered the risk from all sources of flooding to and from the Scheme. Management of the increased impermeable area through the collection and attenuation of surface water within an attenuation pond with discharges restricted to greenfield rates would provide a negligible to minor betterment downstream at The River Wear.

14.3 Assessment methodology

Study area

14.3.1 Information has been obtained for a study area covering a minimum of 1 km from the Scheme (see Figure 14.1). The study area was extended to incorporate river quality data and flow gauging data beyond this 1 km distance, where considered relevant and necessary to inform the assessment by the specialist carrying out the work.

Data gathering

14.3.2 The following desk-based sources have been consulted to gain information on the existing environment:

- Ordnance Survey Mapping;
- Environment Agency - What's in your backyard (http://apps.environment-agency.gov.uk/wiyby/default.aspx);
- Environment Agency - Catchment Data Explorer (http://environment.data.gov.uk/catchment-planning/);
- Environment Agency (https://data.gov.uk/publisher/environment-agency);
- Environment Agency – Flood map for planning (https://flood-map-for-planning.service.gov.uk/);
- Data on water hardness provided upon request by the Environment Agency (2014);
- Landmark Envirocheck Report (2015);
- Landmark Envirocheck Report (2014);
- Defra's MAGIC interactive map (http://magic.defra.gov.uk);

- British Geology Surveys interactive map (http://mapapps.bgs.ac.uk/geologyofbritain/home.html);
- Historic maps (British Library, 2017);
- Google Earth (2017);
- National River Flow Archive (CEH, 2015);
- Defra's archive website for freshwater fisheries designations (www.defra.gov.uk);
- Topographical surveys to determine watercourse dimensions;
- South Tyneside Local Development Framework 2011, (http://www.southtyneside.info/CHttpHandler.ashx?id=14712&p=0); and
- Sunderland Core Strategy and Development plan 2015-2033 (https://www.sunderland.gov.uk/corestrategy).

14.3.3 In addition to the desk based study, a walkover survey was conducted in 2014 to assess the baseline conditions of the River Don. This was updated by a walkover survey in November 2017 to verify and update, where necessary, the baseline conditions of the watercourses.

Assessment methods

14.3.4 The water quality assessment, as defined in DMRB (HD45/09)[131], applies a staged process (Methods A-F), though not all steps of it are always applicable. Chapter 5 of HD45/09 provides a general explanation of the procedures for assessing impacts to surface waters from the effects of routine runoff.

14.3.5 Method A is an assessment using Highways Agency's (now known as Highways England) Water Risk Assessment Tool (HAWRAT). This was undertaken to predict the risk of potential impacts of the Scheme on potentially sensitive water receptors. The HAWRAT assessment has been undertaken for the design year (2036).

14.3.6 The DMRB (HD45/09) states that an assessment of the potential ecological impacts of routine runoff on surface waters is required in order to determine whether there is an environmental risk and if pollution mitigation measures are needed in specific circumstances. HAWRAT was developed for this purpose and the methodology behind it was derived from a collaborative research programme undertaken by the Highways Agency (now Highways England) and the Environment Agency, which investigated the effects of routine road runoff on receiving waters and their ecology.

14.3.7 HAWRAT uses toxicity thresholds to identify potential effects and those adopted in the tool were determined through that collaborative research programme; the thresholds were designed to prevent adverse ecological effects in the receiving water. Equally, in artificial and heavily modified water bodies, the thresholds were designed to prevent adverse effects on ecological potential[132]. The thresholds were developed with the Environment Agency and are consistent with the requirements of the Water Framework Directive (WFD). The DMRB (HD45/09) goes on to confirm that the Environment Agency has approved the method of assessment used by HAWRAT and has agreed that the outputs from the tool can be used in environmental impact assessments.

14.3.8 HAWRAT uses a pass/fail reporting method whereby a 'Fail' indicates either: an unacceptable impact; a need to carry out further assessment steps; or a need to refer the situation to specialist judgement. A 'Pass' indicates that there will be no short-term impact associated with road runoff. An 'Alert' indicates an outfall that would otherwise pass were it not for the presence of a downstream structure or protected area. Long-term impacts are subsequently assessed by consideration of in-river average annual concentrations of soluble pollutants (dissolved copper and dissolved zinc), which are then compared against published Environmental Quality Standards (EQS) as set out by the WFD. A pass in relation to these EQS values confirms compliance with the WFD.

14.3.9 Finally, HAWRAT is a stepped approach: Step 1 assesses the water quality of runoff at source; Step 2 assesses the water quality of runoff at the point of discharge *without* mitigation; and step 3 assesses the water quality of runoff at the point of discharge *with* mitigation. A Fail at Step 2, therefore, is an indicator that mitigation is required, whilst a pass at Step 3 indicates the outcome with the Scheme.

14.3.10 Method B is a more detailed water quality assessment which only applies if a 'fail' results from HAWRAT and cannot be removed by applying mitigation within HAWRAT. This did not apply in this case, so Method B was not required.

14.3.11 Method C is an assessment of the potential impacts of routine runoff on groundwater, as opposed to surface water. This requirement for this method was scoped out of the assessment as the British Geology Survey interactive map indicates that the superficial deposits would be clay, in the DCO boundary area and surrounding 1 km study area, including at the location of the proposed attenuation pond. Therefore, no interaction between groundwater and surface water was expected during operation.

14.3.12 Method D of the DMRB guidance was undertaken to calculate spillage risk and the associated probability of a serious pollution incident.

14.3.13 Methods E and F are detailed hydrological/hydraulic modelling methods that apply only if making changes to the watercourse or floodplain that potentially affect flood risk; these were not applicable here.

14.3.14 Traffic models TA2 and TA3 have been used to predict future traffic forecasts for the Scheme. Predicted traffic flows are a parameter of the HAWRAT for the routine run-off and spillage risk assessments; as higher traffic levels could lead to more pollution from increased usage. Additionally, the percentage of Heavy Good Vehicles (HGVs) is a parameter for the spillage risk assessment; this assumes a higher percentage of HGVs increases the likelihood of a pollution incident.

14.3.15 A flood risk assessment (FRA) was undertaken to assess the potential impacts of the Scheme on flood risk (see Appendix 14.2). The FRA has informed the flood risk section of this chapter.

14.3.16 A WFD assessment was undertaken to determine if the Scheme would compromise the attainment of a WFD objective or result in the deterioration in the WFD status of any water bodies (see Appendix 14.3). The WFD has informed the fluvial geomorphology section of this chapter.

14.3.17 Tables 14.4 to 14.6 below are based on DMRB and have been used to categorise the results of the assessments. The significance of an impact is a function of the sensitivity of a feature of

[131] Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 10, HD 45/09 'Road Drainage and the Water Environment'

[132] Modified watercourses and artificial waterbodies can only achieve good 'potential' as these waterbodies are not in their natural state and therefore can only provide the potential to reach an ecological status.

the water environment and the magnitude of a predicted impact. The significance of effects has been determined only for residual effects following embedded and additional mitigation.

14.3.18 Table 14-4 provides the criteria used to determine the sensitivity of water environment features and Table 14-5 the magnitude of an impact. Table 14-6 shows how the significance of an effect is categorised using sensitivity and magnitude.

Table 14-4: Valuation of water environment features

Sensitivity	Criteria	Typical Examples
Very high	Feature has a high quality and rarity on a regional or national scale	**Surface water quality:** EC designated salmonid / cyprinid fishery. WFD classification – High. Site protected / designated under EU or UK habitat legislation (SAC, SPA, SSSI, WPZ, Ramsar site, salmonid water). Species protected by EU legislation.
		Groundwater: Principal aquifer providing a regionally important resource or supporting site protected under EU and UK habitat legislation. Source Protection Zone (SPZ) 1.
		Flood risk: Floodplain or defence protecting more than 100 residential properties from flooding.
		Fluvial geomorphology: WFD classification – High. A watercourse that appears to be in complete natural equilibrium and exhibits a natural range of morphological features (such as pools and riffles). There is a diverse range of fluvial processes present, free from any modification or anthropogenic influence.
High	Feature has a high quality and rarity on a local scale	**Surface water quality:** WFD classification - Good Major cyprinid fishery Species protected under EU or UK habitat legislation
		Groundwater: Principal aquifer providing locally important resource or supporting river ecosystem. SPZ 2.
		Flood risk: Floodplain or defence protecting between 1 and 100 residential properties or industrial premises from flooding.
		Fluvial geomorphology: WFD classification – Good. A watercourse that appears to be in natural equilibrium and exhibits a natural range of morphological features (such as pools and riffles). There is a diverse range of fluvial processes present, with very limited signs of modification or other anthropogenic influences.
Medium	Feature has a medium quality and rarity on a local scale	**Surface water quality:** WFD classification – Moderate.
		Groundwater: Aquifer providing water for agricultural or industrial use with limited connection to surface water. SPZ 3.
		Flood risk: Floodplain or defence protecting 10 or fewer industrial properties from flooding.
		Fluvial geomorphology: WFD classification – Moderate. A watercourse showing signs of modification and recovering to a natural equilibrium and exhibiting a limited range of morphological features (such as pools and riffles). The watercourse is one with a limited range of fluvial processes and is affected by modification or other anthropogenic influences.
Low	Feature has a low quality and rarity on a local scale	**Surface water quality:** WFD classification – Poor.
		Groundwater: Unproductive strata.
		Flood risk: Floodplain with limited constraints and a low. probability of flooding of residential and industrial properties.
		Fluvial geomorphology: WFD classification – Poor. A highly modified watercourse that has been changed by channel modification or other anthropogenic pressures. The watercourse exhibits no morphological diversity and has a uniform channel, showing no evidence of active fluvial processes and not likely to be affected by modification.

Table 14-5: Estimating magnitude of impact on water environment features

Magnitude of impact	Criteria	Typical Examples
Major adverse	Results in loss of feature and/or quality and integrity of the attribute	**Surface water quality:** Failure of both soluble and sediment-bound pollutants in HAWRAT (Method A, Annex I) and compliance failure with EQS values (Method B). Calculated risk of pollution from a spillage >2% annually (spillage risk assessment, Method D, Annex I). Loss or extensive change to a fishery Loss or extensive change to a designated nature conservation site.
		Groundwater: Loss of, or extensive change to, an aquifer Potential high risk of pollution to groundwater from routine run-off – risk score >250 (groundwater assessment, Method C, Annex I). Calculated risk of pollution from spillages >2% annually (spillage risk assessment, Method D, Annex I). Loss of, or extensive change to, groundwater supported designated wetlands.
		Flood risk: Increase in peak flood level (1% annual probability) >100 mm (hydrological assessment of design floods and hydraulic assessment, Methods E and F, Annex I).
		Fluvial geomorphology: Major shift away from anticipated natural baseline conditions with potential to alter processes at the catchment (large) scale.
Moderate adverse	Results in effect on integrity of feature, or loss of part of feature	**Surface water quality:** Failure of both soluble and sediment-bound pollutants in HAWRAT (Method A, Annex I) but compliance with EQS values (Method B) Calculated risk of pollution from spillages >1% annually and <2% annually. Partial loss in productivity of a fishery.
		Groundwater: Partial loss or change to an aquifer. Potential medium risk of pollution to groundwater from routine run-off – risk score 150-250 Calculated risk of pollution from spillages >1% annually and <2% annually. Partial loss of the integrity of groundwater supported designated wetlands.
		Flood risk: Increase in peak flood level (1% annual probability) >50 mm.
		Fluvial geomorphology: A shift away from natural baseline conditions with potential to alter processes at the reach or multiple reach (medium) scale.
Minor adverse	Results in some measurable change in feature quality or vulnerability	**Surface water quality:** Failure of either soluble or sediment-bound pollutants in HAWRAT. Calculated risk of pollution from spillages >0.5% annually and <1% annually.
		Groundwater: Potential low risk of pollution to groundwater from routine run-off – risk score <150 calculated risk of pollution from spillages >0.5% annually and <1% annually minor effects on groundwater supported wetlands.
		Flood risk: Increase in peak flood level (1% annual probability) >10 mm.
		Fluvial geomorphology: Minimal shift away from natural baseline conditions with typically localised impacts up to the reach (local) scale.
Negligible	Results in effect on feature, but of insufficient magnitude to affect the use or integrity	The Scheme is unlikely to affect the integrity of the water environment.
		Surface water quality: No risk identified by HAWRAT (pass both soluble and sediment-bound pollutants). Risk of pollution from spillages <0.5%.
		Groundwater: No measurable impact upon an aquifer and risk of pollution from spillages <0.5%.
		Flood risk: Negligible change in peak flood level (1% annual probability) <+/- 10 mm.
		Fluvial geomorphology: Minimal or no measurable change from natural baseline conditions in terms channel form and flow/ sediment processes. Any human impacts likely to be highly localised and not affecting the reach (local) scale.

Magnitude of impact	Criteria	Typical Examples
Minor beneficial	Results in some beneficial effect on feature or a reduced risk of negative effect occurring	**Surface water quality:** HAWRAT assessment of either soluble or sediment-bound pollutants becomes pass from an existing site where the baseline was a 'fail' condition. Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is <1% annually).
		Groundwater: Calculated reduction in existing spillage risk by 50% or more to an aquifer (when existing spillage risk <1% annually).
		Flood risk: Reduction in peak flood level (1% annual probability) >10 mm.
		Fluvial geomorphology: Slight improvement on natural baseline conditions with potential to improve (enhance) flow processes at the reach (local) scale.
Moderate beneficial	Results in Moderate improvement of feature quality	**Surface water quality:** HAWRAT assessment of both soluble and sediment-bound pollutants becomes a pass from an existing site where the baseline was a 'fail' condition. Calculated reduction in existing spillage by 50% or more (when existing spillage risk >1% annually).
		Groundwater: Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is >1% annually).
		Flood risk: Reduction in peak flood level (1% annual probability) >50 mm.
		Fluvial geomorphology: Notable improvements (enhancements) on natural baseline conditions and recovery of fluvial processes at the reach or multiple reach (medium) scale.
Major beneficial	Results in major improvement of feature quality	**Surface water quality:** Removal of existing polluting discharge, or removing the likelihood of polluting discharges occurring to a watercourse.
		Groundwater: Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring Recharge of an aquifer.
		Flood risk: Reduction in peak flood level (1% annual probability) >100 mm.
		Fluvial geomorphology: Substantial improvement (enhancement) on baseline conditions at catchment (large) scale. Some recovery of flow and sediment regime.

Table 14-6: Estimating significance of effects on water environment features

Sensitivity of Features	Magnitude of impact			
	Negligible	Minor	Moderate	Major
Very High	Neutral	Moderate or Large	Large or Very Large	Very Large
High	Neutral	Slight or Moderate	Moderate or Large	Large or Very Large
Medium	Neutral	Slight	Moderate	Large
Low	Neutral	Neutral	Slight	Slight or Moderate

Consultation

14.3.1 The Environment Agency has been consulted directly in relation to the drainage design, water quality, flood risk and the impacts on aquatic habitats. The Environment Agency also provided up-to-date information on the River Don and recommendations on the scope of the environmental assessments and proposed mitigation measures.

14.3.2 During the Testo's examination period, a number of comments were raised surrounding the cumulative impacts of Testo's, IAMP and Downhill Lane and the methodology for assessing water quality, particularly for the River Don. These have been taken into consideration in this chapter and Chapter 15 (Cumulative Effects).

14.3.3 The Environment Agency were also consulted on the outcomes of the EIA process and the proposed mitigation for the Scheme in June 2018.

14.4 Baseline conditions

14.4.1 Figure 14.1 illustrates the indicative environmental constraints for the wider study area, including the key water environment features and existing drainage network. This assessment assumes that IAMP One is in place and operational before the Downhill Lane Scheme starts construction, whilst the Scheme's construction, opening and future years will align with those for the Testo's scheme.

Existing drainage network

14.4.2 Catchments 1 to 3 are associated with the Testo's junction, whilst Catchments 4 to 8 are associated with Downhill Lane junction. As seen on Figure 2.5, the existing outfalls and catchments for Downhill Lane junction are:

- Catchment 4, covering the northern sections of the main carriageway, drains via Outfall 4 into the River Don.
- Catchment 5, covering Downhill Lane west of the A1290, which has an over the edge drainage arrangement ultimately discharging to the River Don. Over the edge drainage refers to allowing the surface water runoff to drain over the slope/embankment to be collected by the existing ditch; this is in line with the existing drainage design.
- Catchment 6, covering the eastern junction and parts of Downhill Lane east of the junction and a southbound slip road onto the A19, drains via Outfall 6 into a tributary of the River Don.
- Catchment 7, draining the A1290 south-west of the junction, drains via Outfall 7 into the existing road drainage network on the western side of the A1290 and then via Hylton Dene Burn in to the River Wear. It was assumed that IAMP One's street-level sustainable drainage system would not alter the point of discharge for this catchment.
- Catchment 8, the southern section of the main carriageway, drains into the existing A19 road drainage network and ultimately to the River Wear, again via Hylton Dene Burn.

14.4.3 Drainage surveys were undertaken in 2015 to determine the existing highways drainage system (see Figure 2.5).

River Don

14.4.4 The River Don lies in the Northumbria River Basin District and is a Main River which rises east of Wrekenton and flows in a generally easterly direction, under the A194(M) and A195, and through farmland until it meets the A19 at Downhill Lane junction, approximately 900 m south of the A19 Testo's Junction. North of Downhill Lane junction, the River Don passes beneath the A19 in a culvert of approximately 160 m in length. An unnamed tributary of the River Don flows from approximately 170 m east of Downhill Lane junction in a northerly direction for approximately 250 m to its confluence with the River Don. The river then follows a sinuous, but generally northerly course, between fields, for around 1.5 km and then through a predominantly urban area, to discharge into the River Tyne at Jarrow, which is tidally influenced.

14.4.5 The River Don is a complex catchment managed under the River Don Partnership involving South Tyneside Council, Sunderland City Council and Northumbrian Water, amongst others.

14.4.6 The Environment Agency classified the River Don as a heavily modified water body, which means it has been significantly artificially altered or modified over time. The River Don is classified as achieving Moderate Ecological Potential from its source to its confluence with the River Tyne. A further review of the water body classification of the River Don indicates that the Moderate classification is driven by the sub-category Supporting Elements (Surface Water), though no additional information is provided on why this achieves a Moderate classification. Otherwise, the Biological classification is Good, the Hydromorphological classification is Supports Good, the Physico-chemical quality is High, as is the classification of Specific Pollutants, which includes background copper and zinc concentrations. The River Don from source to tidal limit WFD water body is also classified as achieving Good Chemical Potential.

