



M3 junction 9 improvements

Preliminary Environmental
Information Report
Volume 1: Main Report



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1. Part 1 – Introduction

1.1 Background

- 1.1.1 M3 Junction 9 is a key transport interchange which connects South Hampshire (facilitating an intensive freight generating industry) and the wider sub-region, with London via the M3 and the Midlands/North via the A34 (which also links to the principal east–west A303 corridor).
- 1.1.2 A significant volume of traffic currently uses the grade separated, partially signalised gyratory (approximately 6,000 vehicles per hour during the peak periods) which acts as a bottleneck on the local highway network and causes significant delay throughout the day. Northbound and southbound movements between the M3 and the A34 are particularly intensive, with downstream queues on the northbound off-slip of the M3 often resulting in safety concerns during peak periods.
- 1.1.3 To address this, the Proposed Scheme comprises the development and delivery of a scheme of works for increasing the capacity, enhancing journey time reliability and supporting development in line with development plans. The Proposed Scheme includes the replacement of a circulatory roundabout with a dumbbell roundabout, conversion of the M3 south of Junction 9 to a dual four all-lane running motorway, realignment of slip roads, the addition of new structures, and improvements to safety features, signage and technology. Further description of the Proposed Scheme is detailed in Part 2 of this report.
- 1.1.4 The Proposed Scheme is classed as a Nationally Significant Infrastructure Project under the Planning Act 2008 and, as such, requires a Development Consent Order (DCO) to proceed. Highways England intends to submit an application for a DCO to construct the Proposed Scheme to the Secretary of State through the Planning Inspectorate. However, before submission of the DCO application, Highways England will be carrying out consultation, Environmental Impact Assessment (EIA) and refinement of the preliminary engineering design of the Proposed Scheme.

1.2 Environmental Impact Assessment

- 1.2.1 EIA is a statutory process required for such a Proposed Scheme. It is a systematic process to identify, predict and evaluate the environmental effects of a proposed project. Its primary purpose is to inform the decision as to whether a project should go ahead. However, the EIA process will also have an important influence on the design of the Proposed Scheme since it enables environmental impacts to be identified and, where possible, to be avoided or reduced through sensitive design or additional mitigation. In addition, it identifies enhancement opportunities that could be incorporated in to the design. Where appropriate. EIAs for Nationally Significant Infrastructure Projects are reported in two stages, as follows:
- A Preliminary Environmental Information Report (PEIR) is prepared to inform consultation with the public about the Proposed Scheme
 - Following consultation with the public, an Environmental Statement is prepared to accompany the application for a DCO

1.3 The decision maker and planning policy

- 1.3.1 The Localism Act 2011 provided the authority for the Secretary of State to be responsible for the processing of DCO applications for Nationally Significant Infrastructure Projects, with the power to appoint The Planning Inspectorate. In its role, The Planning Inspectorate will examine the DCO application for the Proposed Scheme and then will make a recommendation to the Secretary of State who will then decide whether to grant a DCO.
- 1.3.2 In accordance with section 104(2) of the Planning Act 2008, the Secretary of State is required to have regard to the relevant National Policy Statement (NPS), amongst other matters, when deciding whether or not to grant a DCO. The relevant NPS for the Proposed Scheme is the National Policy Statement for National Networks (NPS NN).
- 1.3.3 The Secretary of State will also consider other important and relevant national and local planning policy. The National Planning Policy Framework (NPPF) published in 2019 is relevant national policy.
- 1.3.4 The local planning policy relevant to the proposed scheme can be found in Part 9 of this report.
- 1.3.5 The EIA Scoping Report submitted to The Planning Inspectorate identified the national and local planning policies relevant to the assessment relating to each environmental topic. The purpose of considering relevant planning policy during the EIA is twofold:
- a) To identify policy that could influence the sensitivity of receptors (and therefore the significance of effects) and any requirements for mitigation; and,
 - b) To identify planning policy that could influence the methodology of the EIA. For example, a planning policy may require the assessment of a particular impact or the use of a particular methodology.

1.4 Purpose of this PEIR

- 1.4.1 This document is the M3 Junction 9 Improvements PEIR. It provides an initial statement of the main environmental information available for the study area, along with descriptions of the likely environmental effects and mitigation measures envisaged for the Proposed Scheme. In the absence of detailed results, the environmental assessment necessarily relies on informed professional judgement of specialist authors and preliminary results from emerging surveys at this stage. This document is intended to provide members of the community and the general public with an understanding of the key issues and enable them to prepare well-informed responses to consultation.
- 1.4.2 It should be noted that at this stage the information is preliminary. An iterative process of scheme development and EIA is ongoing. The final EIA work will be reported within the Environmental Statement, that will accompany the DCO application.
- 1.4.3 This report has been prepared for a non-technical audience. Individuals who are interested in the detailed proposals and assessment criteria to be used in the EIA process should refer to the M3 Junction 9 Improvements EIA Scoping Report (Highways England, 2019), available on the National Infrastructure Planning website:

<https://bit.ly/2KyzqQN>

1.5 Structure and content of this PEIR

1.5.1 This report is divided in to a number of sections which set out the main environmental topics being considered in the EIA. Since the Proposed Scheme is a highway project, the design and assessment are guided by the Department for Transport's Design Manual for Roads and Bridges (DMRB). The volume of the DMRB on Environmental Assessment and associated Interim Advice Notes (IANs) prepared by Highways England set out the main environmental topic areas considered as part of a highway scheme EIA. This report covers those topic areas, but is structured under the following headings, with the aim of making the document more concise and accessible for members of the community and the general public:

- Air quality
- Cultural heritage
- Landscape and visual
- Biodiversity
- Geology and soils
- Material assets and waste
- Noise and vibration
- Population and health
- Road drainage and the water environment
- Climate
- Cumulative effects

1.5.2 Each environmental topic section of this report describes the local environment, the likely impacts that the Proposed Scheme would have on receptors relevant to an environmental topic, and the types of mitigation under consideration to reduce potential impacts of the Proposed Scheme.

1.5.3 Please note that, in the strict context of EIA, the terms 'impact' and 'effect' can have different meanings. However, for ease of understanding they are used interchangeably in this document.

1.6 Availability of this PEIR

1.6.1 Copies of this report will be available as part of the summer 2019 consultation material for the Proposed Scheme. Details of these events are contained in Highways England's Statement of Community Consultation. The Statement of Community Consultation will be published in advance of the consultation.

1.7 Consultation

1.7.1 We held an options consultation in early 2018 at which a proposal was put forward for consideration along with details of three rejected options. Since then the design has been further developed. The majority of those who responded to the options consultation agreed with the need for improvements around Junction 9 of the M3 and believed that the option presented at that stage would meet the scheme objectives.

1.7.2 A number of key issues and concerns were raised in relation to the scheme, including disruption during construction, environmental impacts, future capacity and road safety. Further information outlining how we have sought to address these issues and concerns through our design and assessment work can be found in the Consultation Brochure accompanying this pre-design public consultation. The Consultation Brochure is part of the information available online during the consultation period. You can view all the consultation materials on our webpage at:

<https://highwayseotland.citizenspace.com/he/m3-junction-9-improvements-statutory-consultation>.

1.7.3 A Scoping Report was submitted to the Planning Inspectorate on 28 January 2019. Following a period of consultation with stakeholders, a Scoping Opinion was received on 8 March 2019. A copy of the Scoping Opinion can be found at the following link:

<https://infrastructure.planninginspectorate.gov.uk/document/TR010055-000078>

1.7.4 The preliminary assessments used to inform the preliminary environmental information has taken the Scoping Opinion into consideration where possible at this stage. The Scoping Report, Scoping Opinion and this preliminary assessment form the basis for the further EIA work to be carried out and presented in the Environmental Statement to accompany the DCO. A formal response to the Scoping Opinion will be submitted alongside the Environmental Statement.

1.7.5 Table 1-1 below describes the engagement that has been carried out since submission of the Scoping Report.

Table 1-1 Engagement since submission of Scoping Report

Consultee	Date	Topic	Discussion summary
Environment Agency	07/02/19	Water environment information request	Email exchange to gather information for the water environment baseline
South Downs National Park Authority Winchester City Council Hampshire County Council Historic England Environment Agency	11/02/19	Order Limits and Scoping Report	Meeting to provide project update and discuss the Scoping Report
Winchester City Council	19/02/19	Archaeological trial trenching works	Email and telephone exchange regarding scope of archaeological works. Comments provided on Written Scheme of Investigation for first phase of archaeological trial trenching.

Consultee	Date	Topic	Discussion summary
Winchester City Council	20/02/19	Baseline noise monitoring locations	Email exchange to agree locations and durations for baseline noise monitoring
Environment Agency	26/02/19	Flood risk and drainage workshop	Meeting about the design criteria and flood risk and drainage
Walking, cycling and horse-riding stakeholders	06/03/19	Walking, cycling and horse-riding proposals	Forum to update local stakeholder groups on the Proposed Scheme and proposals in this area, discuss and gather feedback
Winchester City Council	21/03/19	Water environment information request	Email exchange to gather information for the water environment baseline
Natural England	16/04/19	Habitats Regulations Assessment	Meeting to discuss biodiversity mitigation and the Habitats Regulations Assessment in order to inform Screening and Appropriate Assessment
Hampshire County Council South Downs National Park Authority Winchester City Council Historic England	25/04/19	Archaeology and cultural heritage workshop	Meeting to discuss the results of the trial trenching surveys and any proposed mitigation measures
Hampshire County Council South Downs National Park Authority Environment Agency Winchester City Council	23/05/19	Consultation information and preliminary landscape designs	Meeting to discuss the information that will be available for consultation and also to present our preliminary landscape designs
Environment Agency	13/06/19	Drainage and flood risk	Meeting about the drainage design, water quality, groundwater impacts, flood risk and water framework directive assessment

2. Part 2 – The Proposed Scheme

2.1 Location of the Proposed Scheme

Surrounding area

- 2.1.1 The site is located within the planning authority boundaries of Winchester City Council, Hampshire County Council and the South Downs National Park Authority (SDNPA). The site and surrounding area are shown in Figure 1-2.
- 2.1.2 The surrounding area is primarily urban to the west of the M3 and primarily rural to the east. There are large concentrations of residential receptors close to the A34 in the north of the study area (in Headbourne Worthy, Kings Worthy and Abbots Worthy) and close to the M3 to the south of the study area (on the eastern fringe of Winchester). A small number of isolated farm holdings or rural dwellings lie to the east of the Proposed Scheme. There are a small number of schools and education facilities, including St Swithun's School north of the B3404 and east of the M3, Winnall primary school and Stepping Stones pre-school to the south west of the junction.
- 2.1.3 Immediately west of the Proposed Scheme, there is an area of commercial development. This includes Sun Valley Business Park, Tesco, Winnall Industrial Estate and Scylla Industrial Estate. Wykeham Trade Park and Highways England's maintenance depot are located to the northwest of the junction.
- 2.1.4 The South Downs National Park (SDNP) extends beyond the area of the Proposed Scheme to the north, east, south and some areas to the west. The land to the east is generally greenfield. The River Itchen and associated floodplain are present within the north part of the Proposed Scheme. It lies along the River Itchen valley with the base of the valley to the west of the junction. The River Itchen Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI) also extend to the northeast and southwest.

Key designations

- 2.1.5 The River Itchen SAC is located in part beneath the existing alignment of the A34, the A33 and the M3. The River Itchen SAC is a European designated site of international importance. The site is designated for its habitats and species (water courses of plain to montane levels with a plant community that is typified by the species of *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation for example pond water-crowfoot, stream water-crowfoot and river water-crowfoot, Atlantic salmon, brook lamprey, bullhead, otter, southern damselfly and white-clawed crayfish).
- 2.1.6 The River Itchen is also a designated SSSI, primarily due to the complex mosaic of habitats found within the riparian zone and the species which occur within them, including otter, water vole and the white-clawed crayfish. The River Itchen SSSI is of nature conservation value at the national scale and is of high environmental value.
- 2.1.7 In addition, St Catherine's Hill SSSI is located approximately 400 metres to the south of the Proposed Scheme and is designated for diverse chalk grassland habitats. The statutory designated sites are shown on Figure 5-4-1.
- 2.1.8 The SDNP is an important designated area in and next to the Proposed Scheme. The extent of the SDNP is shown on Figure 1-2.

- 2.1.9 Two Groundwater Source Protection Zones (SPZs) lie within the northern extent of the Proposed Scheme. They are classified as Groundwater SPZ 1 (inner zone) and SPZ 2 (outer zone). The SPZs are shown on Figure 5-9-2.
- 2.1.10 There are a number of Scheduled Monuments and Listed Buildings adjacent to the Proposed Scheme. Designated cultural heritage assets are shown on Figure 5-2-2.
- 2.1.11 Further designations such as Noise Important Areas and Air Quality Management Areas are shown on the Environmental Constraints Plan (Figure 1-2).

2.2 Objectives of the Proposed Scheme

- 2.2.1 The main objective of the Proposed Scheme is to introduce free-flow movement between the M3 and A34 at Junction 9. By providing an unconstrained link, vehicles will not be required to manoeuvre through a priority or signal controlled junction. This will reduce congestion and improve journey time reliability on the M3, A34 and local road network.
- 2.2.2 The Proposed Scheme has five strategic objectives, in line with Highways England Delivery Plan 2015-2020 (Highways England, 2015):
1. Supporting economic growth – unlocked development capacity for job, business and housing creation.
 2. A safe and serviceable network – safety improved as a result of reducing delays and queue lengths.
 3. A more free-flowing network – reduce the amount of congestion and increase journey time reliability.
 4. An improved environment – endeavour to reduce where possible the number of households adversely affected by noise, improve the air quality at sensitive receptors and no net loss in biodiversity.
 5. A more accessible and integrated network – improvements at Junction 9 would also include improvements for walkers, cyclists and horse-riders. The Proposed Scheme would connect the National Cycle Network Route 23 which is severed by the current junction layout.
- 2.2.3 The design of the Proposed Scheme will take into account Highways England's 10 principles of good design, published in 'The Road to Good Design' (Highways England, 2018), to support its aspirations for a network that responds better to both people and places through improved design processes. These promote environmentally sustainable design that fits in context, whilst making roads safe, useful and understandable.

2.3 Description of the Proposed Scheme

Overview

- 2.3.1 The existing M3 Junction 9 is a grade separated, partially signalised roundabout connecting multiple nationally and locally significant routes. The M3 here is joined with the A34 towards Newbury and Oxford, A272 towards Petersfield and southern Winchester, and Easton Lane towards Winnall and northern Winchester. Around 1 kilometre north of

the roundabout, the A33 from Basingstoke connects with the A34, and the A31 from Alton connects to the A272 around 1 kilometre south of the roundabout.