Hylton Dene Burn

14.4.7 Hylton Dene Burn is an ordinary watercourse that drains the urban area of Hylton Castle on the north bank of the River Wear in Sunderland. The watercourse receives runoff from the A19, small areas of land to the west of the A19, including Catchments 7 and 8, and areas to the east of the A19 before draining eastwards through Hylton Dene then discharging into the tidal River Wear.

14.4.8 Hylton Dene Burn is not formally classified under the WFD. The watercourse is located within the Wear Lower and Estuary operational catchment. However, due to its size and point of discharge into the tidal River Wear, no classification of Ecological or Chemical status is available. Currently, 16 of the 22 waterbodies within the Wear Lower and Estuary operational catchment have an Ecological status or potential of Moderate, and all 22 have a Chemical status of Good. Therefore, these dominant values have been assumed to be applicable to Hylton Burn Dene for the purposes of this assessment.

River Wear

14.4.9 The River Wear is a Main River that flows in an easterly direction towards the coast at Sunderland, approximately 3 km south of the Scheme's DCO boundary. In the area near the Scheme, the River Wear is estuarine. Upstream of Lamb Bridge at NGR 429440, 552430, the River Wear has Moderate Ecological and Good Chemical status, as classified by the Environment Agency under the WFD. There is no classification for the River Wear below this point, because of its tidal nature.

14.4.10 There are no water abstractions from the River Wear downstream of the A19 crossing. No information regarding other existing discharges to the River Wear was collected for this study, as the River Wear is tidal at this point. The tidal nature of the River Wear means that it receives a twice daily influx of salt water that would substantially disperse and dilute discharges from the A19; as such it is highly unlikely that the quality of discharge from the A19 into the River Wear could the overall quality of the River Wear. However, a qualitative impact assessment of the Scheme on water quality discharging into a tributary of the River Wear, and therefore on the River Wear itself is, is presented in Sections 14.6.13 and 14.6.18 to 14.6.21 of this ES chapter.

Land drains

14.4.11 There are approximately 13 land drains within the 1 km study area. One of the land drains is located north of the electricity sub-station, adjacent to Mount Pleasant Marsh. Two land drains are located approximately 320 m and 480 m north of the Scheme DCO boundary. A further land drain is situated south-west of the Scheme; at its closest it is located approximately 60 m west of the most southern extent of the red-line boundary. Finally, a land drain is situated alongside the Nissan Plant (at the most southern extent of the Scheme) and lies approximately 20 m east of the DCO boundary running parallel to the A19 (see Figure 14.1).

Surface water quality

14.4.12 Environment Agency records show four historical pollution incidents have occurred on the River Don or its tributaries between the River Don's source (east of Wrekenton) and Jarrow. All the incidents, which occurred in 2017, 2005, 2002 and 2001, involved the spillage of sewage into the River Don.

14.4.13 The Envirocheck (2014) report shows 10 historical pollution incidents have occurred between the River Don's source and Jarrow. All the incidents, which occurred between 1990 and 1996, were discharged into various surface waterbodies and were classified as Category 3 (minor) incidents.

14.4.14 The Envirocheck (2015) report shows two additional historical pollution incidents in the River Don; one at Mount Pleasant Marsh and one at Hylton Castle. Both incidents were classified as Category 3 (minor) incident.

14.4.15 The River Don has a Very Good Compliance rating score in the vicinity of Downhill Lane junction. The rating system relates to the level of permits that the Environment Agency has recorded as breached in the last year. The Boldon Business Park, adjacent to Mount Pleasant, held a radioactive substance site licence between 2001 and 2012, which related to an organisation involved in medical systems for the keeping and use of radioactive materials and disposal of radioactive waste.

14.4.16 The Envirocheck report (2014) identified two active consented discharges within 1 km of the Scheme. Mount Pleasant Farm has a licence to discharge treated sewerage into the River Don. Additionally, Carlton Developments, located along Newcastle Road in West Boldon, also has a licence to discharge treated sewerage into the River Don.

14.4.17 The Envirocheck report (2015) identified one consented discharge within 250 m of the Scheme. National Grid Electricity Transmission, located along Newcastle Road, has a licence to discharge treated sewerage into a tributary of the River Don.

14.4.18 The River Don, within the study area, was designated as a cyprinid water under the repealed Freshwater Fish Directive (FFD). This stretch of the River Don is now a protected area under the WFD. The River Don is not classified as a salmonid water under the repealed FFD.

14.4.19 Twenty-one designated LWSs lie within 2 km of the Scheme (see Figure 9.1) and five LWSs are mentioned in this chapter in regards to their relationship to the water environment. Chapter 9 (Ecology and Nature Conservation) provides more information on the LWSs, the potential effect of the Scheme on these sites and the proposed mitigation measures.

14.4.20 Calf Close Burn, 1.7 km north-west of the Scheme, is a stream that flows across agricultural land and the residential area of Fellgate. It is defined as a priority habitat in the Durham Biodiversity Action Plan.

14.4.21 Boldon Lake, 950 m north of the Scheme, is a small artificial lake situated directly north-east of Testo's junction. The site includes a lake fringed by marginal vegetation, with a surrounding strip of marshy grassland. The pond supports waterfowl, dragonfly and damselfly. Boldon Lake has a recreational purpose as it has provision for anglers. It is designated as a LWS by South Tyneside Council.

14.4.22 Mount Pleasant Marsh is a LWS located at the south-east corner of Testo's junction roundabout, 910 m north of the Scheme. The LWS comprises open water, reed-beds, marshy grassland scrub and plantation woodland that surrounds a National Grid electricity sub-station. The ponds support wildlife including toads, frogs, smooth newts and birds (including heron and kingfishers). West Boldon Environmental Education Centre, which adjoins the water body, hosts many educational visits and training events. The centre has a viewing and dipping platform which is used to educate visitors. The lake also has provision for anglers.

14.4.23 Make-Me-Rich Meadow LWS, 24 m north of the Scheme, includes species-rich, damp, unimproved grassland and a section of the River Don itself. The LWS has been designated, in part, because it includes part of a section of the River Don which has particular habitat features that are beneficial to wildlife. It also provides occupied breeding habitat for water vole and was used by otter.

14.4.24 Elliscope Farm East Hylton, 120 m west of the Scheme, is a designated LWS. The site consists of two small woodlands and a linking section of the River Don, leading east from Hylton Bridge Farm. It has also been designated as a LWS, in part, because it includes a section of the River Don which has particular habitat features that are beneficial to wildlife. It also provides occupied breeding habitat for water vole and was used by otter.

14.4.25 The annual 95 percentile river flow of a watercourse (Q_{95}) is the flow exceeded for 95% of the time (i.e. it is a measure of the flow of water in the river when it is very low). The Q_{95} gives an indication of the capacity of the watercourse to dilute and disperse any contaminants discharged into it without causing any harm to the water quality or ecosystems. Estimates of the Q_{95} were calculated using the methodology (IH108) in accordance with the DMRB.

14.4.26 Dissolved copper (Cu) and dissolved zinc (Zn) are used as indicators of the level of soluble impacts as they can result in particularly acute toxic effects to aquatic life at certain concentrations.

14.4.27 HAWRAT assessments were undertaken to identify the impacts of the existing drainage system on the River Don, a tributary of the River Don, a minor watercourse to the west and to Hylton Dene Burn via a pipe connection (see Table 14.7). The result sheets for the HAWRAT assessment are included in Appendix 14.1. The results indicate that the existing drainage would fail for sediment-bound pollutants at Catchment 4, and Catchment 6 and Catchment 8 at Point 8a and 8b and would fail for soluble pollutants. If designed today, all three outfalls would require additional mitigation to achieve no short-term impacts on water quality.

14.4.28 Table 14-7 indicates that the existing Catchments 4 and Catchment 7 pass for long-term impacts when compared against Environmental Quality Standards (EQSs) values indicating that, despite short-term failures at Catchment 4, the outfalls would be compliant with the requirements of the WFD in terms of dissolved copper and dissolved zinc concentrations (see paragraphs 14.3.5 to 14.3.8 for confirmation of why a pass is considered compliant with the WFD). Existing Catchments 6, 8a and 8b are shown to fail against compliance with Environment Agency EQSs, which means that it is not currently compliant with the WFD. Catchments 6, 8a and 8b alert for sediment impacts because of the close proximity to a designated site (Make-Me-Rich LWS) and downstream structures, so it is still a pass.

14.4.29 Catchment 5 was not assessed as there would be no new drainage or proposed attenuation at this site.

Table 14-7: Summary of HAWRAT routine run-off assessment for the existing drainage system

Drainage catchments	Receiving Watercourse	HAWRAT Results		Compliance with Environment Agency Environmental Quality Standards
		Soluble: acute impacts	Sediment: chronic impacts	
Step 2 Tier 1 (without mitigation) – Existing Drainage system				
4	River Don	PASS	FAIL	PASS
6	River Don Tributary	FAIL	ALERT	FAIL

Drainage catchments	Receiving Watercourse	HAWRAT Results		Compliance with Environment Agency Environmental Quality Standards
		Soluble: acute impacts	Sediment: chronic impacts	
7	Minor Watercourse	PASS	PASS	PASS
8a	Pipe Connection	FAIL	ALERT	FAIL
8b	Minor Watercourse	FAIL	ALERT	FAIL

Flood risk

14.4.30 The Environment Agency has no records of flood events in this area. The Environment Agency's on-line flood maps indicate that the majority of the Scheme area does not lie within a floodplain. However, a small floodplain is situated either side of the River Don, both upstream and downstream of the point where the A19 crosses the River Don, immediately north of Downhill Lane junction. At this location, the river is culverted 10 m beneath the level of the road and, therefore, the risk from fluvial flooding is considered to be very low. The River Don from source (east of Wrekenton) to the Scheme has an approximate catchment area of 1.58 km^2.

14.4.31 It is understood that the Environment Agency's Flood Zone Map will be updated in the near future with flood extents produced for a recent modelling study for the Environment Agency focussed on the River Don at Washington (JBA Consulting, 2017). These flood extents do differ from the current on-line flood map, with slightly more encroachment of flood extents around the Downhill Lane junction itself. The DCO boundary of the Scheme is believed to slightly encroach into the new flood extent.

14.4.32 The Environment Agency's Risk of Flooding from Surface Water maps indicate localised areas of ponding against the southern edge of Downhill Lane to the east of the junction, a small area to the west of the junction on the south side of the A1290 and further ponding to the east and west of the A1290 to the south-east of the junction. They also indicate ponding in fields east of the A19 at the southern extent of the Scheme. Surface water flooding is also shown in the upper reaches of Hylton Dene Burn.

14.4.33 The Environment Agency's online flood maps indicate there is no risk of reservoir flood risk (see Appendix 14.2 and Figure 14.1).

Groundwater

14.4.34 The Scheme is underlain by a Secondary A aquifer in the bedrock. The Environment Agency has classified the groundwater vulnerability beneath the site as low under and to the west of Downhill Lane junction. However, within approximately 200 m to the east of the junction the vulnerability increased to high. The site does not lie within a groundwater Source Protection Zone (SPZ). However, there is a total catchment (zone 3) groundwater SPZ approximately 625 m north-east of the most eastern extent of the Scheme.

14.4.35 British Geological Survey interactive maps indicate that the superficial deposit are Pelaw clay underneath the Scheme and within the 500 m area surrounding Downhill Lane junction. Pelaw clay is slowly permeable and therefore, no interaction between groundwater and surface water is anticipated.

Fluvial geomorphology

14.4.36 In 2014, a survey was undertaken along the banks of the River Don to assess the fluvial geomorphological characteristics of the River Don within the study area. These characteristics are varied, with some signs of natural recovery/adjustment following historical straightening. At the time of the survey, the water was noted to be turbid and the bed could not be seen along the majority of the channel. However, where visible, bed material appeared to be predominantly silt. This was confirmed by a local farmer during the field visit. The majority of the banks appeared to have been historically affected by dredging, and were high and vertical with very little riparian vegetation present. Land use was observed to be primarily agricultural along both banks and extended to the channel edge. Some lateral adjustment was noted to be present in the form or erosion and deposition.

14.4.37 The River Don channel in the western reach of the study area is much more wooded and unlikely to be poached by cattle or grazing animals. Tree roots would likely provide bank stabilisation meaning there is a minimised potential for the channel to adjust.

Sensitivity of features

14.4.38 Table 14-8 shows the sensitivity of each of the features of the local water environment.

Table 14-8: Water attributes - features, quality and sensitivity

Attribute	Feature	Indicator of Quality	Sensitivity
River Don (except for Make-Me-Rich Meadow and Elliscope Farm East Hylton)	Water supply / quality	Good WFD chemical status.	High
	Dilution and removal of waste products	The river receives discharges of treated sewage and storm water. Potential additional pollutant sources: agricultural fields surrounding the river.	Medium
	Biodiversity	Good biological WFD classification. The River Don within the study area was designated as a cyprinid water under the repealed FFD.	High
	Conveyance of flow	Main River.	High
	Fluvial geomorphology	Supports Good Hydromorphological WFD status. River flow/sediment has formed some natural morphological forms including a meandering planform. There is some natural habitat present. However, the channel cross-section is partially modified with obvious signs of artificial modification (including dredging and bank modifications).	Medium
Land drain (north of electricity substation)	Dilution and removal of waste products	Small land drain that is assumed to receive discharge from the electricity sub-station.	Low
West House Farm land drain	Surface water flood risk	Historical flood events relating to agricultural land drain.	Medium

Attribute	Feature	Indicator of Quality	Sensitivity
Groundwater	Water supply / quality	Secondary A aquifer in the bedrock underlain the study area. A water abstraction from groundwater was identified in the vicinity of the Scheme.	Medium
	Vulnerability	Low vulnerability for the majority of the Scheme.	Low
		High vulnerability east of Downhill Lane junction.	High
	Flood Risk	Underlain by secondary A aquifer, deposits have a relatively low primary permeability and ground investigations indicate 1-3 m depth of groundwater.	Low
Boldon Lake	Water supply / quality	WFD chemical status has not been assessed. Assumed Good WFD chemical status.	High
	Biodiversity	The pond has been designated a LWS	Medium
Mount Pleasant Marsh	Water supply / quality	WFD chemical status has not been assessed by the Environment Agency. Assumed Good WFD chemical status.	High
	Biodiversity	The pond is designated as a LWS.	Medium
	Recreation	West Boldon Environmental Education Centre hosts numerous educational visits and training events. The centre has a viewing and dipping platform.	High
Make-Me-Rich Meadow (section of the River Don that flows through Make-Me-Rich Meadow)	Water supply/ quality	The River Don, which has Good WFD chemical status, forms part of Make-Me-Rich Meadow LWS.	High
	Dilution and removal of waste products	The river receives discharges of treated sewage and storm water. Potential additional pollutant sources: agricultural fields surrounding the river.	Medium
	Biodiversity	Make-Me-Rich Meadow is a designated LWS. The River Don within the study area was also designated as a cyprinid water under the repealed FFD.	High
	Conveyance of flow	The section of the River Don that flows through Make-Me-Rich Meadow is considered as a small watercourse due to its size.	Low
	Fluvial geomorphology	River flow/sediment has formed some natural morphological forms including a meandering planform. There is some natural habitat present. However, the channel cross-section is partially modified with obvious signs of artificial modification (including dredging and bank modifications).	Medium
Elliscope Farm East Hylton (section of the River Don that flows through Elliscope Farm East Hylton)	Water supply/ quality	The River Don, which has Good WFD chemical status, forms part of Elliscope Farm East Hylton LWS.	High
	Dilution and removal of waste products	The river receives discharges of treated sewage and storm water. Potential additional pollutant sources: agricultural fields surrounding the river.	Medium
	Biodiversity	Elliscope Farm East Hylton is a designated LWS. The River Don within the study area was also designated as a cyprinid water under the repealed FFD.	High
	Conveyance of flow	The section of the River Don that flows through Elliscope Farm East Hylton is considered as a small watercourse due to its size.	Low
	Fluvial geomorphology	Supports Good Hydromorphological WFD status. River flow/sediment has formed some natural morphological forms including a meandering planform. There is some natural habitat present. However, the channel cross-section is partially modified with obvious signs of artificial modification (including dredging and bank modifications).	Medium
Surface water flood risk area	Conveyance of flow	Localised floodplain where the A19, north of the Downhill Lane junction, passes 10 m beneath the A1 through a culvert. Localised areas adjacent to Downhill Lane, the A1290 and in fields to the west of the A19.	High
Hylton Dene Burn	Water supply/ quality	Assumed to have Moderate chemical status in line with the majority of water bodies in the Wear Lower and Estuary operational catchment	Medium
	Dilution and removal of waste products	The river receives road drainage and surface water runoff. Potential additional pollutant sources: agricultural fields surrounding the river.	Medium
	Biodiversity	Hylton Dene is a Local Nature Reserve, noted for its semi-natural woodland.	High
	Conveyance of flow	Hylton Dene Burn is considered as a small watercourse due to its size.	Low
	Fluvial geomorphology	Assumed to support Good Hydromorphological WFD status. River flow/sediment has formed some natural morphological forms including a meandering planform. There is some natural habitat present. However, the channel cross-section is partially modified with obvious signs	Medium

Attribute	Feature	Indicator of Quality	Sensitivity
		of artificial modification (including dredging and bank modifications).	
River Wear	Water supply/ quality	Good chemical status upstream, but tidal at the point of receiving flow from Hylton Dene Burn.	Low
	Dilution and removal of waste products	The river receives road drainage, surface water runoff, sewage from CSOs and trade discharges. Tidal mixing provides dilution.	Low
	Biodiversity	Tidal at this point	Low
	Conveyance of flow	Tidal at this point	Low
	Fluvial geomorphology	Tidal at this point	Medium

14.5 Assessment assumptions and limitations

14.5.1 The HAWRAT assessment has used the treatment efficiencies for mitigation measures presented in HD33/16 of the DMRB. These treatment efficiencies are indicative and based on the results of a literature review of the current state of knowledge for the efficacy of a range of treatment measures for highway runoff.

14.6 Potential impacts (without mitigation)

14.6.1 Potential impacts of the Scheme on the water environment, without any mitigation measures, are summarised below, and discussed in more detail in paragraphs 14.6.2 to 14.6.8. Mitigation measures are described in Section 14.7 of this ES chapter, and the significance of effects, taking mitigation into account, is described in Section 14.8 of this ES chapter.