- 2.3.2 The improvements proposed as part of the Proposed Scheme maintain this existing connectivity, whilst providing enhanced capacity, simplified routing and improved facilities for walkers, cyclists and horse riders. The chosen option for the Preferred Route Announcement was Option 14. This option provides the following modifications:
- Traffic between the M3 to/from Southampton and the A33/A34 to/from Basingstoke and Newbury to be taken out of the roundabout junction by providing free-flow grade separated links
 - Widening of the M3 from a dual two-lane motorway (two-lane motorway and a hard shoulder) to a four-lane motorway (with hardstrips) between the south-facing roundabout slip roads and the new free-flow links
 - A new smaller grade separated dumbbell roundabout arrangement within the footprint of the existing roundabout, incorporating a new bridge connection over the M3 with walking, cycling and horse-riding facilities
 - New walking, cycling and horse-riding subways through the junction providing a continuous grade separated route between the SDNP, Winnall and Abbots Worthy
 - Connector roads from the new free-flow links to the new dumbbell roundabout
 - Improved slip roads to/from M3.
- 2.3.3 The Proposed Scheme area, as defined by the proposed Order Limits, is approximately 93.9 hectares. Approximately 28.9 hectares of this land is outside of the existing highways boundary. This includes the proposed land required for gantries, signage, an indicative satellite construction compound area, areas for environmental mitigation and areas for drainage requirements. It is important to note that the current proposed draft DCO Order Limits could be subject to change as the design progresses and becomes more detailed, but they currently capture what is considered to be the extent of the land required based on the present design.
- 2.3.4 Additional modifications of the highway design have been made to improve the A33 northbound arrangement following feedback from the Public Consultation report.
- 2.3.5 Further description is provided below. The Proposed Scheme is shown in Figure 1-1.
- M3 to A34 Northbound**
- 2.3.6 To account for the proposed smart motorway project (M3 Junction 9 to Junction 14), the existing M3 northbound would be converted to an all-lane running motorway (i.e. with no hard shoulder) with four lanes northbound. South of Junction 9, in the northbound direction, the two nearside lanes would be signed and line marked for the A34 northbound and the two offside lanes for the M3. Access to Junction 9 would be provided via a reconstructed northbound off-slip.
- 2.3.7 The two proposed northbound A34 lanes would pass under Junction 9 alongside the two M3 lanes, after which they would bifurcate from the M3 to form the new A34 northbound link with the remaining two offside lanes continuing north as the M3.

- 2.3.8 After the split, the A34 would continue north, passing over the proposed M3 northbound on-slip and then descending to tie into the existing A34 northbound carriageway before it crosses the River Itchen.
- 2.3.9 North of the existing River Itchen crossing, the layout of the existing A34/A33 diverge would be rearranged to allow two lanes to run continuously on the A34 with an offside diverge to the A33.

A34 Southbound to M3

- 2.3.10 The A34 southbound link would leave the existing A34 alignment after it crosses the River Itchen. The Proposed Scheme has been specifically designed to avoid any impacts on the River Itchen floodplain, which would avoid the requirement for flood compensation and potential increased environmental mitigation. The A34 would then pass under the M3 in a cutting to reduce the visual impact on the wider SDNP and the surrounding area.
- 2.3.11 Beyond the M3 underpass, a diverge would lead to a slip road connecting to the revised Junction 9 roundabout. The two traffic lanes of the A34 southbound link road would proceed and join the M3 mainline southbound carriageway to the north of the revised Junction 9 layout.

M3 Junction 9 roundabout

- 2.3.12 The Junction 9 circulatory roundabout would be replaced with an offline dumbbell roundabout. All link roads that access the roundabout would need to be realigned to this new layout.

Slip roads

- 2.3.13 The existing M3 northbound on-slip would be realigned to become the A34 northbound on-slip, merging downstream with two A34 northbound lanes that bifurcate from the M3. One carriageway of the existing A34 link connecting to the existing roundabout would be converted to a two-way road, linking the western dumbbell roundabout to a new roundabout providing access to the Traffic Officer Service and Highways England's maintenance depot. Beyond the access roundabout, the carriageway would become a dedicated M3 northbound on-slip road.
- 2.3.14 The existing M3 southbound off-slip would be removed and replaced with a new off-slip located approximately 600 metres upstream. The new southbound M3 off-slip would then merge with the new link between the A34 and roundabout to maintain local access.
- 2.3.15 The two south-facing slip roads would be realigned to connect to the new dumbbell roundabouts. Both would merge (southbound) and diverge (northbound) directly to the widened M3.

Structures

- 2.3.16 The Proposed Scheme would require four new bridges and a number of other structures as outlined below. These structures remain in development, and the final structural forms will be confirmed in the preliminary designs submitted with the DCO application.

Structure No. 1 – Easton Lane M3 Junction 9 Overbridge

2.3.17 The existing Junction 9 grade separated interchange, consisting of a gyratory with two bridges crossing the M3, would be replaced by a more compact 'dumbbell' arrangement with a single bridge crossing the motorway. The new bridge would carry a dual two-lane carriageway over the widened M3 alignment and be located approximately midway between the two existing bridges, which would be demolished. Both single and two-span options will be considered, as will steel and concrete material options.

Structure No. 2a – A34 southbound slip road underpass of M3 northbound on-slip road

2.3.18 Structure No. 2a would carry the new M3 northbound on-slip over the new southbound A34 link road and would be located next to the existing M3 alignment, to the north of the existing Junction 9 interchange. Single-span and three-span options will be considered, as will steel and concrete material options. Structure No. 2a would be situated immediately to the west of Structure No. 2b (see below) and a possible option is to consider combining the two structures.

Structure No. 2b – A34 southbound slip road underpass of M3 main line

2.3.19 Structure No. 2b would allow the new southbound A34 to pass under the existing M3 and join the M3 southbound carriageway. The total length of the required underpass would be a minimum of 68 metres (depending on the final arrangement) and the M3 carriageway would remain essentially unmodified at this location, so reducing disruption during construction is a key consideration. A form of buried single-span concrete structure would be most appropriate at this location. Structural work will consider different construction methods such as a buried box constructed in an open cut, contiguous piled wall abutments with concrete deck slab to allow a form of top-down construction, or a jacked box or deck method.

2.3.20 If Structure No. 2a is combined with Structure No. 2b, the Structure No. 2b form would be continued through to the Structure No. 2a location to give one long underpass structure supporting both the M3 main carriageway and the new M3 northbound on-slip.

Structure No. 3 – A34 northbound slip road overbridge of M3 northbound on-slip road

2.3.21 Structure No. 3 would carry the new A34 northbound link road over the new M3 northbound on-slip and would be located to the south of Structure No. 2a. The situation is like that at Structure No. 2a (with some differences in span length and skew angle), and the same options of single and three-span, and concrete and steel material options, will be considered.

Subways

2.3.22 Four new pedestrian/cycle subways would be required to accommodate existing and improved provision of these routes in the area. Subway No. 1 would cross under the M3 southbound off-slip adjacent to the new dumbbell roundabout, while Subways No. 2 and 3 would cross under the north and south sides of the western end of the dumbbell respectively. These three subways provide a realigned and upgraded route of the existing path from Easton Lane on the west side of the motorway to Easton Lane on the north.

2.3.23 Subway No. 4 would cross under the western side of the new dumbbell roundabout. This is to connect the existing pedestrian/cycle route from Kings Worthy into the Easton Lane route.