Construction impacts

- Pollution from mobilised sediments and from spillage of fuels, lubricants, hydraulic fluids and cement during construction activity.
- Installation of outfalls would potentially require in-channel working. This could disturb existing channel bed forms.
- Changes in the conveyance of flood flows as a consequence of new structures.

Operational impacts

- Changes to surface water quality as a consequence of routine run-off from the highway. It should be noted that routine run-off would be discharged to the River Don and not to groundwater.
- Pollution from accidental spillages.
- Potential for changes to channel geomorphology due to new discharge from an outfall, a new outfall headwall and increased runoff.
- Changes in the conveyance of flood flows as a consequence of new structures and increased runoff.

Construction impacts

14.6.2 Potential impacts arising from construction activities are typically considered to be short-term, although in some cases they can have longer term effects. For instance, short-term acute impacts on water quality could have longer term chronic effects on aquatic ecology.

14.6.3 Some of the temporary land areas are intended to be used for the temporary storage of topsoil or subsoil in bunds, or of bulk fill materials. Storing construction materials on site could cause sediment from the materials to enter the surrounding water environment and cause sediment loading.

14.6.4 During the majority of the construction period, areas of the construction site would have surfaces of bare earth, exposed construction materials (e.g. crushed rock) and stockpiles of topsoil. Rainwater draining from the construction site would carry a heavy load of sediment from these sources. Without mitigation, the discharge of such quantities of sediment would affect the quality of water in local watercourses and could lead to silting-up; this would increase flood risk and damage aquatic habitats. Deposition of silt from the construction site would cease at the end of construction, but the effects could potentially continue in the longer term due to the effects of the silt already deposited in the stream beds.

14.6.5 Without mitigation, there is a risk that construction could disrupt surface water flows, in particular in areas where excavations are proposed. Where construction works intercept surface water flow paths there is a risk of damage to plant and personnel as well as the changes to risk in the surrounding environment due to altered flow paths. Works that occur in the channel and floodplain can cause potential temporary loss of flood storage which may cause localised increases in flood risk. During construction, it is likely that soil compaction would occur, resulting in increased runoff from reduced soil infiltration rates due to works traffic and the potential presence of temporary haul roads. Furthermore, the excavation works required for a Sustainable Drainage System (SuDS) pond construction could be subject to water ingress and flooding.

14.6.6 Construction could lead to accidental spillages of fuels, lubricants, hydraulic fluids, cement or other pollutants without mitigation. These are risks rather than predicted impacts, because their actual occurrence is uncertain, and the specific location, nature and severity of any incident cannot be predicted. The risk would cease at the end of the construction period, but the effects of any such spillage, if it did occur, could continue to affect the receiving watercourses in the longer term depending on its location and scale.

14.6.7 Installation of an outfall would potentially require in-channel working, which could disturb existing channel forms including bed and bank characteristics and deposits.

Operational impacts

14.6.8 The drainage strategy for the Scheme is shown on Figure 2.6 and described in Chapter 2 of this ES; the drainage strategy has been considered as embedded mitigation for the purpose of this assessment. The proposed drainage design would include SuDS.

14.6.9 Run-off from Catchment 4 in the northern section of the A19 (between Testo's and Downhill Lane junctions) and central area of Downhill Lane junction would drain via the existing drainage system to attenuation Pond 1, built under the Testo's scheme north of Downhill Lane junction; this attenuation pond drains to the River Don. All of the runoff from Catchment 4 would be treated by this wet-based attenuation pond that would also treat and attenuate runoff from Catchment 1 associated with the Testo's scheme. Therefore, the combined runoff from

Catchment 1 and Catchment 4 was considered during the HAWRAT assessment. This embedded mitigation would provide a betterment to the runoff from Catchment 1 (Testo's) and 4.

14.6.10 Catchment 6 would be drained via a new wet attenuation pond situated adjacent to the A19, north-east of Downhill Lane junction. The attenuation pond would retain a depth of 0.5 m of permanent water. The permanent water in the attenuation pond would reduce re-suspension of pollutants that would occur with a dry pond base. The removal of suspended solids and associated heavy metals would be achieved through the physical processes of settlement and filtration.

14.6.11 Water treatment, as described above, would be a secondary function of the attenuation ponds detailed above. Their primary purpose is to regulate the rate of discharge of water into the River Don. The discharge would be attenuated so that flood risk would not be increased as a result of changes in impermeable land area. Additional discharge from Catchment 6 would be restricted to greenfield runoff rates, which is the runoff that would be expected from this catchment had it never been developed.

14.6.12 The existing and proposed outfalls for Catchment 4 are located north of, and the proposed new outfall for catchment 6. Located to the north of the outfalls is, Make-Me-Rich Meadow, which is designated by South Tyneside Council as a LWS.

14.6.13 Runoff from the southern section of the A19 (south of Downhill Lane junction) from Catchments 7 and 8 would drain via existing Outfalls 7 and 8, respectively, into the existing highway drainage system and then ultimately into the River Wear (see Figure 2.6). Changes to existing catchments and outfalls would be as follows:

- Catchment 7 runoff would drain into a minor watercourse before joining the existing highway drainage network and ultimately discharging into the River Wear. Before draining into the minor watercourse approximately 75 % of the runoff would pass through a new attenuation ditch with check dams, and then into a wet-based attenuation pond. The other approximate 25 % would drain directly to the minor watercourse. This new network ditch would also be used to provide attenuation storage for any increased flows from the proposed network.
- Catchment 8 would be drained to a new attenuation pond then via an existing highway drainage to the River Wear. The attenuation pond would retain a depth of 0.5 m of permanent water. The permanent water would reduce re-suspension of pollutants that would occur with a dry pond base. The removal of suspended solids and associated heavy metals would be achieved through the physical processes of settlement and filtration; thereby providing a betterment to the runoff from Catchment 8, which passes through Hylton Dene Burn to discharge into the River Wear.

14.6.14 Water treatment as described above would be a secondary function of the attenuation ponds proposed for catchments 7 and 8. Their primary purpose is to regulate the rate of discharge of water into the River Wear so that flood risk would not be increased. Therefore, new impermeable paved areas within the proposed Catchments 7 and 8 would be restricted to greenfield runoff rates.

14.6.15 The existing highway drainage that would be used for Catchments 7 and 8 flows south adjacent to the A19 then heads east under the Town End Farm housing estate before discharging into the River Wear via Hylton Dene Burn.

Surface water quality

Routine Runoff

14.6.16 HAWRAT assessments were undertaken to assess the potential impacts of the Scheme on the River Don at Catchment 4, one of its tributaries at Catchment 6, on the minor watercourse at Catchment 7 and at two locations for Catchment 8 (a pipe connection to the existing road network and an open outfall further downstream in the upper reaches of Hylton Dene Burn). A summary of the results is shown in Table 14.9. The HAWRAT results sheets for the routine run-off assessments are included in Appendix 14.1. Section 14.4.29 of this chapter explains why there is no presentation of results for Catchment 5. It should be noted that HAWRAT is designed to be applied in open channels and not in piped networks. Assessment at point 8a, which is a piped section of the receiving watercourse, has been undertaken at the request of Sunderland City Council; however, to make sure that any effects at the next open channel section are appropriately identified, an assessment has also been undertaken downstream at point 8b.

14.6.17 Whether the discharge is likely to impact on a protected site for conservation is one attribute of the HAWRAT assessment. Make-Me-Rich Meadow is designated by South Tyneside Council as a LWS and has been considered a protected site for the HAWRAT assessment. Additionally, the River Don was designated as a cyprinid water under the repealed FFD, though this protection is now provided by the WFD status of the watercourse.

14.6.18 Table 14.9 shows that at Step 2 Tier 1 of HAWRAT, which uses only the Q_{95} value and an estimate of river width to assess impacts from sediment-bound pollutants, Catchments 4 and 7 pass for soluble impacts. Catchments 4 and 8 at point 8a fail for sediment impacts. Catchments 6 and 8 at 8b pass with an alert for sediment impacts and Catchment 7 passes. Catchments 4 and 7 comply with EQS values indicating no long-term impacts and compliance with WFD requirements; however, Catchments 6, 8a and 8b fail.

14.6.19 Table 14.9 shows that at Step 2 Tier 2 of HAWRAT, which uses additional river characteristics to further determine sediment impact. All catchments now pass or pass with alert for sediment impacts, however, Catchment 6, 8a and 8b continue to fail for soluble pollutants and for long-term impacts.

14.6.20 Table 14.9 shows that at Step 3, which includes the proposed mitigation (in this case the combined Testo's and Downhill Lane attenuation pond at Catchment 4, new attenuation pond at Catchment 6, an attenuation ditch and pond at Catchment 7 and an attenuation pond at Catchment 8), all catchments would pass for soluble impacts and there would be an alert for sediment-bound impacts for all catchments except 7, which passes. An alert is shown because of the proximity to a designated site (Make-Me-Rich Meadow LWS), so is still a pass. All five catchments would pass relative to EQS values and therefore would be compliant with the requirements of WFD.

14.6.21 The joint Testo's and Downhill Lane attenuation pond 1 for Catchments 1 and 4, attenuation pond at Catchment 6, the attenuation ditch and pond at Catchment 7 and the attenuation pond at Catchment 8 would also provide betterment in terms of soluble and sediment impacts on water quality for the River Don, its tributary and minor watercourses, respectively, relative to the present scenario. It should be noted that relative to existing catchments, there is a reduction in predicted annual average dissolved copper and zinc in all catchments relative to the baseline; hence, all new catchments were considered to be providing betterment with respect to the requirements of the WFD beyond simply being compliant.

Table 14-9: Summary of HAWRAT routine run-off assessment for the Scheme without mitigation (Step 2) and with mitigation (Step 3)

Drainage catchments	Receiving Watercourse	HAWRAT Results		Compliance with Environment Agency Environmental Quality Standards
		Soluble: acute impacts	Sediment: chronic impacts	
Step 2 Tier 1 (without mitigation) – Scheme				
4 (and 1)	River Don	PASS	FAIL	PASS
6	River Don Tributary	FAIL	ALERT	FAIL
7	Minor Watercourse	PASS	PASS	PASS
8a	Pipe Connection	FAIL	FAIL	FAIL
8b	Minor Watercourse	FAIL	ALERT	FAIL
Step 2 Tier 2 (without mitigation) – Scheme				
4 (and 1)	River Don	PASS	ALERT	PASS
8a	Pipe Connection	FAIL	ALERT	FAIL
Step 3 (with mitigation) – Scheme				
4 (and 1)	River Don	PASS	ALERT	PASS
6	River Don Tributary	PASS	ALERT	PASS
7	Minor Watercourse	PASS	PASS	PASS
8a	Pipe Connection	PASS	ALERT	PASS
8b	Minor Watercourse	PASS	ALERT	PASS

Accidental Spillage

14.6.22 The results of the spillage assessment are shown in Appendix 14.1. The assessment identified that the risk of an accidental spillage leading to a pollution incident to be sufficiently low that no mitigation measures would be required.

14.6.23 The risk of an accidental spillage or vehicle fire, which could lead to a pollution incident, was considered to be proportional to the risk of an accident involving heavy goods vehicles. As the Scheme would be designed to reduce accident rates through the improvement of the A19 Downhill Lane junction, the risk of spillages would be expected to reduce.

14.6.24 There are a number of caveats regarding the data used in this assessment. For some sections of the Scheme there was no annual average daily traffic (AADT) data available, therefore overlapping or nearby data was used; meaning some road sections were of a greater length than required for this assessment so the AADT value may be greater than in reality. This is a worst-case scenario and therefore acceptable.

14.6.25 The percentage probability of accidental spillage is sufficiently lower than the threshold value, so the aforementioned caveats were deemed acceptable.

Flood Risk

14.6.26 The detailed assessment and results of the FRA are provided in Appendix 14.2.

14.6.27 The Scheme is not at risk of flooding from rivers or the sea. However, the northern section of the Scheme is immediately adjacent to Flood Zones 2 and 3 where the River Don passes under the A19 north of Downhill Lane junction. At this point the A19 is raised and the current road level (which would not be altered by the Scheme) is 10 m above the crossing confirming the risk is low. Flood Zones are set to change in the near future, which will increase the extent of Flood Zones 2 and 3 and bring a small area of proposed tree planting into Flood Zone 2. Despite this, no additional mitigation beyond that described in Section 14.7 of this chapter is required. The risk of surface water flooding is considered moderate, as there is evidence of surface water flood risk within the DCO boundary; therefore, mitigation is required.

14.6.28 The rate of additional discharge from Catchments 4, 6, 7 and 8 would be restricted to greenfield runoff rates with attenuation provided above this rate up to and including the 1% annual probability plus an allowance for climate change Therefore, the Scheme would result in marginal benefit to areas downstream during rainfall events more extreme than the greenfield rate.

14.6.29 Due to the bedrock characteristics and no historical incidents of flooding, the risk of groundwater flooding is considered low.

14.6.30 The FRA concluded that flood risk to the proposed site is low and the Scheme does not increase risk elsewhere.

Fluvial geomorphology

14.6.31 The new outfall structure and associated discharge proposed on the tributary of the River Don downstream of the A19 would have the potential, locally, to change channel form by altering flow dynamics and sediment processes. The headwall would directly replace a small length of natural channel bank and bed and could potentially encourage erosion upstream or downstream. However, the stream energies in the study area are relatively low and it was not anticipated that there would be any significant erosion.

14.7 Design, mitigation and enhancement measures

Mitigation for construction impacts

14.7.1 The permanent and temporary drainage systems for the Scheme would be developed early in the construction process to reduce the temporary risks of pollution to the water environment during construction.

14.7.2 It is intended that the contractor would use both the existing and proposed drainage systems and associated outfalls during construction. Temporary discharges may be required.

14.7.3 Measures to control the risk of pollution during construction would be implemented through a Construction Environmental Management Plan (CEMP). During construction, contractors would operate to best practice standards to make sure impacts on the surrounding water environment would be limited. Ordinary Watercourse consent would be obtained, if required, for outfalls or works associated with Outfall 6.

14.7.4 Measures to limit adverse effects on flood risk would include the establishment of designated plant and material storage areas outside of flood risk zones. Works within the channel and floodplain would be limited to times of low flows, it is recommended to sign up to the

Environment Agency flood warning system. Within the CEMP there would be a surface water management plan and where possible permanent drainage features would be installed during the initial stages of construction to provide attenuation for construction runoff as early as possible.

14.7.5 All fuel, oil and chemicals would be stored in accordance with the requirements of the Control of Pollution (Oil Storage) Regulations 2001. The construction plant would be refuelled in designated areas on an impermeable surface, away from drains and watercourses. If any refuelling did need to take place in other areas of the site, a prescribed safe method would be used. An emergency spill plan would be generated and spill kits would be available at appropriate locations.

14.7.6 Care would be taken to avoid damage to existing sewers or piped drains within the vicinity of the works areas.

14.7.7 Certain areas of temporary land would be used for storing stockpiles of topsoil, subsoil or bulk, fill materials. Temporary drainage arrangements would be put in place to capture site run-off and to settle out silt that would be mobilised during construction.

14.7.8 The new outfall to the River Don tributary would be installed at a location that would not excessively alter flow dynamics and sedimentation patterns. Specific considerations would include an angled outfall, pointed downstream to minimise impacts to flow patterns. This would direct the outfall discharge away from the banks, minimising the potential for erosion (particularly on the opposite bank). The size/extent of the outfall headwall would be minimised to reduce the potential impact on the bank.

Monitoring and maintenance

14.7.9 Contaminated sediment would be removed periodically from the attenuation ponds. Regular inspections would identify when this action would need to be taken. As such, the attenuation ponds would be maintained in line with the DMRB guidance (defined in Table 6.1 of Volume 4, Section 2, Part 1, HA 103/06).

14.8 Assessment of effects

14.8.1 The residual effects of the Scheme, with embedded and additional mitigation in place, have been assessed and are presented in Tables 14-10 and 14-11.

Surface water quality

14.8.2 During construction there would be no likely residual effects associated with water quality. All effects on surface water quality would be neutral to moderate beneficial during operation.

Flood risk

14.8.3 There would be no likely residual flood risk effects during the construction and operation of the Scheme.

Fluvial geomorphology

14.8.4 With implementation of the proposed mitigation, which focuses on minimising geomorphological impacts, a worst-case assessment concludes that there may be slight adverse residual effects during the construction and operation of the Scheme.

Water Framework Directive compliance

14.8.5 A WFD assessment is provided in Appendix 14.3.

14.8.6 The WFD assessment has shown that the Scheme is compliant under the WFD, and that the works would be unlikely to result in the deterioration or prevention of an improvement in the overall WFD status of the River Don or any downstream water bodies.

Inter-relationships effects between topics

14.8.7 This section assesses the potential interrelationships between effects reported in this and other topic chapters on shared receptors.

14.8.8 The surrounding water environment could potentially be affected by changes to surface water run-off from alterations to the drainage system as well as changes to the geology and soils in the area (see Chapter 10). However, the construction mitigation measures identified in this chapter are considered appropriate to mitigate the potential effects on the surrounding water environment during construction.

14.8.9 Runoff from Catchment 4 would be discharged into a section of the River Don that forms part of Make-Me-Rich Meadow LWS. Signs of Water Vole and Otter have been observed adjacent to this section of the River Don (see Chapter 9). The effects of the highways run-off discharged into this section of the River Don in terms of the water environment have been assessed as slight to moderate beneficial due to the introduction of attenuation storage and additional treatment. Therefore, the Scheme could have a beneficial effect on the surrounding ecological habitat and protected species.

14.8.10 Additionally, the Catchment 6 attenuation pond in the proposed drainage design has been designed so that the additional highways run-off would be discharged at a greenfield run-off rate. As a result, the effect on conveyance of flow through Make-Me-Rich Meadow has been assessed as neutral in this Environmental Statement.

14.8.11 The Catchment 8 attenuation pond in the proposed drainage design has been designed so the additional highways run-off would be discharged at greenfield run-off rates.

Shared use of the A19 Testo's scheme main site compound

14.8.12 As discussed in Section 1.5, in Chapter 1 of this ES, there is the potential that the Scheme could share use of the temporary main site compound for the Testo's scheme for the purpose of general storage, traffic management and office-based administrative purposes. If this was undertaken from the commencement of construction of the Scheme, the area of land take required for the Downhill Lane main site compound could be reduced. There would also be a period where both the Testo's and Downhill Lane junction schemes are being constructed at the same time, followed by a period where only the Scheme is under construction but still using the Testo's scheme main site compound.