2.3.24 All the subways would be likely to be buried concrete box structures. The two existing subways would be removed.

Retaining walls

2.3.25 At this stage, two retaining walls are currently envisaged: one on the A34 northbound on-slip, adjacent to the existing Highways England's maintenance depot; and one on the A34 northbound mainline to the north of Structure No. 3. However, the retaining wall requirements are at an early stage of development and this number could increase or decrease. All retaining wall types will be considered and the choice made based on the particular requirements at each location.

Sign and signal gantries

2.3.26 Nine sign or signal gantries would be required as detailed in 2.3.32. These would be either portal or cantilever gantries, as required.

Closed-circuit television (CCTV) masts

2.3.27 New CCTV masts would be required, these are in development but are anticipated to be in line with guidance and design standards.

Walking, cycling and horse-riding facilities

2.3.28 The walking, cycling and horse-riding facilities around the junction would be upgraded. Connecting to the existing facility on the western side of Easton Lane, it would descend beneath the western dumbbell roundabout via two subways underneath the circulatory carriageway before climbing up to cross the M3 on the northern side of the road bridge across the motorway. On the eastern side of the motorway it would descend, and a subway would route beneath the M3/A34 link to connect back to the eastern side of Easton Lane.

2.3.29 A walking, cycling and horse-riding route would also branch off from the middle of the western dumbbell roundabout via a subway directly westwards. The route would then run alongside the link road to the Highways England depot and the associated link road/M3 northbound on-slip. It would go beneath the A34 northbound interchange link and then over the A34 southbound interchange link before descending and running parallel to the southbound carriageway of the A34 and heading north to Kings Worthy.

2.3.30 There would also be a new walking, cycling and horse-riding facility on the eastern side of the M3 between Easton Lane and Long Walk, running parallel to (but separate from) the motorway.

Signage/gantries

2.3.31 Signage is in development but is anticipated to be in line with guidance and design standards.

2.3.32 Gantries would be provided at the following locations:

- The existing cantilever variable message signs (VMS) on the M3 southbound approach to Junction 9 would be retained

- Two new cantilever VMS would also be provided on the southbound M3, north of Junction 9
- Within Junction 9, two existing cantilever VMS would be removed and replaced with one superspan portal gantry, carrying both signs and lane signals, and one cantilever VMS
- One new cantilever VMS would be provided on the northbound M3 to the north of Junction 9
- South of Junction 9, additional signs would be installed on three gantries to be constructed by the M3 J9-14 Smart Motorway Scheme
- On the southbound A34, a combination of one cantilever gantry carrying signs and lane signals and two cantilever VMS would be provided

2.3.33 All gantry mounted VMS and signals would be standard types commonly used across the Highways England network on Smart Motorway schemes. These are MS4s (Message Sign Mark 4) and Advanced Matrix Indicators (AMI).

2.3.34 Infrastructure to support the VMS and signals would also be provided. This would include masts for CCTV cameras, Radar MIDAS detectors, cabinets, chambers and a ducted network installed in a trench in the verge.

Lighting

2.3.35 Lighting is in development but is anticipated to be in line with guidance and design standards. We do not currently plan to light the junction or slip roads.

2.3.36 The subways and the underpass (Structure No. 2a and 2b) would be provided with lighting due to the length.

2.3.37 The walking, cycling and horse-riding route to the west of the M3 would also be lit.

2.3.38 The walking, cycling and horse-riding route on the eastern side of the M3 between Easton Lane and Long Walk, would not be lit.

Construction activities

2.3.39 The construction phase of the Proposed Scheme is being programmed and sequenced to reduce disruption to the local surroundings, residents, business, and road users as far as practicable. It is anticipated construction methods would follow standard construction practices and specific mitigation measures would be implemented and tailored to the Proposed Scheme as required.

2.3.40 The Proposed Scheme includes the construction of new slip roads, retaining walls, gantries, safety barriers and three new major structures using standard road construction methods. The construction of these assets would re-use excavated materials as fill (where possible) to reduce the number of construction vehicles travelling on the network. Temporary traffic diversions and lane closures will be required for the duration of the construction of the Proposed Scheme.

2.3.41 It is anticipated the construction contractor would operate in accordance with relevant best practices, such as the Considerate Constructors Scheme. Where possible the construction contractor would control and limit noise, vibration and dust levels as far as practicable to

protect affected properties, businesses and other sensitive receptors. Prior to and during construction activities, the construction contractor would engage regularly with key stakeholders to provide an opportunity to raise issues and discuss matters directly.

Drainage

- 2.3.42 The highway drainage strategy seeks to capture the runoff from the highway, its associated earthworks and structures, and existing lengths of the M3 that would not be altered by the Proposed Scheme. The runoff would be attenuated and flows to outfalls restricted to existing discharge rates.
- 2.3.43 The current drainage design proposes an attenuation pond within the parcel of land between the A34 southbound and the M3 mainline to attenuate runoff from these carriageways. A maintenance access track for the pond has been proposed from Long Walk and would follow the highway boundary. The outflow from the pond is proposed to discharge to the River Itchen via an existing Highways England outfall.
- 2.3.44 The drainage proposal for the remaining sections of proposed carriageway is to provide online attenuation before discharging to the ground. This would mimic the existing drainage discharge.
- 2.3.45 The risk of pollution to the River Itchen and groundwater from the proposed drainage design will be assessed and pollution prevention measures provided where identified as being required.

Mitigation requirements

- 2.3.46 A comprehensive environmental mitigation design is in development. This is being developed as part of an iterative design process with input from our environmental disciplines and project engineers, as well as in consultation with relevant stakeholders including the SDNPA, Winchester City Council, Hampshire County Council, Environment Agency and Natural England.
- 2.3.47 The current proposals include the following environmental mitigation:
- the design seeks to integrate the Proposed Scheme into the surrounding topography, creating specific landscape forms, retaining vegetation wherever practicable and creating and planting new habitats
 - replacement habitat and enhancements to existing habitats for protected species
 - creation of areas of new habitat including woodlands, trees, hedgerows, chalk grasslands and pond habitats where practicable
 - provision of bat roosting boxes, bird nesting boxes, dormouse boxes and habitat piles in order to achieve a net gain for biodiversity
- 2.3.48 The environmental mitigation design will seek to enhance the quality of the surrounding environment and will accommodate a new walking, cycling and horse-riding facility on the eastern side of the M3 between Easton Lane and Long Walk, running parallel to (but separate from) the motorway. This will provide a link between Easton Lane and the Itchen Way to the north and enhance recreational opportunities in this part of the SDNP.
- 2.3.49 The current environmental mitigation and enhancement details are being developed as the design and the environmental assessment progresses. Where necessary, once the

assessments have progressed further, other mitigation measures such as for noise, in the form of low noise road surfacing and/or noise barriers would be incorporated into the design. An indication of the environmental mitigation scheme is illustrated on the Preliminary Environmental Mitigation Design Plan (Figure 1-3) and the Preliminary Environmental Mitigation Design Cross Sections (Figure 1-4). This follows preliminary discussions held with stakeholders in May 2019.

2.3.50 All the environmental mitigation measures would be recorded in the Register of Environmental Actions and Commitments, which would be submitted along with the Environmental Statement.

2.3.51 Mitigation measures for the construction of the Proposed Scheme will be outlined in a Code of Construction Practice (CoCP), which will be submitted along with the Environmental Statement. The CoCP will make reference to any Construction Environmental Management Plans that are developed.