14.8.13 There would be no change to the footprint of the Testo's main site compound to facilitate its use by the Downhill Lane Scheme, so it is not anticipated that there would be any significant additional adverse effects on the water environment to those outlined in Chapter 14 of the Testo's scheme ES, as a result of the shared use of the Testo's scheme main site compound. The only change to the impacts assessed by the Testo's scheme ES would relate to a small increase in the number of workers and vehicles using the compound. Since all workers and vehicles using the compound need to adhere to defined good construction practices (e.g.

CEMP pollution controls), there would be no change to the residual effects predicted by the Testo's scheme ES.

14.8.14 However, use of the Testo's Scheme main site compound would enable a reduction in the temporary land take required by the Downhill Lane Scheme main site compound, north of Downhill Lane (East). This would provide a positive effect from reducing the risks to the surface and groundwater water environment (especially the River Don) and existing agricultural land drainage, assessed in this ES Chapter 14 for the Scheme, due to reducing the extent of additional temporary hardstanding proposed for a standalone Downhill Lane Scheme main site compound.

14.8.15 Though the extended use of the Testo's scheme main site compound would mean a longer duration of exposing the environment to pollution risks from the Testo's compound, these would not be significant due to continued application of good construction practices (e.g. CEMP pollution controls) and the reduction of construction activity in the Testo's compound to mainly low risk general storage, traffic management and office-based administrative purposes. In contrast, the pollution risks identified in this ES Chapter 14 for a standalone Scheme would be reduced for the entire duration of the Scheme's construction period due to the reduction in the temporary land take required by the Downhill Lane Scheme main site compound near the River Don north of Downhill Lane (East).

14.8.16 Therefore, the limited change in water environment risks at the Testo's compound compared to the reduced footprint and pollution risks to agricultural land near the River Don would make sharing the Testo's compound a net beneficial effect.

Cumulative effects

14.8.17 The cumulative effects of the Scheme with other developments are assessed within Chapter 15 of this ES.

Table 14-10: Summary of Potential Effects Arising from the Construction of the Scheme

Potential Impact	Feature	Attribute	Indicator of Quality	Sensitivity	Mitigation	Magnitude	Significance
Change in water quality	River Don (except for Make-Me-Rich Meadow)	Water quality	High Physico-Chemical WFD classification. Chemical quality is Good.	High	• Develop Pollution Prevention Plan, including spillage response measures, prior to construction. • Prepare appropriate method statements for working with and storing oils and chemicals in line with the requirements of the Control of Pollution (Oil Storage) Regulations 2001. • Contractor to implement a Construction Environmental Management Plan. • Design an Environmental Incident Control Plan (EICP) so protective measures are implemented to deal with both normal and emergency situations. • Contractors to undertake construction work to best practice standards. • Permanent drainage system to be developed early in construction. • Provide construction phase Surface Water Management Plan. • Limit works in-channel to times of low flows and sign-up to the Environment Agency flood warning system. • For any works in ordinary watercourses, such as obstructions to flow, Ordinary Watercourse Consent would be required from South Tyneside Council or Sunderland Council. • An Environmental Permit from the Environment Agency would be required for the works over or within 8m of the River Don. • Confirm support for Drainage Strategy with Environment Agency and local authorities.	Negligible	Neutral
		Dilution and removal of waste products	The river is of moderate size as it is the largest watercourse in the study area and is a main river. It receives discharges of treated sewage and storm water.	Medium		Negligible	Neutral
		Biodiversity	Good Biological WFD classification.	High		Negligible	Neutral
Flooding from increased surface water run-off		Conveyance of flow	Main watercourse.	High		Negligible	Neutral
Change in water quality	Land drain	Water supply / Quality	A land drain is situated adjacent to Mount Pleasant Marsh, north of the electricity sub-station.	Low		Negligible	Neutral
Change in water quality	Groundwater	Water supply / Quality	Water quality has not been assessed. Water abstraction from groundwater.	Medium		Negligible	Neutral
		Vulnerability	Low vulnerability for the majority of the Scheme.	Low		Negligible	Neutral
			High vulnerability east of Downhill Lane junction.	High		Negligible	Neutral
Change in water quality	Boldon Lake	Water quality	Water quality has not been assessed by the EA.	High		Negligible	Neutral
		Biodiversity	The pond is of high biodiversity value from Defra Higher Level Stewardship Farm Environment Plan.	Medium		Negligible	Neutral
Change in water quality	Mount Pleasant Marsh	Water quality	Water quality has not been assessed by the EA.	High		Negligible	Neutral
		Biodiversity	The pond is of high biodiversity value from Defra Higher Level Stewardship Farm Environment Plan.	Medium		Negligible	Neutral
		Recreation	West Boldon Environmental Education Centre hosts numerous educational visits and training events. The centre has a viewing and dipping platform.	High		Negligible	Neutral
Change in water quality	Make-Me-Rich Meadow (section of the River Don that flows through Make-Me-Rich Meadow)	Water quality	The River Don has High Physico-Chemical WFD classification. Chemical quality is Good.	High		Negligible	Neutral
		Biodiversity	Make-Me-Rich Meadow is a designated as a LWS.	High		Negligible	Neutral
Flooding from increased surface water run-off		Conveyance of flow	The section of the River Don that flows through Make-Me-Rich Meadow is considered as a small watercourse due to its size.	Low		Negligible	Neutral
Flooding from increased surface water run-off	Floodplain	Conveyance of flow	Localised floodplain where the A19, north of the Downhill Lane junction, crosses over the River Don. Also, areas adjacent to junction, Downhill Lane and A1290.	High		Negligible	Neutral
Increased sediment delivery to water column	River Don and tributaries	Fluvial geomorphology	River Don supports Good hydromorphological supporting elements.	High		Negligible	Neutral
Change in water quality	Hylton Dene Burn	Water quality	Hylton Dene Burn assumed to have Good Chemical status.	High		Negligible	Neutral
		Biodiversity	Local Nature Reserve with semi-natural woodland. Ecological status assumed to be Moderate	High		Negligible	Neutral

Potential Impact	Feature	Attribute	Indicator of Quality	Sensitivity	Mitigation	Magnitude	Significance
Flooding from increased surface water run-off	Hylton Dene Burn Floodplain	Conveyance of flow	No flood zones are identified; surface water risks exist.	High	See page above	Negligible	Neutral
Increased sediment delivery to water column	Hylton Dene Burn	Fluvial geomorphology	Assumed to support Good hydromorphological supporting elements	High		Negligible	Neutral
Disturbance to river banks and riparian vegetation	River Don and tributaries	Fluvial geomorphology	River Don Supports Good hydromorphological supporting elements.	High	Minimise work within 8 m of the watercourse. Where in-channel work is required (for construction of outfall headwall) minimise disturbance to bank and work in low-flow conditions where possible.	Minor adverse (temporary)	Slight adverse

Table 14-11: Summary of Potential Effects Arising from the Operation of the Scheme

Potential Impact	Feature	Attribute	Indicator of Quality	Sensitivity	Mitigation	Magnitude	Significance
Change in water quality	River Don (except for Make-Me-Rich Meadow)	Water quality	The River Don has High Physico-Chemical WFD classification. Chemical quality is Good.	High	Run-off from Catchment 4 and Catchment 6 would pass through new attenuation ponds before being discharged into the River Don.	Minor beneficial	Slight beneficial
		Dilution and removal of waste products	The river is of moderate size as it is the largest watercourse in the study area and is a main river. It receives discharges of treated sewage and storm water.	Medium		Minor beneficial	Slight Beneficial
		Biodiversity	Good Biological WFD classification.	High		Minor beneficial	Slight beneficial
Flooding from increased surface water run-off		Conveyance of flow	Main river.	High	Run-off from Catchment 4 and Catchment 6 would pass through attenuation ponds before being discharged into the River Don.	Minor beneficial	Slight Beneficial
Change in water quality	Land drain	Water supply / quality	A land drain is situated adjacent to Mount Pleasant Marsh, north of the electricity sub-station.	Low	n/a	Negligible	Neutral
Change in water quality	Groundwater	Water supply / quality	Water quality has not been assessed. Water abstraction from groundwater.	Medium	n/a	Negligible	Neutral
		Vulnerability	Low vulnerability for the majority of the Scheme.	Low	n/a	Negligible	Neutral
			High vulnerability east of Downhill Lane junction.	High	n/a	Negligible	Neutral
Change in water quality	Boldon Lake	Water quality	Water quality has not been assessed by the Environment Agency.	High	n/a	Negligible	Neutral
		Biodiversity	The pond is of high biodiversity value from Defra Higher Level Stewardship Farm Environment Plan.	Medium	n/a	Negligible	Neutral
Change in water quality	Mount Pleasant Marsh	Water quality	Water quality has not been assessed by the Environment Agency.	High	n/a	Negligible	Neutral
		Biodiversity	The pond is of high biodiversity value from Defra Higher Level Stewardship Farm Environment Plan.	Medium	n/a	Negligible	Neutral
		Recreation	West Boldon Environmental Education Centre hosts numerous educational visits and training events. The centre has a viewing and dipping platform.	High	n/a	Negligible	Neutral

Potential Impact	Feature	Attribute	Indicator of Quality	Sensitivity	Mitigation	Magnitude	Significance
Change in water quality	Make-Me-Rich Meadow (section of the River Don that flows through Make-Me-Rich Meadow)	Water quality	The River Don has High Physico-Chemical WFD classification. Chemical quality is Good	High	Runoff from Catchments 4 and 6 would pass through attenuation ponds before being discharged into the River Don.	Minor beneficial	Slight beneficial
		Biodiversity	Make-Me-Rich Meadow is a designated LWS	High	Runoff from Catchments 4 and 6 would pass through attenuation ponds before being discharged into the River Don.	Minor beneficial	Slight Beneficial
Flooding from increased surface water run-off		Conveyance of flow	The section of the River Don that flows through Make-Me-Rich Meadow is considered as a small watercourse due to its size.	Low	Runoff from Catchments 4 and 6 would be attenuated before being discharged into the River Don.	Minor beneficial	Neutral
Flooding from increased surface water run-off	Floodplain	Conveyance of flow	Localised floodplain where the A19, north of the Downhill Lane junction, crosses over the River Don. Also, areas adjacent to junction, Downhill Lane and A1290.	High	Runoff from Catchments 4 and 6 would be attenuated before being discharged into the River Don.	Negligible	Neutral
Increased erosion of channel bed and/or banks	Tributary of River Don	Fluvial geomorphology	River Don Supports Good hydromorphological supporting elements.	High	Direct the outfall downstream, keep outfall headwall flush with bank, minimise size of headwall.	Minor Adverse	Slight Adverse
Change in water quality	Hylton Dene Burn	Water quality	Hylton Dene Burn assumed to have Good Chemical status.	High	Runoff from Catchment 7 would pass through a new attenuation ditch with pond before discharging into an existing piped drainage system leading to the tidal River Wear via Hylton Dene Burn. Runoff from Catchment 8 would pass through a new attenuation pond before being discharged into an existing piped drainage system leading to the tidal River Wear via Hylton Dene Burn.	Minor beneficial	Slight Beneficial
		Biodiversity	Local Nature Reserve with semi-natural woodland. Ecological status assumed to be Moderate	High		Minor beneficial	Slight Beneficial
Flooding from increased surface water run-off	Hylton Dene Burn Floodplain	Conveyance of flow	No flood zones are identified; surface water risks exist.	High		Minor beneficial	Slight Beneficial
Increased sediment delivery to water column	Hylton Dene Burn	Fluvial geomorphology	Assumed to support Good hydromorphological supporting elements	High		Minor beneficial	Slight Beneficial

CHAPTER 15 CUMULATIVE EFFECTS ASSESSMENT

Executive summary

This chapter considers the potential for other developments or infrastructure projects to have effects that act cumulatively with those of the Scheme.

The potential for individual environmental receptors to be affected in more than one way by the Scheme alone (e.g. within multiple topics), and for those separate effects to act cumulatively, has been considered in the relevant specialist chapters of this Environmental Statement.

There were 9 short-listed other developments considered in cumulative effects assessment. The chapter concludes that IAMP Two would have the main effects that would act cumulatively with the Scheme; these include effects on visual amenity on NMUs and residential receptors, and the temporary and permanent loss of Grade 3b arable and grassland.

The Scheme's contribution to cumulative visual effects would be limited due to more adverse visual effects as a result of IAMP Two and by the screening effects from IAMP One, which was assumed to be built before this Scheme so forms part of the baseline for this environmental assessment. The Scheme's contribution to the loss of Grade 3b arable and grassland would be minimal relative to IAMP Two, which would require a larger area of temporary and permanent use within agricultural land.

15.1 Introduction

15.1.1 This chapter assesses the potential cumulative effects of the Scheme with other proposed developments.

15.1.2 At its simplest, cumulative effects occur as a result of changes caused by other reasonably foreseeable developments acting cumulatively with similar effects of a proposed development.

15.1.3 For the purposes of this cumulative effects assessment, this is different to 'inter-relationship effects between topics' that considers the combined effect of several different impacts of the Scheme, acting together on a single receptor, so that the combined effect is more significant than the sum of the individual effects. This is considered within the specialist topic Chapters 6 to 14 of this ES.

15.1.4 In order for two impacts to have a cumulative effect, the impacts need to have a temporal relationship (i.e. arise at broadly the same time) and a spatial relationship (i.e. occur in broadly the same geographic area).

15.1.5 This chapter has been prepared with reference to the Planning Inspectorate's 'Advice Note 17: Cumulative Effects Assessment'[133] and guidance on cumulative effects contained in DMRB Volume 11, Section 2 (Part 5)[134].

Scope of the cumulative assessment

15.1.6 It was considered most appropriate that the inter-relationships between topics would be addressed within the relevant specialist topic chapter, together with all other impacts on the same class of environmental receptor. This is consistent with the advice given in the Planning Inspectorate's Advice Note 17, paragraph 2.5.

15.1.7 Cumulative effects require a separate identification procedure and assessment method. Consequently, this chapter addresses cumulative effects of the Scheme with other proposed developments.

Traffic related effects

15.1.8 Several environmental topics base all or part of their impact assessment on information about the quantity of traffic on the road network in the wider area surrounding Downhill Lane junction, its distribution, speed and movement.

15.1.9 This information was derived from a computer-based traffic model that has built into it, in accordance with standard guidelines, assumptions about traffic growth over time so the future operational traffic forecasts take into account proposed developments and infrastructure projects in the surrounding region (see Section 5.4, in Chapter 5 of this ES, for more detail). This means that cumulative effects in relation to traffic are already built into these assessments and do not need to be covered again in this chapter.

15.1.10 Topics in this ES that base their assessment on traffic-based calculations are:

- Chapter 6 (Air Quality) – Operational air quality impact assessment.
- Chapter 12 (Noise and Vibration) – Operational noise and vibration impact assessment.
- Chapter 13 (People and Communities) – Driver stress analysis.
- Chapter 14 (Road Drainage and the Water Environment) – Water quality assessment (HAWRAT).

Limitations on the assessment

15.1.11 It is important to note that a full cumulative effects assessment can only be undertaken for developments for which some environmental information is available. Only by identifying the independent impacts of each development can the effects be compared with those of the Scheme.

15.1.12 In some cases, little or no environmental information was available as some developments did not require environmental information to be submitted as part of the planning application or because the project had not progressed to the point of generating or publishing reports in relation to environmental information or effects (see Appendix 15.1 for further details).

15.2 Legislation and policy framework

Legislative context

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2009

15.2.1 Schedule 4 Part 1 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 requires an ES to include:

15.2.2 "*A description of the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the* development…".

[133] The Planning Inspectorate 2015 'Cumulative Effects Assessment', Advice Note 17. https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2015/12/Advice-note-17V4.pdf

[134] DMRB Volume 11, Section 2, Part 5, 'Assessment and management of environmental effects', Chapter 1 paragraphs 1.53-1.60 and Chapter 2 paragraphs 2.13-2.16. http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section2/ha20508.pdf

15.2.3 This information is provided in the individual topic chapters of this ES (Chapters 6 to 14). The likely significant cumulative effects are considered in this chapter.

Planning policy

National Policy Statement

15.2.4 The National Policy Statement for National Networks (NNNPS) paragraph 4.3 states that the Examining Authority and the Secretary of State should take into account a development's potential adverse impacts, including any longer-term and cumulative adverse impacts.

15.2.5 Paragraph 4.15 refers to the information to be provided as part of the ES, including cumulative effects. That information is provided in this chapter, and in the individual topic chapters of this ES (Chapters 6 to 14). The ES needs to provide information on how the effects of the applicant's proposal would combine and interact with the effects of other developments (NNNPS paragraph 4.16) and the Examining Authority should consider how the cumulative effects and interaction between effects may affect the environment even when they may be considered acceptable on an individual basis with mitigation in place (NNNPS paragraph 4.17). Those aspects have been taken into account in the assessment of inter-relationships between topics in the individual topic chapters and the cumulative effects assessments below.

15.2.6 NNNPS paragraph 4.55 states that the Secretary of State should be satisfied that "*the effects of existing sources of pollution in and around the project are not such that the cumulative effects of pollution when the proposed development is added would make that development unacceptable, particularly in relation to statutory environmental quality limits*".

15.2.7 Potential pollution concerns are addressed in Chapter 6 (Air Quality), Chapter 9 (Ecology and Nature Conservation), Chapter 12 (Noise and Vibration) and Chapter 14 (Road Drainage and the Water Environment). The ES should also describe the cumulative effects on the water environment, as outlined in paragraph 5.223 of the NNNPS; this is addressed in this chapter.

Local Planning Policy

15.2.8 There are cumulative impact policies set out in the local and regional development plans for South Tyneside, City of Sunderland and Gateshead. However, the International Advanced Manufacturing Park (IAMP) Area Action Plan 2017-2032 is the most relevant local planning policy in relation to the assessment of cumulative effects by developments near this Scheme.

15.2.9 Policy EN4 within the IAMP Area Action Plan seeks to take into account the cumulative effects on air quality, noise, odours and dust; these were considered within the cumulative effects assessment of this chapter.

15.3 Assessment methodology

Scoping the cumulative effects assessment

15.3.1 Guidance on the identification of other projects that should be taken into account in the consideration of cumulative effects is available in DMRB[135] and from Table 3 in PINS Advice Note 17, which is reproduced here as Table 15-1 with some expansion to take more account of projects going through consenting regimes other than the Planning Act 2008 (PA2008).