3. Part 3 – Assessment of alternatives

3.1 Consideration of alternatives

- 3.1.1 In 2013, Hampshire County Council (HCC) commissioned a feasibility study to examine the strategic case for initial options and estimate the expected performance of potential improvement schemes. The report proposed and assessed nine options and recommended that the option of direct free-flow links from M3 to A34 and remodelling Junction 9 would most likely ease congestion while reducing land take.
- 3.1.2 The Asset Support Contractor for the area developed three free-flow options as below:
- Option 1 – 70mph (120km/h) speed limit (A34 free-flow link below M3, but could also be considered over M3)
 - Option 2 – 50mph (80km/h) speed limit (A34 free-flow link below M3, but could also be considered over M3)
 - Option 3 – 40mph (65km/h) speed limit (A34 free-flow link below M3, but could also be considered over M3)
- 3.1.3 In December 2014, the Department for Transport published the Road Investment Strategy (RIS) for 2015-2020. The RIS sets out the list of schemes that are to be delivered by Highways England over the period covered by the RIS (2015 to 2020).
- 3.1.4 The RIS identifies improvements to M3 J9 Winnall Interchange as one of the key investments in the Strategic Road Network for the London and South East region.
- 3.1.5 Highways England developed the three options further throughout 2015, 2016 and 2017. During the strategy, shaping and prioritisation stages, Option 1 was developed into a further alternative, Option 4. This option makes more use of existing infrastructure, such as retaining, rather than demolishing, the Highways England depot, while delivering broadly similar journey time benefits.
- 3.1.6 Some options were combined for the next stage of option identification. As such, Highways England decided that the options should be renumbered to provide more clarity. As the original options were numbered 1 to 4, it was decided to renumber future options Option 11 to Option 18.
- 3.1.7 The following options were considered during the strategy, shaping and prioritisation stages but ultimately rejected for further consideration due to land take, visual impact, cost inefficiencies and environmental issues:
- Option 12 – This option provided free-flow links between A34 and M3 with the A34 southbound link passing under the M3 with a 70mph (120km/h) design speed and a two-step relaxation on horizontal geometry. The A34 northbound link has a 70mph (120km/h) design speed.
 - Option 13 – This option provided free-flow links between A34 and M3 with the A34 southbound link passing over the M3 with a 70mph (120km/h) design speed. The A34 northbound link has a 70mph (120km/h) design speed.
 - Option 15 – This option provided free-flow links between A34 and M3 with the A34 southbound link passing over the M3 with an 85km/h design speed and a two-step

relaxation on horizontal geometry. The A34 northbound link has a 70mph (120km/h) design speed.

- Option 17 – This option provided free-flowing links with a 75 metres loop for the A34 southbound link under the M3. The A34 northbound link has a 70mph (120km/h) design speed.

3.1.8 The Proposed Scheme then progressed in to the option identification stage. During the early part of the option identification stage, five options were short listed for further consideration:

- Option 11 – A development of Option 1 to include south-facing Junction 9 slip roads, retain Highways England depot and remove sweeping A33 southbound link to retain existing merge. This option provides free-flow links between A34 and M3 with the A34 southbound link passing under the M3 with a 70mph (120km/h) design speed. The A34 northbound link also has a 70mph (120km/h) design speed. Junction 9 would be rebuilt with a dumbbell roundabout layout.
- Option 14 – A variant of Option 4 providing free-flow links between A34 and M3 with the A34 southbound link passing under the M3, a 60mph (100km/h) design speed and a three-step relaxation on horizontal geometry. The A34 northbound link has a 70mph (120km/h) design speed. Junction 9 would be rebuilt with a dumbbell roundabout layout.
- Option 16A – A variant of Option 4 providing incremental delivery of Option 14. This provides a free-flow for the A34 southbound with a 60mph (100km/h) design speed and a three-step relaxation on horizontal geometry. The northbound A34 would still use the existing A34 through the Junction 9 roundabout. This option is considered to facilitate potential scheme capital costs within the affordable budgets of RIS (2015-2020). Option 16A was produced as a possible first stage of the incremental delivery of Option 14, which would then theoretically be followed by a second stage to complete the construction of a scheme comparable to Option 14.
- Option 16B – A variant of Option 4 providing incremental delivery of Option 14. This provides a free-flow for the A34 northbound, which has a 70mph(120km/h) design speed. The southbound A34 would still use the existing A34 through the Junction 9 roundabout. This option is considered to facilitate potential scheme capital costs within the affordable budgets of RIS (2015-2020). Option 16B was also produced as a possible first stage of the incremental delivery of Option 14 which would then theoretically be followed by a second stage to complete the construction of a scheme comparable to Option 14.
- Option 18 – A variant of Option 1 providing a throughabout (a type of road junction where a major road passes through a roundabout) at M3 Junction 9 (do-minimum design) with a 40mph (70km/h) design speed. This option was developed to consider a reduced cost option of converting the current Junction 9 roundabout to a throughabout. This option is considered to facilitate potential scheme capital costs within the affordable budgets of RIS (2015-2020) and has no impact on the SDNP.

3.1.9 The Proposed Scheme then progressed into the next stages of design, which included assessing options in more detail, referred to herein as the ‘option selection stage’ and ‘option selection assessment’. An Environmental Assessment Report (WSP, 2018d) was drafted at this stage. Options 11 and 18 were not progressed to an option selection stage. Option 11 was discounted due to its significant adverse environmental effects, high cost and a low benefit-to-cost ratio compared to other options. Option 18 was discounted as it

was not compliant with the RIS's objectives for providing free-flowing links from the A34 to the M3.

- 3.1.10 Our Investment Decision Committee decided that Option 14 should progress to the option selection assessment because it fully meets the Proposed Scheme objectives and whilst it has similar adverse effects to the other options, it provides walking, cycling and horse riding benefits sooner. In addition, the incremental delivery of Option 14 was progressed in the event of insufficient funds in future to deliver Option 14.
- 3.1.11 For the incremental delivery it was decided that Option 16B would be built first as it had a lower cost and higher benefit to cost ratio. This would be followed by a variation to Option 16A in order to complete the construction of a scheme comparable to Option 14. The variation to Option 16A was named Option 16C to distinguish from the original Option 16A as it requires additional improvements such as the dumbbell roundabout and the widening of the Option 16B A34 northbound link under Junction 9 from one lane to two lanes and alteration of the diverge from a ghost island diverge for lane drop to a two lane drop.
- 3.1.12 In early 2018, the preferred Option 14 was taken to an options consultation. This is because there was clear evidence that Option 14 was more efficient and cost effective to build in one phase rather than the two phases of Option 16B followed by 16C. Views were sought on the preferred Option 14.
- 3.1.13 Feedback from the options consultation highlighted the main concerns with the preferred option were about access from Junction 9 to the A33. These related to safety concerns with the weaving length from the A34 northbound merge, from the Junction 9 link, to the subsequent offside diverge to the A33.
- 3.1.14 The Preferred Route Announcement was made in July 2018 and took this option forward. It highlighted the need for further design development to be carried out to address the A34/A33 merging concerns.
- 3.1.15 To address these concerns, three options were considered for improving the A33 northbound layout. The option taken forward is described in paragraph 2.3.13. This includes realigning the existing M3 northbound on-slip to become the A34 northbound on-slip that merges with the A34 northbound two lanes from the M3.