Table 15-1: 'Other development' for inclusion in Cumulative Effects Assessment (based on Planning Inspectorate Advice Note 17 Table 3)

Tier 1	Projects under construction.	Decreasing level of detail likely to be available ↓
	Permitted applications whether under PA2008 or other regimes, but not yet implemented.	
	Submitted applications whether under the PA2008 or other regimes, but not yet determined.	
Tier 2	Projects on the Planning Inspectorate's Programme of Projects where a Scoping Report has been submitted. Potential applications under other regimes where the competent authority has issued a statutory EIA Scoping Opinion and a Scoping Report or Environmental Report is available.	
Tier 3	Projects on the Planning Inspectorate's Programme of Projects where a Scoping Report has not been submitted.	
	Potential applications under other regimes where the competent authority has not issued a statutory EIA Scoping Opinion and there is no Environmental Report or Scoping Report available.	
	Identified in the relevant Development Plan (and emerging Development Plans – with appropriate weight being given as they move closer to adoption), recognising that much information on any relevant proposals will be limited.	
	Identified in other plans and programmes (as appropriate) which set the framework for future development consents/approvals, where such development is reasonably likely to come forward (e.g. highway schemes to which the Secretary of State has made a commitment in the Roads Investment Strategy).	

15.3.2 Where other projects are already complete or expected to be completed before construction of a NSIP, the effects arising from these developments should be considered as part of the EIA baseline and potentially as part of both the construction and operational assessment. Section 5.4, in Chapter 5 of this ES, describes third party developments which have been considered within the future baseline for the assessment of construction and operational effects of the Scheme, and which have been considered for the cumulative effects assessment.

15.3.3 Relevant 'other developments' considered in the cumulative effects assessment were identified by the staged process outlined in Section 15.4 of this chapter.

Study area (zone of influence)

15.3.4 The primary method used to identify the potential impacts was through plotting a zone of influence around the Scheme DCO boundary. For the purposes of this assessment, the footprint is defined by the DCO boundary, as this captures the temporary and permanent footprint of the works.

[135] Design Manual for Roads and Bridges, Volume 11, Section 2, Part 5 (HA205/08), paragraphs 1.54 and 1.58

15.3.5 The zone of influence is the area in which the Scheme could potentially have significant effects on environmental receptors. It was established by identifying the study areas used to assess each environmental topic in this ES. These study areas, used within specialist topic Chapters 6 to 14, were taken to represent the individual zones of influence for each environmental topic as summarised in Table 15-2.

Table 15-2 Environmental topic zone of influence

Environmental topic	Zone of Influence	
	Construction	Operation
Air Quality	The zone of influence was defined as a 200 m buffer around the Scheme DCO boundary and of any 'other affected roads' as defined in Chapter 6.	Operational air quality effects are assessed within ES Chapter 6; see paragraph 15.1.10 in this ES chapter.
Cultural Heritage	Direct impacts on cultural heritage were assessed within a 200 m buffer around the Scheme DCO boundary, whilst a 1 km buffer was applied for setting effects.	
Landscape and Visual Effects	A 2 km zone of influence from the DCO boundary was used for landscape and visual effects around the footprint of the Scheme.	
Ecology and Nature Conservation	A 500 m buffer around the Scheme DCO boundary was used to carry out field surveys for ecological habitats and species, and a 2 km buffer was used to identify any designated sites around the footprint of the Scheme.	
Soils and Geology	The effects on soils and geology were considered within the Scheme DCO boundary, plus surrounding soils and geology for sources of contamination up to 250 m beyond the DCO boundary.	
Materials	Materials needs and waste arising are identified from within the Scheme DCO boundary, whilst potential sources of materials (such as quarries) and waste management facilities were considered on a regional basis, as defined in Chapter 11 of the ES.	
Noise and Vibration	DMRB requires a study area to be defined as an area within 1 km of the Scheme DCO boundary. The study area should also cover an area 50 m from any 'affected links beyond this 1 km boundary'. An affected link is one where there is the potential for traffic flow/speed/composition to result in a change in noise of >1dB.	Operational noise effects are assessed in ES Chapter 12; see paragraph 15.1.10 in this ES chapter.
People and Communities	For assessment of physical assets in general a 100 m buffer corridor was applied around the Scheme DCO boundary. Professional judgement was applied in deciding the relevance of individual receptors, taking into account the size of the property, ownership and access routes.	Effects in relation to driver stress during operation are captured within ES Chapter 13; see paragraph 15.1.10 in this ES chapter. For parts not captured within the traffic model based assessments, a 100 m buffer was applied around the Scheme DCO boundary.
Road Drainage and Water Environment	A 500 m buffer around the Scheme DCO boundary was used in accordance with DMRB guidance. Professional judgement was also used to identify drainage and water receptors within 1 km from the footprint of the Scheme, plus any potential downstream effects.	Effects in relation to risk to water quality from routine drainage run-off and from accidental spillages on the highway during operation are within ES Chapter 14; see paragraph 15.1.10 in this ES chapter. For other effects, a 500 m buffer was applied around the Scheme DCO boundary. Professional judgement was also used to identify any water receptors within 1 km from the Scheme DCO boundary, plus any downstream effects.

15.3.6 In order to identify a long-list of other developments, an overall zone of influence was established. This was done by combining the zones of influence identified in Table 15-2, excluding those effects covered by the traffic modelling-based assessments (see paragraph 15.1.10 in this chapter) presented within specialist topic chapters and the Material topic's regional level study area that would make the assessment disproportionate.

15.3.7 In effect this resulted in an overall zone of influence defined by a 2 km buffer around the Scheme's DCO boundary, based on the buffer used for landscape and visual and ecology to capture the most spatially distant receptors considered in the environmental assessment.

15.3.8 It was important to recognise that on this basis other developments could have a similar 2 km zone of influence. As a consequence, for a third party development less than 4 km from the Scheme there could be a spatial overlap of their respective overall zones of influence and therefore potential for a cumulative effect. Therefore, the search area for other developments for potential cumulative effects was initially identified as 4 km from the Scheme's DCO boundary.

15.3.9 However, for those receptors identified within 2 km of the Scheme DCO boundary, the topic assessments (i.e. excluding those listed in paragraph 15.3.11, below) identified no receptors

would be to be affected beyond 1 km from the Scheme. Therefore, the overall zone of environmental influence by the Scheme was reduced to 1 km, which in turn reduced the overall 'other development' search area to a 3 km buffer (see Figure 15-1 in Volume 3 of this ES); in this way achieving a proportionate search for potential cumulative effects.

15.3.10 As discussed in Section 1.5 of Chapter 1 in this ES, the cumulative effects of Scheme established the overall zone of environmental influence by only using the DCO boundary for a standalone Scheme (i.e. without the Testo's main site compound or Bridleway B46 areas).

15.3.11 It must be noted that for some environmental topic assessments, some receptors did not fall within the environmental topic study areas as outlined in Table 15-2 but were included in the environmental topic assessments due the sensitivity of the receptors or were included based on professional judgement by environmental topic specialists. These receptors would be included in the cumulative effects assessment, and identified as:

- Noise receptors identified at a retail park at Spire Road south-west of Hillthorn Farm, and a section of the A1231 near Barmston Interchange.
- Scot's House a historic Grade II* Listed Building which lies approximately 1.8 km to the north-west of Downhill Lane junction, adjacent to the A184.

Identification of a long-list of other developments

15.3.12 A long-list of other developments within the overall search area of 3 km from the Scheme's DCO boundary was identified by considering any development projects included on:

- the Planning Inspectorate's list of Nationally Significant Infrastructure Projects (NSIPs) (as defined by The Planning Act 2008); and
- any major development sites (as defined in the Town and Country Planning (Development Management Procedure) (England) Order 2015) on the following Local Planning Authority online planning registers: South Tyneside, Gateshead and City of Sunderland.

15.3.13 The search included applications submitted within the last 5 years which is the maximum period a planning application can be valid for. Furthermore, land allocation sites were identified by the following local development plans:

- South Tyneside Local Development Framework – Site Specific Allocations (South Tyneside Council, 2012);
- Core Strategy and Urban Core Plan for Gateshead and Newcastle upon Tyne 2010-2030 (Gateshead Council, 2015);
- Draft Core Strategy and Development Plan 2015-2033 (Sunderland City Council, 2017);
- South Tyneside Strategic Housing Land Availability Assessment (SHLAA 2012/13 – 4th Edition) (South Tyneside Council, 2013);
- Strategic Housing Land Availability Assessment (SHLAA) and Five Year Housing Land Supply (Gateshead Council, 2013);
- Strategic Housing Land Availability Assessment 2017 (Sunderland City Council, 2017);
- South Tyneside Employment Land Review (South Tyneside Council, 2011);
- Gateshead Employment Land Review Update and Office Capacity Study (Gateshead Council, 2012); and
- Sunderland Employment Land Review 2016 (Sunderland City Council, 2016).

15.3.14 Upon completion of a long-list of other projects, relevant stakeholders, such as the Local Planning Authorities, were consulted to identify any additional projects to be included and to agree the final long-list of other developments (see Appendix 15.1 in Volume of the ES).

Identification of a short-list of other developments

15.3.15 In order to identify a short-list of other developments, inclusion and exclusion criteria were established using guidance stated in the PINS Advice Note 17 and DMRB Volume 11, which was then applied to the long-list of other developments. This took place in the following order of events:

- The degree of certainty of each development was considered through assigning a tier to each development based on Table 15-1. Tier 3 projects were excluded from the short-list (except where professional judgement deemed it necessary for them to be included) as these projects were least certain and most likely to have limited publicly available information to inform the cumulative effects assessment.
- Tier 1 and Tier 2 projects were excluded where environmental information was not available, or where there was insufficient detail within environmental reports to inform cumulative effects assessment.
- Tier 1 and Tier 2 projects were further screened by identifying whether there was a temporal and spatial overlap between other developments and the Scheme.
    - Temporal overlap was established by comparing the construction and operational timescale of the Scheme with the construction, operation and decommissioning of other developments.
    - The study areas used for the environmental assessments of the other developments were taken to represent their geographic zone of influence. This was compared against the overall zone of influence of the Scheme to establish any spatial overlap.
    - Where the geographic zone of influence of another development overlaps with the overall zone of influence of the Scheme, the receptors relevant to each topic within the area of overlap were identified. If such a receptor was present, and there was also an overlap between the time periods in which the impacts would occur, then the potential for a cumulative effect was considered.
- Consideration of any other relevant factors and professional judgment was used in order to avoid excluding other developments that would be close to zones of influences, but have characteristics likely to give rise to a significant effect or that could give rise to a cumulative effect by virtue of proximity to the Scheme.
- Similarly, professional judgement was applied to other developments that exceeded the threshold, but were not likely to give rise to discernible effects.

The nature and significance of potential cumulative effects

15.3.16 In identifying cumulative effects, consideration was given to the various different ways in which cumulative effects can occur. In particular:

- Cumulative effects can be 'additive' (e.g. one source of pollution can add to another source of pollution to create a higher concentration of pollutant than would otherwise

occur, or an area of habitat could suffer loss of land from one development and then further loss of land from another development).

- Cumulative effects can also be 'synergistic', where for instance a habitat may be affected by loss of land from one development and pollution or noise from another, resulting in a combined significant effect.
- It is important to recognise whether either or both of the impacts giving rise to the cumulative effect are temporary or permanent, and if temporary over what timescale.
- The geographic extent of the cumulative effect relative to both the extent of the receptor and the extent of the individual effects.
- If the effect is intermittent (i.e. what is its frequency).
- The value/sensitivity of the receptor and how susceptible is the effect to being successfully mitigated.

15.3.17 Any cumulative effects identified were further defined as 'construction' or 'operational' effects, 'short-term' or 'long-term' (based on whether they would still be felt 15 or more years after construction) and 'beneficial' or 'adverse'.

Assessment of cumulative effects

15.3.18 The short-listed developments would not affect all the same receptors as the Scheme, as not all the individual topic zones of influences would spatially overlap with the Scheme's overall zone of influence. Therefore, a simple tabulated analysis identified which of the Scheme's topic receptors may share the potential for a cumulative effect (see Appendix 15.3 in Volume 3 of the ES). In this way each topic could also consider the combined cumulative effect of all the developments likely to affect a common receptor.

15.3.19 The DMRB guidance Volume 11, Section 2 (Part 5)[136] sets out a specific methodology for the assessment of the significance of cumulative effects; Table 15-3, below, replicates Table 2.6 from the DMRB guidance on how to determine the significance of cumulative effects.

Table 15-3: Determining the significance of cumulative effects

Significance	Effect
Severe	Effects that the decision-maker must take into account as the receptor/resource is irretrievably compromised.
Major	Effects that may become a key decision-making issue.
Moderate	Effects that are unlikely to become issues on whether the project design should be selected, but where future work may be necessary to improve on current performance.
Minor	Minor effects that are locally significant.
Not significant	Effects that are beyond the current forecasting ability or are within the ability of the resource to adapt to such change.

15.3.20 It was recognised that stakeholders were particularly interested to understand the cumulative effects arising from the Scheme being constructed and operated at similar times to the IAMP Two development.

15.3.21 As discussed in Section 5.4, in Chapter 5 of this ES, it was assumed that before the Scheme starts construction IAMP One will have been built and be fully operational; therefore, IAMP One is treated as a commercial receptor in the cumulative effects baseline. Similarly, the Testo's scheme has been incorporated within the future baseline for the Scheme as being under construction and operational in the same timeframes as the Scheme. Therefore, the Testo's scheme is also not presented in this chapter as a short-listed third-party development; however, the Testo's scheme is considered as under construction in the assessment of construction cumulative effects and fully built and operational in the assessment of operational cumulative effects.

15.3.22 For many of the short-listed developments, it could also be assumed that construction activity would begin at the latest between 2018 and 2019 based on reviewing the decision notices of the short-listed developments; however, the exact dates are less certain due to limited available information.

15.3.23 On this basis, the construction and operational cumulative effects assessment considered the following two worst-case scenarios, as all alternative scenarios would comprise a mix of these worst-case cumulative effects:

- **Construction effects** - all the short-listed developments would be under construction at the same time.
- **Operational effects** - all the short-listed developments would be operational at the same time.

15.3.24 In order to assess these two scenarios the cumulative assessment assumed that:

- The Scheme and Testo's scheme would share use of the Testo's main site compound (see Chapter 2 of this ES on the shared use of the Testo's main site compound).
- All IAMP Two construction and permanent works areas would be predominantly located west of the A19.
- The proposed local road network improvements would all be constructed in accordance with the Area Action Plan as adopted by the local authorities in late 2017. This would include the dualling of the A1290 and the construction of a new vehicular bridge (known as the Washington Road bridge) over the A19 south of the A19 Downhill Lane junction.
- The following features west of the A19 and south of the A184 would be permanently removed by the creation of the IAMP Two development upon commencement of construction and would not be considered as receptors in this cumulative effects assessment:
  - Three Horse Shoes (public house);
  - North East Land Sea and Air Museums;
  - football pitches north of North East Land Sea and Air Museum;
  - Footpath B22;
  - Make-me-Rich Farm (residential and commercial);
  - West Moor Farm (residential and commercial);
  - West Moor Farm Cottage (residential);
  - Woodland View Lodge (residential);

[136] DMRB Volume 11, Section 2, Part 5, 'Assessment and management of environmental effects', Chapter 2 paragraphs 2.13-2.16. http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section2/ha20508.pdf

- Usworth Cottages No.s 1- 5 (residential);
- The Chalet (residential); and
- Downhill Lane west of the A19.

- For the operational assessment, IAMP Two would have created new offices and other business unit facilities, with land near the existing Three Horse Shoes becoming a Hub with a Hotel, Café, Conference Facilities, Gym and Nursery. IAMP Two would also have converted Elliscope Farm into office buildings.
- The proposed development on land north of Nissan Agricultural Land (west of the A19, east of the A1290 and north of Washington Road), known as 'Wearpoint 55', is located within the footprint of the IAMP Two scheme. Since IAMP Two overlaps with the footprint of Wearpoint 55, it was assumed for this cumulative effects assessment that a development within this footprint (either IAMP Two or Wearpoint 55) would exist adjacent to the A19 Downhill Lane Junction Improvement Scheme and the effects would be broadly similar. As the footprint of IAMP Two would be larger and in order to take into account the environmental worst-case, IAMP Two was used in the assessment as it would cover the footprint and potential effects of Wearpoint 55.
- Since environmental information for IAMP Two was limited at the time of this assessment, the environmental assessment carried out by Wearpoint 55 was used to inform the cumulative effects where the footprint overlaps.

15.4 Baseline conditions

Short-listed Developments

15.4.1 Figure 15.1 shows the Scheme's overall zone of influence, whilst Figures 15.2 and 15.3 and Appendices 15.1 and 15.2 of this ES present the long and short-list of developments identified in January 2018 and updated in June 2018 and October 2018 for consideration for potential cumulative effects. The shaded developments in Appendix 15.1 were screened out from being short-listed for the cumulative effects assessment using the criteria outlined in 15.3.15, above.

15.4.2 A total of 73 developments were included in the long-list. After filtering, nine developments were considered relevant for the cumulative effects assessment (see Appendix 15.2). These developments are shown on Figure 15.3 and are identified as the following:

- **ID1**: Land north of Nissan Agricultural Land (west of the A19, east of A1290 and north of Washington Road) - known as the 'Wearpoint 55' development;
- **ID2**: International Advanced Manufacturing Park (IAMP Two), Washington Road, Usworth;
- **ID3**: Land West of Cotswold Lane and North of Hutton Street Boldon Colliery Now 1-34 Colliery Mews (exc 13);
- **ID4**: Land at Hillthorn Farm, Washington, NE37 3HZ (Renewable Energy Centre);
- **ID5**: Follingsby Park, South Follingsby Lane, Gateshead;
- **ID6**: Land at Nissan European Technology Centre, Nissan Way, Washington;
- **ID7**: Land at Hillthorne Farm, Washington (Employment);
- **ID8**: Land at Hillthorne Farm, Washington (Transport Infrastructure); and
- **ID9**: Land at and adjacent to Nissan Way, Barmston Lane and Barmston Pond, including Land at Nissan Motor Manufacturing (UK) Ltd, Washington.

15.4.3 The level of environmental information available to inform the cumulative effects assessment varied amongst the short-listed developments.

15.4.4 Environmental Statements (ESs) were produced for projects ID1, ID4, ID5, ID7, ID8 and ID9 and used to inform the cumulative effects assessment.

15.4.5 No ESs were produced for ID2, ID3, and ID6. However, topic specific environmental assessment reports, where available, were used to inform the cumulative effects assessment.

15.4.6 A preliminary Environmental Report and a Design Plan (containing details of the footprint of IAMP One and Two) of the IAMP were used to inform the cumulative effects assessment of IAMP Two, as environmental information was limited at the time of the assessment. Though a recently rejected planning application, ID1 was retained as a short-listed development as it provided an ES that was used to inform the cumulative effects assessment where IAMP Two and ID1 footprints overlap (see assumptions in Section 15.3 of this chapter).

15.4.7 The short-listing of these developments is presented in more detail in Appendix 15.1 of this ES, whilst Figure 15.4 shows their site boundaries in relation to the DCO boundary and overall zone of influence of the Scheme.

15.4.8 In mid-December 2018 Sunderland City Council received a new planning application for an 8.9 ha greenfield development west of the Nissan Plant, known as Hillthorn Business Park (planning application reference 18/02195/FU4). It was not possible to consider the proposed development in this chapter before finalising the ES, but the proposed development area encompasses the same footprint as ID4, ID7 and ID8 combined; therefore, the likely potential cumulative effects have been considered.

Relevant Highway Developments

15.4.9 In addition to future year housing and employment developments, the treatment of uncertainty in model forecasting also needed to include any proposed highway infrastructure schemes. Highway developments within the surrounding areas of the Scheme that could influence the traffic flows in this area were identified and used in the traffic model and are listed in Table 15-4[137].

15.4.10 This chapter only considered any physical impacts from these highway schemes as the traffic impacts have already been considered through the incorporation of these changes within the traffic model. The only highway scheme to have any significant physical influence would be the Testo's scheme, which is within the construction and operational assessment baselines as described by Section 5.4 in Chapter 5 of this ES.

Table 15-4: Highway Scheme Uncertainty Log Summary

Local Authority	Scheme Name / Type	Uncertainty
Highways England	Moor Farm (Built)	Near Certain
	Seaton Burn (Built)	
	Coast Road (Under Construction)	

[137] The A19 Downhill Lane Junction Improvement Scheme Transport Assessment Report (Arup, January 2019); (DCO application document reference TR010024/APP/7.4).

Local Authority	Scheme Name / Type	Uncertainty
	Testo's Junction Major Improvement (A19(T) / A184)	
	Howdon Interchange (A19(T) / A193) (LNMS)	More than likely
	Killingworth Interchange (A19(T) / A1056) (LNMS)	
	A19 Northbound Widening between A194 Lindisfarne and A185 Southern Portal	
	A1 Birtley to Coalhouse Improvement	
Sunderland	A19/A690 (Built)	Near Certain
	A19/A1231 (Built)	
	Cherry Blossom Way Realignment, Nissan Way Dualling, Hilthorne Farm Link/A1290 Realignment (assumed to open in 2022)	
	St Marys Way Realignment (SSTC Phase 1)	
	New Wear Bridge (SSTC Phase 2)	
	Highway Infrastructure associated with IAMP including Washington Road Bridge (assumed to open after 2022)	More Than Likely
South Tyneside	Lindisfarne Corridor Improvements (Built)	Near Certain
	A19/A1290 Junction Improvements (Built)	
	The Arches Roundabout (Strategic Economic Plan)	
	A194/B1306 Signalisation	
Gateshead	A184 / A185 / B1426 Heworth Roundabout. Junction upgrade scheme - Signalised crossroads	Near Certain
North Tyneside	Whitehouse Farm – Buffer Area (106 / 278)	Near Certain
	High Flatworth Roundabout (106 / 278)	
	Four Lane Ends - Buffer Area (Pinchpoint)	
	Scaffold Hill, West Shiremoor Amendments (106 / 278)	
	A192 West Park Highway Mitigations (Built)	
	Holystone Roundabout Cobalt Road Improvements (Built)	
	A19 Dualling and associated Cobalt Road Improvements (Built)	
	A1058 / Norham Road	Reasonably Foreseeable
	Billy Mill Roundabout, LEP Bid	

15.5 Potential impacts (without mitigation)

15.5.1 Appendix 15.1, in Volume 3 of this ES, presents the screening process for identifying which receptors were shared between the Scheme and the short-listed developments, and therefore considered for cumulative effects assessment.

15.5.2 Traffic flows are a key factor influencing the environmental effects of the Scheme in conjunction with other developments. Other developments within the region that may affect traffic flows through Downhill Lane junction have been identified for the traffic model through the development of a 'traffic uncertainty log'.

15.5.3 The traffic model considers large-scale developments in the wider surrounding region, in terms of the volumes that these developments are expected to generate and any expected change in the pattern of traffic on the highway network. The region within which developments have been identified for inclusion in the traffic model is extensive.

15.5.4 The traffic uncertainty log considered a total of 842 development proposals and ranked them by both scale and certainty of occurrence. Those proposals ranked 'near certain' or 'more than likely' to occur that met the scale criteria were included in the traffic model 'core scenario', which was used for modelling environmental impacts. Of the 842 overall proposals in the uncertainty log, a total of 86 met these criteria (11 employment proposals; 69 housing proposals 3 office proposals; 2 retail proposals; one mixed proposal).

15.5.5 As a consequence of the traffic model including traffic changes related to the other developments, those assessments using traffic modelling data (see above paragraph 15.1.10 in this chapter) would have already considered the cumulative effect of traffic changes in the main assessment. Therefore, these cumulative effects were not considered again in this chapter. Instead, the cumulative effects assessment focused on the assessments which did not make use of the traffic modelling data and their respective overlapping operational zones of influence.

15.5.6 Other than ID2 and ID8, other highways schemes identified in Table 15-4 were not considered further in the cumulative effects assessment, as they were not located within the overall 3 km search area or were screened out using the above short-listing criteria.

Air quality, noise and vibration

Workers at IAMP One and residential receptors at Town End Farm and Capetown Road

15.5.7 For workers in IAMP One and residential receptors at Town End Farm and Capetown Road, there would be risk of additive and synergistic cumulative impacts in relation to the potential noise and air pollution construction cumulative impacts from ID2 and the Scheme due to construction works and traffic near these receptors.

15.5.8 There would be no other shared receptors between the Scheme, ID1 and ID3 to ID9 in relation to air quality and noise and vibration. Therefore, these developments were not considered further for cumulative impacts in relation to air quality and noise and vibration.

Cultural heritage

15.5.9 Chapter 7 (Cultural Heritage) of this ES identified no significant residual effects on cultural heritage receptors during construction or operation of the Scheme. All effects were identified to be Neutral (no effects). Therefore, there would be no contribution to cumulative impacts by the Scheme, so cultural heritage was not considered further in the cumulative effects assessment.

Landscape and visual effects

Landscape impacts

Landscape character

15.5.10 The Scheme and short-listed development ID2 would have potentially prominent adverse additive cumulative impacts on the landscape character of Landscape Character Units (LCU) 1, 2, 5, 8 and 9 (a, b &c) in combination with the Scheme (see Figures 8.2 and 15.4 in Volume

2 of the ES); additional to the baseline changes by IAMP One and the Testo's scheme. This would be due to loss of vegetation, change in field pattern, introduction of new landform features and a reduction in tranquillity and visual amenity.

15.5.11 There would be no other shared LCUs with the Scheme and the rest of the short-listed developments. Therefore, these developments were not considered further for cumulative impacts in relation to landscape character.

Visual impacts

15.5.12 Short-listed developments ID1 to ID9 were considered in relation to potential adverse additive cumulative visual impacts on views from Penshaw Monument. The landscape and visual assessment for the Scheme in Chapter 8 did not predict adverse visual effects on Penshaw Monument, plus Elliscope Farm was not assessed in the construction assessment and only experienced a Neutral visual effect in the operational assessment. Therefore, cumulative visual impacts on Penshaw Monument or Elliscope Farm were not considered further in this chapter. Similarly, no Scheme impacts were anticipated on:

- residents at West House Farm Cottage, Scot's House, Mansion House, Hylton Grove Farm, Hylton Bridge Farm, Mount Pleasant Farm or in West Boldon and Fellgate;
- occupants of North Moor Farm due to the screening provided by the IAMP One buildings;
- attendees of the Gateshead College Skills Academy;
- workers at West House Farm, the Nissan Plant and My Pet Store; and
- users of Bridleway B28, Travelling Man Public House and West Boldon open space.

15.5.13 Except for ID2, which is explained further below, there were no other shared receptors between the Scheme and the rest of the short-listed developments in relation to visual impacts. Therefore, these short-listed developments were not considered further for cumulative impacts in relation to visual impacts.

15.5.14 There would be potential adverse additive cumulative impacts on views obtained by the visual receptors described below. This would be due to the construction and/or operation of the Scheme and ID2, plus the Testo's scheme, occurring within the same timescale and spatially close to one another.

15.5.15 Generally, additional to those for the Testo's scheme, within the construction baseline, there would be short-term impacts on views towards temporary construction works for the Scheme construction works, Testo's scheme construction works, industrial buildings at ID2, site compounds and storage and laydown areas. Vegetation loss during construction would also change the character of views resulting in adverse cumulative impacts in the medium to long-term. The presence of moving traffic and industrial buildings would also result in permanent adverse impacts on views during operation of the Scheme and ID2, in addition to the Testo's scheme in the baseline.

Users of WBEEC

15.5.16 During construction, there would be adverse additive cumulative impacts on views from this receptor due to distant views of construction works for the Scheme and ID2; additional to the baseline change in the foreground of views created by the construction of the Testo's scheme.

15.5.17 During operation, there would be more distant views towards buildings at ID2 and vegetation loss and new structures at the Downhill Lane junction, in addition to new structures in the baseline at Testo's junction.

Users of Footpath B29 and residents at West Pastures Travelling Community Site

15.5.18 During construction, there would be adverse additive cumulative impacts on views from these receptors due to construction activity at ID2 in addition to the baseline construction presence of the Testo's scheme, with more distant views towards construction activity at Downhill Lane junction.

15.5.19 During operation, buildings at ID2 would be very apparent. However, the Scheme would be predominantly screened by buildings at ID2.

Users of Footpath B27

15.5.20 For users of Footpath B27, views during construction (once re-opened by the Testo's scheme) would be dominated by construction works for ID2, with only glimpsed views towards construction works for the Scheme; in addition to any remaining construction phase work or new structures at the Testo's scheme.

15.5.21 During operation, buildings at ID2 would be very apparent. However, the Scheme would be predominantly screened by buildings at ID2.

Users of Bridleway B46

15.5.22 For users of Bridleway B46 (once re-opened by the Testo's scheme), there would be close-range views to the any remaining construction phase work or newly constructed structures at the Testo's scheme in the foreground to the west, with construction works for large scale buildings ID2 behind because of loss of vegetation along the A19. Views towards construction works for the Scheme would be also visible to the to the south.

15.5.23 During operation, vegetation loss along the A19 and at Downhill Lane junction, would be highly apparent, with more open views of traffic and new structures at Downhill Lane junction; in addition to the traffic and new structures at Testo's junction in the baseline. Views towards buildings at ID2 would be more glimpsed, but would be prominent due to the scale of the development.

Residents on Lawn Drive, at the Downhill Lane Farm complex, along the north-western edge of Town End Farm and users of Downhill Lane east of the junction

15.5.24 During construction, receptors to the east would experience adverse additive cumulative impacts due to having elevated and/or close-range views towards construction works for ID2 and the Scheme; additional to the baseline changes in views due to the Testo's scheme construction works.

15.5.25 During operation, views from Town End Farm would see more traffic and structures at Downhill Lane junction due to vegetation loss on Washington Road. The buildings at ID2 would be apparent due to the elevated or close-range nature of views and due to the scale of the development.

Residential receptors along the western edge of Town End Farm

15.5.26 During construction, there would be adverse additive cumulative impacts on views from these receptors due to construction works for ID2 and the Scheme. Views would be predominantly screened by retained vegetation along the residential edge; However, glimpsed views would be visible to construction of the Scheme NMU footbridge and the new Washington Road bridge over the A19 as part of ID2.

15.5.27 During operation, there would be glimpsed views towards buildings at ID2 and new bridge structures to the west.

Users of the shared cycleway/footway along A1290 from Downhill Lane junction to Cherry Blossom Way (via Washington Road)

15.5.28 For users of the shared cycleway/footway along the A1290 from Downhill Lane junction to Washington Road, there would be adverse additive cumulative impacts on views due to construction works at the Scheme and for buildings within ID2. Most of the works for the Scheme would be screened by works at ID2 and the existing IAMP One buildings in views to the north from the southern part of the cycle route on Washington Road.

15.5.29 During operation, views towards the Scheme would be predominantly screened by buildings at ID2 and the existing IAMP One from the south-west of the route, which would be the most prominent features in views. Vegetation loss at Downhill Lane junction would be perceptible.

Workers within IAMP One buildings

15.5.30 During construction, workers at IAMP One would have adverse close-range views of construction works for ID2, with views towards construction works for the Scheme against the backdrop of the Testo's construction works in the baseline. The change in views would primarily be attributable to ID2.

15.5.31 During operation, there would be adverse close-range views of buildings at ID2 and the Scheme. Vegetation loss at the road junction of the Scheme would be perceptible.

Users of the NMU routes running through IAMP One complex (including along Follingsby Lane)

15.5.32 For users of the main spine road of IAMP One, there would be adverse additive cumulative impacts on views due to construction works at the Scheme and for buildings within ID2. Most of the works for the Scheme would be screened by buildings within the IAMP One complex and works at ID2. Similarly, views from the dedicated NMU route along the alignment of Follingsby Lane would be contained within IAMP One complex, apart from at either end whereby on the eastern end, views would extend to construction of ID2 and the Scheme in longer distance views. To the northern end, views would be to the construction works for ID2 and with glimpsed and long-distance views to the Scheme.

15.5.33 During operation, views towards the Scheme would be predominantly screened by buildings at ID2 and the existing IAMP One, apart from the eastern most points of the routes when joining back to the A1290.

Users of the shared cycleway/footway along Washington Road and Washington Road footbridge

15.5.34 For users of the shared cycleway/footway along Washington Road and from the footbridge, there would be close-range views towards construction works for the Scheme and ID2, including the new Washington Road bridge over the A19.

15.5.35 Vegetation loss due to these schemes would be prominent and would open up views towards construction works additional to the baseline construction presence of the Testo's scheme.

15.5.36 During operation, vegetation loss would result in more open views of traffic on the A19 and at Downhill Lane junction, with open views towards the new bridge structures of the Scheme as well as buildings and the new Washington Road bridge over the A19 as part of ID2.

Ecology and nature conservation

Statutory and non-statutory sites

15.5.37 Only ID3 and ID6 presented a potential risk of additive cumulative impacts on shared Local Wildlife Site (LWS) receptors with the Scheme; it is worth noting that no risks to internationally or nationally designated sites or protected species were identified for the Scheme. The Scheme scoped out detailed assessments of LWSs (with the exception of Make-Me-Rich Meadows LWS) as no reasonable/probable pathway for impacts were predicted; this is discussed in Chapter 9 (Ecology and Nature Conservation) of this ES. ID3 and ID6 did not share Make-Me-Rich Meadow LWS as a receptor and therefore no cumulative impacts were predicted.

15.5.38 There were no other shared receptors between the Scheme and the rest of the short-listed developments in relation to statutory and non-statutory sites. Therefore, these short-listed developments were not considered further for cumulative impacts in relation to statutory and non-statutory sites.

Habitats and species

15.5.39 There would be a risk of permanent and temporary additive and synergistic adverse cumulative impacts on habitats and species from the extended works footprint around the Scheme and ID2; additional to the baseline impacts of the Testo's scheme. The predominant land type to be lost would be arable and grasslands.

15.5.40 For the Scheme there would be a physical overlap of the DCO boundary (see Figure 15.4 in Volume 3 of the ES) with ID1 (south-west section) and ID2 scheme (overlap with most of the DCO boundary apart from the north-east section and the Testo's shared main site compound); the Scheme and ID2 would also physically overlap with the Testo's scheme DCO boundary in the baseline.

15.5.41 For the Scheme there would be a permanent loss of approximately 9.79 ha of habitats (arable, woodland and grassland) and temporary loss of approximately 12.03 ha; in addition to the baseline change by the Testo's scheme comprising a permanent loss of approximately 20.68 ha of arable and grassland, plus temporary loss of approximately 36.08 ha. According to the IAMP Area Action Plan 2017-2032, approximately 150 ha of land has been allocated for the IAMP Scheme as a whole; approximately 110ha of the land would be designated as an ecological landscape mitigation area. IAMP One, in the ES baseline for the main assessment, accounts for 60.9 ha, with 11.4ha modified and 49.5 ha permanently removed. The loss of this land would lead to temporary and permanent loss of habitat for species in the area.

15.5.42 However, the total area of temporary and permanent land required by these developments is reduced by the fact that the developments partly overlap (see Figure 15.4 in Volume 3 of the ES), and part of the same area of land would be affected by at least two of the developments. As a result of the overlap, the potential for additive cumulative effects of habitat loss is slightly reduced.

15.5.43 There is also a risk of additive adverse cumulative impacts on aquatic habitats in local watercourses from pollution and sedimentation during construction and operation of the Scheme, Testo's scheme and IAMP developments (including ID2).

15.5.44 There were no other shared receptors between the Scheme and the rest of the short-listed developments in relation to habitats and species. Therefore, these short-listed developments were not considered further for cumulative impacts in relation to habitats and species.

Geology and soils

15.5.45 There would be an additive adverse cumulative effect of increased permanent loss and temporary disturbance of Grade 3b agricultural soils from the Scheme and ID2, additional to the recent baseline effects by the Testo's and IAMP One developments. The land required would be the same area as described above for habitat loss under 'Ecology'. The principal contributor to agricultural land loss would be the IAMP development, comprising IAMP One and ID2, though there would be the risk of impacts from double handling of material where the sites overlap.

15.5.46 There were no other shared receptors between the Scheme and the rest of the short-listed developments in relation to geology and soils. These short-listed developments were not considered further for cumulative impacts in relation to geology and soils.

Materials

15.5.47 There would be potential for adverse cumulative effects on demand for materials and waste treatment or disposal during construction of the Scheme and ID2 in the same timeframe, in addition to the Testo's scheme in the baseline.

15.5.48 There were no other shared receptors between the Scheme and the rest of the short-listed developments in relation to materials. Therefore, these short-listed developments were not considered further for cumulative impacts in relation to materials.

People and communities

15.5.49 There would be additive adverse impacts on non-motorised users (NMUs) during construction due to impacts on visual amenity and disruption around NMU networks from the construction of ID2 and the Scheme, in addition to the Testo's scheme in the baseline. During operation, NMUs would experience long-term benefits from new links created by ID2 and the Scheme, improving road and NMU safety and connectivity along the NMU networks around these developments; these would be additional to and complement the Testo's scheme improvements.