4. Part 4 – Environmental assessment methodology

4.1 Introduction

4.1.1 The Proposed Scheme is classed as a Nationally Significant Infrastructure Project under the Planning Act 2008. Therefore, the EIA will be carried out in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, as well as guidance contained in the DMRB.

4.2 Scoping

4.2.1 The scoping process is used to determine which environmental topics should be assessed and the level of detail included in the EIA. A Scoping Report has been prepared for the Proposed Scheme, setting out the key potential impacts and the proposed approach to the assessment. The M3 Junction 9 Improvements EIA Scoping Report can be accessed by following the link provided in Section 1.4.3.

4.3 Identifying baseline conditions and sensitive receptors

4.3.1 An important stage in carrying out EIA, which usually starts at the scoping stage, is to establish the baseline conditions. The baseline conditions are not necessarily the same as those that exist at the current time; they are the conditions that would exist in the absence of the Proposed Scheme either (a) at the time that construction is expected to start, for impacts arising from construction; or (b) at the time that the Proposed Scheme is expected to be open to traffic, for impacts arising from its operation. Therefore, the identification of the baseline conditions involves predicting changes likely to happen in the intervening period, for reasons unrelated to the Proposed Scheme. Work is currently ongoing to understand the baseline conditions. This report provides preliminary information about the baseline conditions.

4.3.2 The identification of sensitive receptors is closely linked to the baseline conditions. Receptors could be a physical resource, for example a water body or habitat type, or receptors could be a user group, for example, local residents or recreational users of an area. Some receptors would be more sensitive to particular environmental impacts than others or be considered more valuable.

4.4 Predicting environmental impacts

4.4.1 The next stage of the EIA process is to predict potential impacts that could arise as a result of the Proposed Scheme. Impacts are changes to the environment, compared with the baseline environment, attributable to the construction and operation of the Proposed Scheme, and could be adverse or beneficial, direct or indirect, temporary or permanent.

4.4.2 The methods of forecasting impacts vary by environmental topic. For example, the assessment of air quality and noise relies on traffic modelling. The general approach to the assessment is outlined in this document where appropriate. Further information can be found in the EIA Scoping Report and can be accessed by following the link provided in Section 1.4.3. A list of the planning policies that influence the assessment approach for various topics is provided in Part 9 of this report.

4.5 Evaluating significance

- 4.5.1 The EIA process then provides an evaluation of how significant these impacts would be considering the sensitivity of the environmental receptor, the nature and magnitude of change (for example if it is permanent or temporary, large scale or small scale) and whether it can be mitigated through good design or construction management. It should be noted that the PEIR includes preliminary assessments and does not assign significance. Any preliminary assessments that assign significance are indicative for the purposes of this pre-design public consultation and will be confirmed and detailed in the Environmental Statement.
- 4.5.2 DMRB Volume 11, Section 2, Part 5 HA 205/08 'Assessment and Management of Environmental Effects' (Highways Agency, 2008) provides advice on typical descriptors of environmental value, magnitude of change and significant of effects. Table 4-1 to Table 4-4 reproduce these descriptors and demonstrate how the significance of effect category can be derived. Preliminary assessments against these criteria will be made on the basis of professional judgement.

Table 4-1 Environmental value (or sensitivity) and typical descriptors (Highways Agency, 2008)

Value (sensitivity)	Typical descriptors
Very high	Very high importance and rarity, international scale and very limited potential for substitution
High	High importance and rarity, national scale, and limited potential for substitution
Medium	High or medium importance and rarity, regional scale, limited potential for substitution
Low (or lower)	Low or medium importance and rarity, local scale
Negligible	Very low importance and rarity, local scale

Table 4-2 Magnitude of change and typical descriptors (Highways Agency, 2008)

Magnitude of change	Typical descriptors
Major	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (Adverse)
	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality (Beneficial)
Moderate	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements (Adverse)
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial)
Minor	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (Adverse)
	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial)
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse)

Magnitude of change	Typical descriptors
	Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial)
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction

4.5.3 The significance of effect will be determined from a combination of the assessed value of the asset and the magnitude of change. Five levels of significance (very large, large, moderate, slight or neutral) are defined which apply to both adverse and beneficial impacts. A significance of effect of moderate or above is taken to be significant in EIA terms. The matrix used to assess the significance of effect is presented in Table 4-3.

Table 4-3 Significance of effects matrix (Highways Agency, 2008)

		Magnitude of change				
		No change	Negligible	Minor	Moderate	Major
Value	Very high	Neutral	Slight	Moderate or large	Large or very large	Very large
	High	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
	Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
	Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
	Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

4.5.4 The DMRB recognises 'the approach to assigning significance of effect relies on reasoned argument, professional judgement and taking on board the advice and views of appropriate organisations. For some disciplines, predicted effects may be compared with quantitative thresholds and scales in determining significance. Assigning each effect to one of the five significance categories enables different topic issues to be placed upon the same scale, in order to assist the decision-making process at whatever stage the project is at within that process' (Highways Agency, 2008).

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

Table 4-4 Descriptors of the significance of effect categories (Highways Agency, 2008)

Significance category	Typical descriptors
Very Large	Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change (e.g. loss or severe damage to key characteristics) in a site or feature of local importance may also enter this category.

Significance category	Typical descriptors
Large	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.
Slight	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.
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

4.5.6 This is the methodology that will be used for the final findings reported in the Environmental Statement. However, not all of the environmental topics will use the above criteria or approach. For example, some topics do not use a matrix-based approach but instead use numerical values to identify impacts (e.g. Noise and Vibration) and some topics do not have agreed methods of assessment of scales of measurement for either value or sensitivity (e.g. Geology and Soils). Therefore, each environmental topic specialist will use the information provided above, their topic specific guidance as well as their professional judgement to assess the significance of effects.

4.6 Mitigation and enhancement

4.6.1 Where significant adverse effects are identified, mitigation will be proposed to reduce significant impacts. In some cases, EIA professionals and stakeholders involved in the process could also identify and recommend enhancement opportunities for a project to achieve improved environmental outcomes. It is therefore important that the EIA process takes place alongside the development of a scheme’s design to make the most of such opportunities.

4.7 Reporting

4.7.1 EIA work for the Proposed Scheme is currently being carried out by environmental specialists. The final findings of the EIA for the Proposed Scheme will be reported in the Environmental Statement.

4.7.2 Additional assessments such as the Flood Risk Assessment, Habitats Regulations Assessment, Arboriculture Impact Assessment, the Highways Agency Water Risk Assessment Tool and Water Framework Directive Assessment will be reported alongside the Environmental Statement.

4.8 Major events

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

- Vulnerability of the project to major risks of major accidents and/or disasters that are relevant to the project (subsequently referred to as major events).

- Any consequential changes in the predicted effects of that project on environmental topics.

Methodology

4.8.2 An assessment of significance will be carried out for the major events identified for the Proposed Scheme. In accordance with the latest Highways England guidance, a qualitative assessment will be carried out and reported within the relevant individual environment topics in the Environmental Statement, as set out in Table 4-5.