15.5.50 There would be a temporary and permanent loss of Grade 3b agricultural land during the construction and operation of the Scheme and ID2, which would have additive cumulative impacts on agricultural businesses in addition to the parallel baseline losses by the Testo's scheme and 2020 permanent baseline loss by IAMP One. The land required would be the same area as described for habitat loss under 'Ecology', above. The total area of temporary and permanent land required by these two developments would be reduced by the overlap of the schemes. During operation, the temporarily used areas of agricultural land would have been restored.

15.5.51 There is potential for cumulative additive beneficial cumulative impacts from construction and operation of the Scheme and ID2, additional to the creation of new baseline benefits by the Testo's scheme and IAMP One. The construction workforce required for these developments would generate employment. During operation there would be wider benefits within the local region through improved travel networks from the Scheme, the Testo's scheme and employment during the operation ID2.

15.5.52 There would be some disruption for drivers and potential additive adverse cumulative impacts on driver stress during construction of the Scheme and ID2, in addition to the Testo's scheme in the baseline. The impacts of driver stress during operation were considered in the traffic model based assessment in Chapter 13 of this ES.

15.5.53 There were no other shared receptors between the Scheme and the rest of the short-listed developments in relation to peoples and communities. Therefore, these short-listed developments were not considered further for cumulative impacts in relation to people and communities.

Road drainage and water environment

Land drainage and flood risk

15.5.54 There would be a risk of additive adverse cumulative impacts during construction and operation from the Scheme and ID2, in addition to the recent baseline changes by the Testo's scheme and IAMP One, on land drainage and flood risk from increased change of greenfield to hard standing feeding into the River Don and River Wear catchments.

15.5.55 There were no other shared receptors between the Scheme and the rest of the short-listed developments in relation to land drainage and flood risk. Therefore, these short-listed developments were not considered further for cumulative impacts in relation to land drainage and flood risk.

Surface water quality

15.5.56 There would be a risk of additive adverse cumulative impacts, especially to the River Don, from the Scheme and ID2, in addition to the Testo's scheme in the baseline, on surface water quality due to pollution from construction activity. Furthermore, during operation there would be a risk of changes to surface water quality as a consequence of routine run-off from the highway.

15.5.57 There were no other shared receptors between the Scheme and the rest of the short-listed developments in relation to surface water quality. Therefore, these short-listed developments were not considered further for cumulative impacts in relation to surface water quality.

15.6 Design, mitigation and enhancement measures

15.6.1 For most of the potential cumulative impacts, good design and application of good construction practices would minimise the cumulative effects. These would include application of construction site pollution controls (see Chapter 14 'Road Drainage and the Water Environment'), dust emission controls (see Chapter 6 'Air Quality'), noise mitigation (see Chapter 12 'Noise and Vibration') and the implementation of a Soil Management Plan in the Construction Environmental Management Plan (see Chapter 10 'Geology and Soils'). In addition, development of waste and traffic management plans would take into consideration consultation with the local authorities and other developments to reduce the cumulative effects from construction traffic movements and off-site waste disposal.

15.6.2 Highways England has already proactively liaised with the local authorities and the developers of the Wearpoint 55 (ID1) and IAMP developments (One and Two) during the early design and planning phases of these schemes. The development teams have been collaborating to make sure, as far as reasonably practicable, the schemes can be delivered efficiently whilst reducing adverse cumulative effects on the environment, public and key stakeholders. In this way the Scheme design has accommodated and will be able to integrate with these neighbouring third party schemes.

15.6.3 Regular engagement with stakeholders has already assisted with drainage design and the design of the new NMU bridge south of Downhill Lane junction to encourage more and safer NMU travel to the Nissan Plant, IAMP One and IAMP Two, plus across the rural countryside east of the A19. This would direct NMUs via a route that takes NMUs away from the existing

highway crossing and via a standalone NMU bridge that connects the countryside east of the A19 to the countryside west of the IAMP development, via Follingsby Lane through IAMP One.

15.6.4 Continued liaison with the local authorities and consideration of third party developments (esp. the Testo's scheme and IAMP) would inform the development of the detailed design and monitoring of adverse effects on habitats and species in order to manage the Scheme's contribution to the integrated ecological conservation for this area. For example, The Scheme's landscape planting would complement Testo's planting scheme to improve ecological networks north-south along the A19, while the Scheme's and Testo's planting scheme would complement that of the IAMP development (One and Two) to support an east-west wildlife corridor.

15.6.5 It is acknowledged that Sunderland City Council raised a concern regarding temporary impacts on farmland birds and the ability to displace into adjacent habitats. However, the contribution to the effect by the Scheme does not justify the need for mitigation.

15.7 Assessment of effects (with mitigation)

15.7.1 This section presents the assessment of significance of the above cumulative effects, with mitigation, based on the available environmental information for the short-listed developments.

Air quality, noise and vibration

Workers at IAMP One and residential receptors at Town End Farm and Capetown Road

15.7.2 Application of good construction dust and noise practices would limit the risk of cumulative adverse noise and air pollution effects on workers in IAMP One and residential receptors at Town End Farm and Capetown Road, meaning any cumulative effects would be, at worst, of Minor adverse significance. The cumulative effects during operation were considered in the traffic model based assessments within Chapter 6 (Air Quality) and Chapter 12 (Noise and Vibration) of this ES.

Landscape and visual effects

Landscape effects

Landscape character

15.7.3 The adverse additive cumulative effects on the landscape character of LCUs 1, 2, 5, 8 and 9 (a, b & c) during construction and operation phases (up to 15 years post completion) of ID2 and the Scheme, with the Testo's scheme in the baseline, would be due to vegetation loss, changes in landscape pattern, new landform features and a reduction in tranquillity and visual amenity. These can be summarised as:

- Major adverse cumulative effects on LCUs 1 and 9 (a, b & c), although the main contribution to this change in landscape character would be due to ID2, which would be present within a large proportion of these LCUs;
- Moderate adverse cumulative effect on LCU 2, primarily due to the combination of ID2 and the Scheme;
- Minor adverse cumulative effects due to changes in the landscape character of LCUs 5 and 8, predominantly as a result of the Scheme, although ID2 would also be perceptible.
- Residual Minor adverse cumulative effecst on these LCUs post 15 years establishment of landscape planting mitigation.

Visual effects

Users of WBEEC

15.7.4 During construction there would be Minor adverse cumulative effects on views from these receptors due to combined long distance views of construction works for ID2 and the Scheme, additional to the baseline change in the foreground of views created by the construction of the Testo's scheme.

15.7.5 Adverse visual effects on the WBEEC were not anticipated during operation as a result of the Scheme within Chapter 8 of this ES, so this receptor has not been considered further.

Users of Footpath B29 and residents at West Pastures Travelling Community Site

15.7.6 During construction, there would be views towards construction works at ID2 with glimpsed views towards works at the Scheme; additional to the baseline change in the foreground of views created by the construction of the Testo's scheme. This would result in a Moderate adverse cumulative effect, predominantly attributable to ID2.

15.7.7 A Minor adverse cumulative effect would remain from the opening year until mitigation planting establishes (15 years after opening), whereby operational effects as a result of the Scheme were not anticipated and therefore cumulative effects on these receptors were not considered further.

Users of Footpath B27

15.7.8 For users of Footpath B27, there would be close-range views towards construction works for buildings within ID2 (once re-opened by the Testo's scheme). Construction works for the Scheme would be predominantly screened by intervening works and ID2, although vegetation loss at Downhill Lane junction would likely be perceptible. There would be a Major adverse cumulative effect, predominantly attributable to ID2.

15.7.9 During operation, there would be close-range views towards buildings in ID2, which would screen the Scheme. There would be a Moderate adverse cumulative effect due to ID2, potentially reducing to Minor adverse on establishment of mitigation planting (15 years after opening).

Users of Bridleway B46

15.7.10 For users of Bridleway B46 (once re-opened by the Testo's scheme), there would be a Moderate adverse cumulative effect on close-range views to the Testo's scheme's remaining construction works and new structures in the foreground to the west, with construction works for large scale buildings ID2 behind because of loss of vegetation along the A19. Views towards construction works for the Scheme would be also visible to the to the south.

15.7.11 During operation, vegetation loss along the A19 and at Downhill Lane junction would be apparent and would result in more open views of traffic and new structures at on the A19 (newly constructed Scheme and Testo's scheme, as well as towards buildings within ID2. There would be a Moderate adverse cumulative effect in the immediate opening year, reducing to Minor adverse on establishment of mitigation planting (15 years after opening) which would restore enclosure in views.

Residents on Lawn Drive, at the Downhill Lane Farm complex, along the north-western edge of Town End Farm and users of Downhill Lane east of the junction

15.7.12 During construction; additional to the baseline changes in views due to the Testo's scheme construction works; there would be elevated and/or close-range views towards construction works for ID2 and the Scheme. Vegetation loss would be apparent at Downhill Lane junction,

which would open up views towards traffic and construction activity for the Scheme and ID2 in the wider landscape beyond. There would be a Major adverse cumulative effect, predominantly attributable to extensive views to ID2 and vegetation loss at the Scheme in both elevated and close-range views.

15.7.13 During operation, vegetation loss along the A19 and at Downhill Lane junction would result in there being more open views towards traffic and new structures at Downhill Lane junction, as well as towards buildings within ID2. This would be particularly due to the elevated and/ or close-range nature of views. There would be a Major adverse cumulative effect in the opening year, reducing to Moderate adverse on establishment of mitigation planting (15 years after opening), which would restore enclosure of views towards Downhill Lane junction on the closer range views.

Residential receptors along the western edge of Town End Farm

15.7.14 During construction, these receptors would experience glimpsed close-range views towards construction works for the Scheme and ID2 bridge construction, although works would be filtered by retained vegetation along the A19 / Washington Road. There would be a Minor adverse cumulative effect on views, mostly attributable to the construction of the new Washington Road bridge as part of ID2 and the NMU footbridge as part of the Scheme.

15.7.15 The Minor adverse cumulative effect would remain from the opening year until mitigation planting establishes up until the future year (15 years after opening), whereby operational effects as a result of the Scheme were not anticipated; therefore, cumulative effects on these receptors would not be considered further.

Users of the shared cycleway/footway along A1290 from Downhill Lane junction to Cherry Blossom way, via Washington Road

15.7.16 For users of the shared cycleway/footway along the A1290 from Downhill Lane junction to Washington Road, there would be close-range views towards construction works for ID2. Most of the works at the Scheme would be screened by works at ID2 and the existing IAMP One buildings, although vegetation loss at the junction would be perceptible. There would be a Major adverse cumulative effect, predominantly attributable to ID2.

15.7.17 During operation, views towards the Scheme would be predominantly screened by buildings within ID2, although vegetation loss would be perceptible at Downhill Lane junction. Therefore, these operational effects would remain Major adverse in significance, predominantly due to the presence of the ID2 buildings and infrastructure; potentially reducing to Minor adverse on establishment of mitigation planting (15 years after opening).

Workers within IAMP One buildings

15.7.18 During construction, these receptors would experience a Major adverse additive cumulative effect on views, mostly attributable to the ID2 construction works in close-range views with towards construction works for the Scheme beyond.

15.7.19 The Major adverse cumulative effect would remain from the opening year until mitigation planting establishes (15 years after opening) for the ID2 scheme in the east and the Scheme to the north lessening to a minor adverse cumulative effect. Adverse effects would be predominantly attributable to ID2 due to scale and proximity of buildings.

Users of the NMU routes running through IAMP One complex (including along Follingsby Lane)

15.7.20 For users of the main spine road through IAMP One, there would be Moderate adverse additive cumulative effects on views due to construction works for buildings within ID2 and structures by the Scheme. Most of the works for the Scheme would be screened by buildings within the IAMP One complex and works at ID2.

15.7.21 Similarly, views from the dedicated NMU route along the alignment of Follingsby Lane would be contained within the IAMP One complex, apart from at either end whereby: to the eastern end, views would extend to construction of ID2 with the Scheme in the distance; and to the northern end, views would be to the ID2 construction work only.

15.7.22 During operation, views towards the Scheme would be predominantly screened by buildings at the ID2 and the existing IAMP One, apart from the eastern most points of the routes on meeting the A1290. Mitigation planting establishment by 15 years after completion would reduce effects to Minor adverse and be attributable predominantly to the ID2 scheme.

Users of the shared cycleway/footway along Washington Road and on the Washington Road footbridge

15.7.23 During construction there would be elevated, close-range views towards construction works for the Scheme and ID2 buildings and new Washington Road bridge (in particular from the footbridge). Vegetation loss along the A19 and at Downhill Lane junction would change the character of views and would open up views towards traffic and construction activity and to a lesser extent the baseline construction presence of the Testo's scheme.

15.7.24 Therefore, there would be a Major adverse cumulative effect in these views predominantly attributable to the ID2 buildings construction to the west as well as the new Washington Road bridge in the foreground in front of the Scheme new bridge structures.

15.7.25 During operation, vegetation loss along the A19 and at Downhill Lane junction would result in more open views towards traffic, new bridge structures at the junction and additional NMU bridge and Washington Road bridge structures in the foreground. The large-scale buildings within ID2 to the west would also be imposing without established mitigation planting. This would result in a Major adverse cumulative effect remaining in the opening year, reducing to Moderate adverse on establishment of mitigation (15 years after opening) along the boundary of the Scheme and ID2, which would restore enclosure of views towards Downhill Lane junction. However, three new bridge structures would remain visible from the footbridge and sections to the north along Washington Road.

Ecology and nature conservation

Habitats and species

15.7.26 There would be a risk of habitat fragmentation and severance for species due to the temporary and permanent loss of arable and grassland habitat required by the Scheme and ID2, in addition to the recent baseline changes by Testo's and IAMP One. The Scheme's contribution to temporary loss of arable and grassland habitat would be small relative to ID2, which would require the largest area of temporary and permanent land (including land within the Scheme's DCO boundary, south-west of Downhill Lane junction). However, assuming embedded mitigation would be used at these sites during construction and operation, the cumulative effects on habitats and species would be of Moderate adverse significance during construction and Minor significance once mitigation planting becomes more established. Continued liaison with the developers of the IAMP Two and local planning authorities during the detailed design stage would support achieving an integrated large-scale approach to conservation in this area.

15.7.27 There would also be a risk of additive adverse cumulative effects from pollution and sedimentation of aquatic habitats during construction and operation of these developments.

Assuming good practice mitigation is used at these sites, the cumulative effects on habitats and species would be of Minor adverse significance.

Geology and soils

15.7.28 There would be an additive adverse cumulative effect of increased permanent loss and temporary disturbance of Grade 3b agricultural soils from the Scheme and ID2, in addition to the effects of the Testo's scheme and IAMP One in the baseline. Use of good construction practices and advanced planning would minimise these effects. By considering the fact that this agricultural land is of lower quality on the national scale (i.e. it is not best and most versatile land), the cumulative effects would be at worse Minor adverse significance.

Materials

15.7.29 The potential adverse cumulative effects on demand for materials and waste treatment or disposal during construction of the Scheme, ID2 and the Testo's scheme would be minimised by all the developments seeking to minimise waste generation though sustainable material sourcing and re-use of waste arisings (e.g. surplus soils) on site.

People and communities

15.7.30 There would be cumulative visual amenity effects on NMUs during construction and operation, which are the same as those outlined in the Landscape and Visual section above. Furthermore, there would be disruption to NMUs and the routes that they would travel on during construction of the Scheme and ID2, plus the Testo's scheme, that would be of Minor adverse significance.

15.7.31 During operation there would be beneficial effects for NMUs due to improved NMU networks and safety, from improvements incorporated into the design the Scheme that would be of Minor beneficial significance.

15.7.32 There would be a temporary and permanent loss of Grade 3b agricultural land during the construction and operation of the Scheme and ID2; the principal contributor to agricultural land loss would be from ID2. By considering the fact that this agricultural land is of lower quality on the national scale (i.e. it is not best and most versatile land) and the total area of land lost is large, farm businesses with agricultural land west of the Scheme would experience an additive cumulative effect from the temporary and permanent loss of agricultural land which would be of Moderate adverse significance. During operation, temporary loss of agricultural land would be restored which would reduce the effects to Minor adverse significance.

15.7.33 There would be some disruption for drivers during construction of the Scheme and ID2, additional to that by Testo's in the baseline, around the A19 and A1290 that would cause additive effects on driver stress. The cumulative effects would be of Minor adverse significance during construction.

15.7.34 There is potential for additive beneficial cumulative effects from construction and operation of the Scheme and ID2.

15.7.35 Driver stress and local economic benefits from improved traffic flows during operation would have been considered within the traffic model-based assessment within Chapter 13 (People and Communities) of this ES; however, the additive beneficial cumulative effects from employment during construction of these schemes would be of Minor beneficial significance.

Road drainage and water environment

Land drainage and flood risk

15.7.36 The risk of additive adverse cumulative effects from the Scheme, the Testo's scheme and IAMP (ID2 and IAMP One) on land drainage and flood risk would be managed by the design of a drainage strategy, with suitable temporary and permanent drainage systems, by continuing existing liaison between Highways England, local developers (including for ID2), the Environment Agency and local planning authorities. This integrated drainage strategy would mean a cumulative effect of, at worse, Minor adverse significance during construction and not significant during operation.

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ENVIRONMENTAL MASTERPLAN

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N

River Don

River Don tributary

River Don

EFD
Species rich grassland and scrub and tree planting around pond.

EFA/EFE
Retain existing significant tree, shrub and scrub vegetation.

EFB
Linear belt of trees and shrubs to integrate scheme into surrounding landscape.

EFA
Tree planting for screening.

EFB
Woodland planting to replace vegetation lost at junction and on Washington Road.

EFB
Scrub planting to match species on existing DHL junction.

EFB
Gap up existing hedgerow.

EFA
Native shrubs and trees to provide screening of NMU ramps and bridge.

EFB
Linear belt of shrubs (no large tree species due to overhead power lines) to integrate new earthworks to surrounding fields and gap up existing boundary hedge.

EFB
Linear belt of trees and shrub planting to integrate new earthworks to surrounding fields.

EFB/EFE
Careful clearance and monitoring of working area required for construction of NMU ramps, footbridge and temporary NMU access diversion to Washington Road. (Assume no mature tree removal).

EFA/EFE
Retain existing tree belt vegetation.