Table 4-5 Major events and associated environmental assessment topics

Major event	Potential environmental impacts	Environmental assessment topic
Storms	Flood High winds causing damage to environmental receptors and structures	Climate change Road drainage and the water environment
Floods	Flooding	Road drainage and the water environment
Transport accidents – road	Environmental pollution incidents; emissions to air, ground and water	Air quality Biodiversity Materials Geology and soils Road drainage and the water environment

4.9 Expertise

4.9.1 The EIA Regulations require that the Environmental Statement is prepared by ‘competent experts’. The EIA is being undertaken by Jacobs on behalf of Highways England. Jacobs has been awarded the EIA Quality Mark from the Institute of Environmental Management (IEMA), demonstrating competency in Environmental Statement preparation. At the individual level, suitably qualified and experienced specialists have carried out the initial assessment presented in this PEIR and will carry out the detailed assessment to be presented in the Environmental Statement.

4.10 Constraints and limitations

4.10.1 Any constraints and limitations to the preliminary assessment are outlined in each topic section below.

5. Part 5 – Assessments

5.1 Air Quality

- 5.1.1 Air quality is a consideration in any development proposal involving significant changes in the nature and location of emissions to air. The Proposed Scheme aims to reduce traffic congestion at the M3 Junction 9 via improvements including introduction of free-flow movements onto the A34. Vehicle traffic emissions are the largest contributor to air pollution at a local level in the UK, so changes in the flow of traffic has the potential to increase (and decrease) emissions from vehicle traffic and change ambient air quality concentrations at nearby receptors.
- 5.1.2 A DMRB ‘simple’ air quality assessment was carried out at the option selection stage (described in 3.1.9) to establish the potential effects of the Proposed Scheme on local and regional air quality for several different design options. The preliminary design stage assessment will include detailed air quality modelling of the preferred design for the Proposed Scheme.
- 5.1.3 Traffic data that the preliminary design assessment will be based on are not yet available, so this section summarises the available information regarding current air quality (baseline) at and around the Proposed Scheme area, identifies the potential impacts during the construction and operational phases of the Proposed Scheme, and makes a reference to the outcomes of the option selection assessment.

Existing and baseline knowledge

- 5.1.4 A review and assessment of the current air quality information near the Proposed Scheme has been carried out to establish a ‘baseline’ situation against which the assessment results could be compared to. This has included a desk-based review of the following sources:
- Local Air Quality Management (LAQM) published reports by Winchester City Council (Winchester City Council, 2018)
 - Project-specific nitrogen dioxide (NO₂) diffusion tube monitoring undertaken by local authorities and Highways England between 2013 and 2017
 - Department for Environment, Food and Rural Affairs (Defra) background maps (Defra, 2019a)
 - National modelling carried out by Defra using the Pollution Climate Mapping (PCM) model
 - Natural England’s MAGIC website (Defra, 2019) (for information on designated sites)
 - Air Pollution Information System for ecological sites

LAQM

- 5.1.5 Under Part IV of the Environment Act 1995, the UK Government introduced LAQM, which places duties on local authorities to carry out periodic reviews of air quality in their areas and to assess present and likely future air quality concentrations against the Air Quality Strategy (AQS) objectives (‘AQO’). Where these objectives are not likely to be met, the local authority must designate an Air Quality Management Area (AQMA) and produce an action plan for improvement in air quality in these areas.

- 5.1.6 The Proposed Scheme falls within the local authority area of Winchester City Council. The latest LAQM report, the 2018 Air Quality Annual Status Report (Winchester City Council, 2018), has been obtained and reviewed. Should the preliminary design identification of the affected road network identify a study area that includes further local authorities once the traffic data has been received, these local authorities will be included in the preliminary design full assessment report, as required.
- 5.1.7 The main pollutant of concern in Winchester is NO₂, which currently exceeds the annual mean air quality objective close to busy roads within the city centre.

AQMA

- 5.1.8 In 2003, the Winchester Town Centre AQMA was designated for exceedances of the annual mean NO₂ AQO and 24-hour PM₁₀ AQO. The 24-hour PM₁₀ AQMA was later revoked in 2013 after a number of years of measured concentrations remaining below objective levels.
- 5.1.9 The highest NO₂ concentration recorded within the AQMA during the latest monitoring year (2017) was 50.8µg/m³ at Romsey Road station. The AQMA is about 1.2 kilometre away from the Proposed Scheme. It is shown on Figure 5-1-1.

Local air quality management monitoring

- 5.1.10 Winchester City Council carries out air quality monitoring using NO₂ diffusion tubes (a network of 34 locations) and continuous monitoring stations (at four locations).
- 5.1.11 Table 5-1 summarises the annual NO₂ diffusion tube monitoring concentrations at locations within a radius of 2 kilometre from the Proposed Scheme's boundary between 2013 and 2017. There is one exceedance (56.0µg/m³) identified at Martyr Worthy Road, Kings Worthy station, in 2017. The locations are shown on Figure 5-1-1.

Table 5-1 LAQM diffusion tube monitoring (2013-2017) (2km from Proposed Scheme boundary)

Site Name	Site Type	In AQMA?	2013	2014	2015	2016	2017	Distance from Site (km)
10 Eastgate St	Roadside	Yes	41.5	44.6	37.6	36.8	30.9	1.8
Greyfriars	Roadside	Yes	37.1	34.1	31.5	30.0	27.5	1.7
Friarsgate	Roadside	Yes	33.0	28.4	25.9	26.9	23.9	1.8
Upper Brook St (Echo)	Roadside	Yes	45.1	39.0	37.6	37.1	33.0	2.0
Roadside Monitor	Roadside	Yes	47.6	40.3	38.2	37.2	32.1	2.0
Roadside Monitor	Roadside	Yes	47.6	40.3	38.2	38.6	31.7	2.0
Roadside Monitor	Roadside	Yes	47.6	40.3	38.2	37.7	31.9	2.0
Jewry St	Roadside	Yes	52.5	47.1	40.6	41.7	38.7	2.0
City Road	Roadside	Yes	41.8	38.1	36.7	33.8	31.6	2.0
74 Northwalls	Roadside	Yes	34.6	31.1	30.0	29.7	28.2	1.7
Wales St	Roadside	Yes	37.5	31.2	30.5	31.5	29.8	1.3
Alresford Rd (M3)	Other	No	43.1	41.3	37.0	38.4	33.0	1.4
Worthy Rd 1	Roadside	Yes	33.2	29.3	24.2	22.8	21.5	1.6
Worthy Rd 2	Roadside	Yes	33.2	29.3	24.2	23.8	22.2	1.6
Worthy Rd 3	Roadside	Yes	33.2	29.3	24.2	22.9	20.4	1.6

Site Name	Site Type	In AQMA?	2013	2014	2015	2016	2017	Distance from Site (km)
Andover Rd	Roadside	Yes	40.5	36.4	33.5	32.9	32.4	1.9
Bus Station	Other	Yes	41.8	35.9	33.7	30.4	28.0	1.9
Church Green Close, Kings Worthy	Other	No	28.0	24.3	25.5	25.5	20.9	1.5
Martyr Worthy Rd, Kings Worthy	Other	No	n/a	n/a	n/a	n/a	56.0	1.8

5.1.12 Table 5-2 summarizes the annual NO₂ and PM₁₀ concentrations at the continuous monitoring stations between 2013 and 2017. No exceedances of the NO₂ AQS objective are identified at continuous monitoring stations for the most recent monitoring years (2015 to 2017).