Note: -
No tree species under overhead power lines.

EFA/EFE
Native shrub and trees and carefully sited tree planting to help screen/integrate NMU ramps & structure.

EFB
Woodland planting to replace lost vegetation on edge of Washington Road/A19 Southbound slip road

See insert A

See insert B

EFB
New NMU crossing to link existing NMU route along A1290 and through IAMP One. Verges to be reinstated with grass.

INSERT A

EFD/EFB
Species rich grass around pond.

INSERT B

Legend

- DCO Boundary (denotes Proposed Highway boundary where no specific line shown below)*
- Proposed Highway Boundary (where deviating within DCO Boundary)
- Land over which rights of way permanently extinguished or reinstated (see Note 2)
- Street lighting
- Highway signage (large / lit signage only)
- Existing significant vegetation (retained)
- Vegetation to be retained and protected
- Verge / open grass areas
- Species rich / wet grass seeding
- Woodland / woodland edge planting
- Linear belt of trees and shrubs (informal hedgerow planting)
- Native shrub planting
- Native scattered scrub planting
- Semi-ornamental shrub planting
- Individual selected standard native trees
- Maintenance access (gravel track with species rich grass)
- Return to agriculture

Planning Policy

- Local wildlife sites
- Public Rights of Way (Bridleway B46)
- Shared use cycleways
- Indicative IAMP One Site Boundary

Non Motorised Users (NMU)

- Existing NMU route along Downhill Lane (dotted section affected by Scheme design)
- Future baseline NMU route through IAMP One
- Proposed NMU redirection

ENVIRONMENTAL FUNCTIONS

EFA	Visual Screening
EFB	Landscape Integration
EFD	Biodiversity and Nature Conservation
EFE	Visual Amenity

Notes:

1. For illustrative purposes only. To be read in conjunction with other plans and documents in the Development Consent Order Application, in particular the Environmental Statement (document reference TR010024/APP/6.1).
2. No physical works proposed in this area. See section 1.5 in document **TR010024/APP/6.1 (Volume 6)** and document **TR010024/APP/7.5.**
3. *DCO boundary excludes Testo's compound area as per Section 1.5 in document TR010024/APP/6.1 (Volume 6).
4. The Ordnance Survey background displayed in this drawing has been modified to show the neighbouring Testo's and IAMP One consented schemes. This reflects the most likely baseline scenario for the completed Downhill Lane scheme.

0 50 100 150 200 m

SCALE 1 : 2000

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Project
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JUNCTIONS IMPROVEMENT

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SHEET 1 OF 1

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GLOSSARY OF TECHNICAL TERMS AND ACRONYMS

µg	Micrograms – i.e. a millionth of a gram. The first symbol is the Greek letter 'mu'.
AADT	Annual Average Daily Traffic – one of several ways of measuring the flow of traffic; represents the daily average number of vehicles using a particular link in the network, averaged across the whole year.
Above Ordnance Datum (AOD)	'Ordnance Datum' is the standard measure of sea level in the UK, from which all heights are measured for mapping purposes.
Accidental Spillages	'Accidental Spillages' means fuels, oils or other contaminants spilled onto the road as a result of accidents during operation of the road, for instance due to road traffic collisions.
AD	Anno Domini (Year of Our Lord).
ADMS	ADMS Roads is a software programme used to model air pollution problems associated with networks of roads.
ALC	Agricultural Land Classification – a system of classifying the quality of agricultural land from Grade 1 (best) to Grade 5 (worst). Grade 3 is subdivided into 3a and 3b. For the purposes of government policy, Grades 1 - 3a are further classified as the 'best and most versatile' (BMV) agricultural land.
Amenity	Amenity can be defined as 'the pleasantness or attractiveness of a place' (Oxford Dictionary of English), and visual amenity is therefore the contribution of views towards the pleasantness or attractiveness of a place. The degree of visual amenity varies between locations according to the quality of views available.
At-grade	A term meaning 'on the same' level – i.e. when a roundabout or junction and all the roads joining it are at the same ground level so all the traffic need to go around the roundabout or through the junction.
AONB	Area of Outstanding Natural Beauty.
AQMA	Air Quality Management Area – local planning authorities are obliged to declare an AQMA in any area where there are, or are expected to be, exceedances of the relevant Air Quality Objectives. The authority declaring an AQMA is obliged to prepare a management plan to prevent or remove any such exceedances.
AQO	Air Quality Objective – targets set in the UK Air Quality Strategy that represent specific concentrations of certain pollutants in the air. The concentrations vary from pollutant to pollutant, and there may be more than one AQO for each pollutant; depending on the method and timescale of measurement. AQOs are intended to represent the concentration of any pollutant below which no effects on human health would be expected to occur, even in the most vulnerable individuals. If the concentration of any one pollutant goes above the AQO level an 'exceedance' is said to occur.
AQS	Air Quality Strategy – this establishes the Air Quality Objectives at a national level for a number of specific air pollutants.
Attenuate	'Attenuate' in this context means any method used to slow down the rate of discharge of water drained off the road into local watercourses, to avoid the risk of causing floods. In this case, the water will be captured in ponds and then slowly released at a rate agreed with the Environment Agency.
Attenuation	During rainfall, water can run off rapidly from the impermeable surface of the road, increasing water level in the streams to which it discharges. An 'attenuation pond' (or balancing pond') holds back the water before discharge, allowing it to be released slowly and reducing flood risk. While the water is held in the pond, sediment and pollutants can settle out, which improves the quality of the water before it is discharged.
BAP	Biodiversity Action Plan – includes the UK BAP (United Kingdom Biodiversity Action Plan), LBAP (Local Biodiversity Action Plan) and the HE BAP (Highways England Biodiversity Action Plan).
Baseline	IN EIA, 'baseline conditions' are the environmental conditions in existence just before the occurrence of an impact – i.e. they are the conditions that would be affected. Baseline conditions are not the same as existing conditions, which are those in existence at the time of carrying out the EIA, because, this may be some time in advance of the occurrence of an impact and environmental conditions may change in the intervening period.
BGS	British Geological Survey.
Biodiversity	Biodiversity is the variety of life in all its forms as discussed in the UK Action Plan published in 1994 – HMSO Cm 2428.
BMV land	'Best and Most Versatile land' is land in Grades 1, 2 and 3a of the Agricultural Land Classification system, deemed by government policy to be a national strategic resource
Bund	A 'bund' is a linear bank or mound, usually built of earth.
CEMP	Construction Environmental Management Plan – a plan prepared by a contractor before the start of construction work, detailing 'environmental aspects' that may be affected by the construction work and management methods to prevent any such effects. The CEMP would include methods and site management practices to be applied to prevent generation of nuisance dust, accidental pollution events and a range of other potential sources of accidental damage to the environment, and response and reporting procedures to minimise the damage in the event of a pollution incident.
Construction activity	Vegetation removal, topsoil stripping, temporary storage of materials, ground excavation and remodelling, bare earth, movement of construction vehicles and tall features such as cranes and other construction plant.
Contaminated Land	Any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land that – (a) significant harm is being caused or there is the significant possibility of such harm being caused

dB	Decibel – a measure of noise. Not on a linear scale – 2dB is 10 times as loud as 1dB and 3dB is 10 times as loud as 2 dB and so on.
DCO	Development Consent Order – under which the relevant Secretary of State can grant consent for construction of a Nationally Significant Infrastructure Project, on the advice of the Planning Inspectorate, in accordance with the Planning Act 2008.
DEFRA	Department for the Environment, Food and Rural Affairs.
Desk study	A collation and review of relevant existing information available from published, archival or online sources, including for instance geological and hydrogeological mapping, historical maps, environmental records etc., allowing an assessment of risks to the human and environmental receptors to be undertaken.
DMRB	Design Manual for Roads and Bridges – the 15 volumes of DMRB provide guidance for all aspects of the design of roads and bridges in the UK. Volume 10 covers environmental mitigation and Volume 11 governs environmental impact assessment. Other volumes cover other aspects of the design and preparation of highways projects.
Do-Minimum (DM)	A hypothetical scenario used to provide a realistic comparison of the effects of the scheme. The do-minimum scenario includes and changes to the highways infrastructure that would occur even if the scheme does not go ahead, and any other developments in the surrounding area that would influence the movement of traffic and would occur independently of the scheme.
Do-Something (DS)	A hypothetical scenario used to provide a realistic comparison of the effects of the scheme. The do-something scenario includes changes in traffic flows caused by the scheme as well as any other developments in the surrounding area that would influence the movement of traffic.
Driver stress	A standard measure of driver stress can be calculated, based on the volume of traffic per lane and average speeds.
Environment Agency	A non-departmental government body covering England and Wales, responsible for the protection of the environment, including the regulation of polluting activities and the control and prevention of flooding.
ECI	Early Contractor Involvement – a form of contract for major construction projects, in which the contractor is involved earlier than under a traditional contract, to ensure their construction to relevant decision-making during the pre-construction phases.
EIA	Environmental Impact Assessment – an assessment of certain types of major project of the significant effects that the project could have on the environment. The proposer is required to carry out the assessment by law, in this case under the Infrastructure Planning (Environmental Impact Assessment) Regulations, 2009.
EIA Regulations	Each consenting regime is governed by a dedicated set of EIA Regulations. Nationally Significant Infrastructure Projects subject to the Planning Act 200 must carry out EIA in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations, 2009 as amended.
Environmental Statement	The report on the results of the EIA.
EU	European Union.
Recycled road planings	Old road surface materials removed from redundant carriageways or areas to be re-surfaced.
FRA	Flood Risk Assessment.
Fugitive Dust	i.e. visible emissions of dust that does not come from a definable point source, for example a smoke stack. Typical examples would include stored piles of soil, dry bare earth on construction sites or haul roads etc.
Future Year	This is a specified year in the future, usually15 years after the opening of the project. This is used to make predictions using computer models for both traffic flows and related environmental effects.
Geology	Geology is the stud of solid earth, the material of which it is composed (principally rocks) and the processes by which they evolve.
Geophysical surveys	Geophysical surveys use variations in physical properties of the soils, such as its electrical conductivity or magnetic properties, to detect archaeological features without excavation.
GIS	Geographical Information Systems.
GLVIA	Guidelines for Landscape and Visual Impact Assessment – a set of guidelines for the stated purpose, published jointly by IEMA and the Landscape Institute.
Grade Separated	Refers to a junction where one road has been elevated or lowered to a different level so that the main flow of traffic is separated.
Greenfield runoff	The rate of discharge that would be expected from an area of undeveloped land with entirely soil covered, permeable surfaces. Such areas release water into watercourses much more slowly than areas with hard, impermeable surfaces.
Ground Flora	Ground flora refers to small non-woody plants growing at ground level within woodland areas, such as primroses, bluebells, celandine etc.
Ha	Hectares.
HAWRAT	Highways Agency Water Risk Assessment Tool – a method to assist in assessing impact on water quality in accordance with DMRB (Note that Highways Agency is now Highways England).
Hedgerow	Hedgerow is defined as any boundary line of trees or shrubs over 20 m long and less than 5 m wide, between major woody stems at the base (Defra, 2007).

HER	Historic Environment Records – a database maintained by individual counties or local authorities, containing records of archaeological sites, historic buildings and other aspects. The HER for this study was the Tyne and Wear Historic Environment Record.
HDV	Heavy Duty Vehicle.
HGV	Heavy Goods Vehicle.
Hibernaculae	The place/ structure/ shelter chosen by an animal for hibernation.
Historic landscape character types (HLCT)	Historic landscape character types are distinctive and repeated combinations of components defining generic historic landscapes such as 'ancient woodland' or 'parliamentary enclosure'. The types used in this study were defined based on evidence from historic maps and other sources.
HRA	Habitat Regulations Assessment.
IAMP	International Advanced Manufacturing Park.
IAN	Interim Advice Note – published by Highways England (formerly the Highways Agency) to modify/ update guidance given within DMRB, in advance of the permanent replacement of the relevant sections of DMRB.
IAQM	Institute of Air Quality Management.
IEEM	Institute of Ecology and Environmental Management – a professional body for ecologist and environmental managers
IEMA	Institute of Environmental Management and Assessment – a professional body for environmental managers and EIA professional.
Impermeable	Impermeable surfaces are those where water cannot pass through the surface and soak into the underlying ground. This means that all of the water will flow rapidly off the surface. In the case of a highway, it will flow off the road surface into the highway drainage system.
LAF	Local Access Forum – statutory bodies, prescribed under the Countryside and Rights of Way Act 2000 and appointed by a local highway authority or national park authority. Their function is to advise the relevant authority as to the improvement of public access to land for the purposes of open-air recreation and the enjoyment of the area. LAFs comprise appointed members who must be representative of both users of local rights of way or access land and owners and occupiers of access land or land encompassing local rights of way.
Landform	'Landform' is the combination of slope and elevation that produce the shape and form of the land.
Landscape character assessment	Landscape character assessment is the process of categorising the landscape into different Landscape Character Areas. The purpose of this process is to aid the formulation and implementation of planning policies relating to the landscape.

LBAP	Local Biodiversity Action Plan – see also BAP; the relevant LBAP for the area is Durham Biodiversity Action Plan.
LCA	Landscape Character Area – defined at a local level by the Local Planning Authority.
LCU	Landscape Character Unit – defined at a more detailed, project-specific level for the purposes of this assessment.
Limit value	The concentration of certain specific pollutants in the air that are not to be exceeded, under the Air Quality Standards that implement the European Directive on Ambient Air Quality and Clean Air for Europe – 2008/50/EC.
Link	A 'link' is the stretch of road between two junctions. For major strategic routes such as motorways, the volume of traffic along a link remains constant along its whole length, because traffic can only join or leave at the junctions. For many other roads this is not the case, because traffic can join or leave at other access points such as private properties, businesses etc.
LNR	Local Nature Reserve.
LWS	Local Wildlife Site.
Marginal habitat	Marginal habitats are areas of shallow water or wet ground around the edges (margins) of waterbodies and have their own characteristic flora and fauna.
Mitigation	Measures which have the purpose of avoiding, reducing or compensating for adverse environmental impacts. It may also include measures to create environmental benefits.
Nationally Significant Infrastructure Project	Any infrastructure project that is deemed, according to the criteria set in the Planning Act, 2008 (as amended) to be nationally significant. Such projects are authorised through a statutory process that requires an application for a DCO, rather than a conventional planning application or the traditional model through the publication of Statutory Orders and the holding of Public Inquiries.
NCA	National Character Area – landscape character areas defined at a national level by Natural England.
Natural England	A public body responsible for the protection of the natural environment and landscape in England and the management of NNRs and SSSIs.
NMU	Non-Motorised Users (e.g. walkers, cyclists, horse riders).
NNR	National Nature Reserve.
NO_2	Nitrogen dioxide – a chemical pollutant emitted from vehicle exhausts.
NO_x	Oxides of nitrogen – includes NO (nitrogen oxide) and NO_2.
NIA	Noise Important Area - where 1% of the population are affected by the highest noise levels from major roads according to the results of Defra's strategic noise maps.

NPPF	National Planning Policy Framework – a statement of central government guidance on planning policy, replacing the previous system of topic-specific PPGs and PPSs.
NSIP	See 'Nationally Significant Infrastructure Project'.
Oblique angle of view	Oblique: an angled view rather than a direct view, in which features would be less noticeable.
On-line	'On-line' improvement means that the work will be undertaken following the line of the existing road.
Outfalls	The location at which runoff is discharged into a watercourse.
PEI	Preliminary Environmental Information – information that the applicant must publicise before carrying out consultation of the community in advance of applying for a DCO, if the project concerned is subject to a requirement of EIA.
Photomontage	This is where a photorealistic image of the scheme, based on a 3D computer model of the scheme is overlaid onto a base photograph to visually represent the scheme. Features that would be removed as part of the scheme are removed from the base photograph using Photoshop.
PINS	Planning Inspectorate – an executive agency of the government dealing with planning appeals, national infrastructure planning application, examinations of local plans and other planning-related issues in England and Wales.
PM_{10}	Particulate Matter with a diameter of 10 micrometres or less – a pollutant emitted from vehicle exhausts.
$PM_{2.5}$	Particulate Matter with a diameter of 2.5 micrometres or less – a pollutant emitted from vehicle exhausts.
PRoW	Public Right of Way – includes footpaths, bridleways and restricted byways.
Ramsar site	Wetlands of international conservation importance, designated under the Ramsar Convention, often but not always for the protection of populations of water birds.
Receptor	The 'receptor' is the existing environmental feature that would be affected by an impact – for instance, the population of a protected species, or a specific archaeological site, or the occupants of a residential property.
Red and Amber List Species	Red List and Amber List – as defined in 'Birds of Conservation Concern 3: the population status of birds in the United Kingdom, Channel Islands and the Isle of Man (2009).
RIS	Road Investment Strategy.
Routine runoff	'Routine runoff' means water draining from the road surface into nearby watercourses whenever it rains, which tends to wash contaminants from the road surface into the nearby watercourses.
SAC	Special Area of Conservation – strictly protected sites designed under the EU Habitats Directive, representing internationally important, high-quality conservation sites that significantly contribute to conserving the 189 habitat types and 788 species identified in Annexes I and II of the Directive (as amended).
Scrub	Scrub is a climax vegetation dominated by locally native shrubs, usually less than 5 m tall, occasionally with a few scattered trees (JNCC, 2010).
SoCC	Statement of Community Consultation – a statement published by the proposer of a Nationally Significant Infrastructure Project, detailing how they intend to consult the community about their project before applying for a DCO. Required under the Planning Act 2008, as amended by the Localism Act, 2011.
SCC	Sunderland City Council.
SSSI	Site of Special Scientific Interest – a statutory designation under the Wildlife and Countryside Act 1981 (as amended), protecting nationally important wildlife sites, habitats and geological sites.
STC	South Tyneside Council.
SWMP	Site Waste Management Plan – a plan for construction projects governing the minimisation, management, storage, re-use and disposal of wastes generated through construction work.
TAG	Transport Analysis Guidance – Department for Transport guidance on the appraisal of transport strategies and projects, providing for a framework for decision-making on the funding of projects.
Treatment	'Treatment' means any method used to improve the quality of water before discharge through the removal of sediment or pollutants.
TPO	Tree Preservation Order.
UK	United Kingdom.
WFD	Water Framework Directive.
Woodlands	Vegetation dominated by trees more than 5 m high when mature, forming a distinct, although sometime open, canopy (JNCC, 2010).
ZTV	Zone of Theoretical Visibility – this is the zone from which the scheme is theoretically visible over 'bare earth'.