Table 5-2 LAQM Winchester City Council continuous monitoring station monitoring (2013-2017)

Site Name	Site Type	In AQMA?	Pollutant	Concentration (µg/m ³)					Distance from Site (km)
				2013	2014	2015	2016	2017	
Echo Office	Roadside	Yes	NO ₂	47	41	38	38	n/a	2.0
			PM ₁₀	31	29	32	31	n/a	
Godson House	Urban Background	Yes	NO ₂	25	24	20	n/a	n/a	1.8
			PM ₁₀	23	18	n/a	n/a	n/a	
St George's Street	Roadside	Yes	NO ₂	n/a	n/a	n/a	n/a	38.5	2.1
Station Approach (Chesil Street)	Roadside	Yes	NO ₂	n/a	n/a	n/a	n/a	29.7	1.9

Defra background maps

5.1.13 Background annual mean concentrations for NO₂, PM₁₀ and PM_{2.5} were obtained from Defra for 2018, and background sector removal (“in-square” major roads and motorways were removed) carried out using the Defra Background Sector removal tool 6.0.

5.1.14 As the Affected Road Network cannot be defined at this stage (see the methodology Section below), the maximum background concentrations of the nine grid squares centred around the Proposed Scheme were used. These nine grid squares cover an area of 4km² including the residential and rural areas on the west and east of the Proposed Scheme’s centre, respectively.

5.1.15 The maximum NO₂, PM₁₀ and PM_{2.5} mean annual concentrations are 13.2µg/m³, 15.5µg/m³ and 9.9µg/m³, respectively, as presented in Table 5-3, and do not show exceedance of the relevant AQS objectives.

Table 5-3 2018 sector removed Defra background concentrations of NO₂, PM₁₀ and PM_{2.5}

X	Y	Total NO _x (µg/m ³)	Total NO ₂ (µg/m ³)	Total PM ₁₀ (µg/m ³)	Total PM _{2.5} (µg/m ³)
449500	130500	14.2	10.6	15.3	9.7
449500	131500	12.4	9.4	14.9	9.3
450500	131500	12.9	9.8	13.1	8.4
450500	130500	13.4	10.1	12.7	8.2
450500	129500	13.7	10.4	13.0	8.4
449500	129500	14.5	10.9	15.5	9.9
448500	129500	17.9	13.2	13.8	9.3
448500	130500	13.9	10.4	12.8	8.5
448500	131500	13.0	9.9	9.9	8.0
Max			13.2	15.5	9.9

Monitoring data

5.1.16 During the lifetime of the Proposed Scheme, three project-specific NO₂ diffusion tube air quality monitoring surveys have been carried out by Highways England:

- Highways England: August 2013 and September 2014
- Highways England: January to June 2016 (10 locations)
- Highways England: May 2017 and May 2018 (20 locations)

5.1.17 Monitoring carried out in 2016 indicated that, near Junction 9, concentrations of NO₂ were below the air quality objective. However, exceedances were measured where the B3047 crosses under the A34 and the B3404 crosses over the M3.

5.1.18 A summary of the first Highways England diffusion tube surveys used within the option selection assessment are presented in Table 5-4 (assumed to be annualised to 2015 to align with 2015 base traffic data). The locations are shown on Figure 5-1-1.

Table 5-4 Option selection air quality assessment monitoring NO₂ concentrations (2015)

ID	Location	X	Y	Type	Monitored NO ₂ (µg/m ³)
M3J9J13_001_0913	Mount Drive	444172	119909	Roadside	34.1
M3J9J13_003_0913	Porteous Crescent	444625	120709	Roadside	29.2
M3J9J13_004_0913	Harlaxton Close	444647	120381	Roadside	22.4
M3J9J13_005_0913	Pantheon Road	444946	121559	Roadside	31.1
M3J9J13_012_0913	Poles Lane	445958	123740	Roadside	23.7
M3J9J13_013_0913	Laura Close	446388	124287	Roadside	26.6

ID	Location	X	Y	Type	Monitored NO ₂ (µg/m ³)
M3J9J13_014_0913	Tilden Road	446521	124459	Roadside	28.9
M3J9J13_015_0913	Shepherds Lane	446631	124762	Roadside	32.7
M3J9J13_019_0913	Southdowns Way/Fivefields Close	449500	128984	Roadside	23.5
M3J9J13_020_0913	Alresford Road	449582	129425	Roadside	30.6
M3J9J13_021_0913	Spitfire End	449561	129596	Roadside	21.4
M3J9J13_024_0913	London Road	449008	132219	Roadside	33.2
M3J9J13_025_0913	Springvale Road	448770	132714	Roadside	21.6
M3J9J13_026_0913	Long Walk	449945	131951	Roadside	19.8
M3J9J13_029_0913	Hockley Link 40m	447816	126687	Roadside	27.9

5.1.19 To support the option selection air quality assessment, a further 12-month monitoring survey was carried out at 20 locations between May 2017 and May 2018. The bias-adjusted average data from this survey is provided in Table 5-5 and are shown on Figure 5-1-1.

5.1.20 The latest monitoring data indicates no exceedances of the NO₂ air quality objective, except for at the St Catherine’s Hill SSSI ecological site.

Table 5-5 Monitoring NO₂ concentrations (May 2017 – May 2018, adjusted annual average)

ID	Location	X	Y	Type	Monitored NO ₂ (µg/m ³)
M3J9Im_006_0116	Chalk Ridge	449563	129243	Roadside	24.4
M3J9j13_019_0913	Southdowns Way/Fivefields Close	449500	128984	Roadside	21.8
M3J9J13_020_0913	Alresford Rd	449557	129422	Roadside	34.4
M3J9Im_008_0116	Winchester Masonic Centre on Alresford Rd (east side of the bridge over the M3)	449867	129436	Roadside	24.7
M3J9Im_005_0116	Willis Way	449945	131951	Roadside	13.9
M3J9j13_027_0913	Firmstone Rd	449054	129558	Roadside	17.0
M3J9Im_004_0116	Spitfire Lane on the M3 side	449554	129574	Roadside	20.8
M3J9J13_022_0913	Longfield Rd	449524	129909	Roadside	23.7

ID	Location	X	Y	Type	Monitored NO ₂ (µg/m ³)
M3J9Im_010_0116	Fiona CI by the northwest side of the junction of Fiona CI and Easton Ln	449014	129959	Roadside	32.5
M3J9J13_024_0913	London Rd	449011	132216	Roadside	33.3
M3J9J13_025_0913	Springvale Rd	448770	132714	Roadside	27.5
M3J9Im_001_0116	Willis Way	448959	132478	Roadside	23.1
M3J9_COLO A_0517	Winchester Chesil Street Monitor	448670	129257	Roadside	30.9
M3J9_COLO B_0517	Winchester Chesil Street Monitor	448670	129257	Roadside	31.5
M3J9_COLO C_0517	Winchester Chesil Street Monitor	448670	129257	Roadside	30.6
M3J9_ECO1_0517	St Catherine's Hill SSSI	448966	127657	Roadside	42.3
M3J9_ECO2_0517	Edge of River Itchen SSSI	449820	132106	Background	15.1
M3J9_ECO3_0517	Edge of River Itchen SSSI	449605	131784	Background	15.1
M3J9_ECO4_0517	Edge of River Itchen SSSI along A34	449342	131775	Roadside	32.0
M3J9_ECO5_0517	Edge of River Itchen SSSI	449162	131872	Roadside	23.1

Ecological sites

5.1.21 There are three designated sites close to the Proposed Scheme: St Catherine’s Hill SSSI and River Itchen SSSI and SAC (shown on Figure 5-1-1). Table 5-6 presents the critical load and background deposition for the most sensitive habitats at each designated site.

5.1.22 Background concentrations of NO_x at the designated sites are included below including the critical level (and air quality objective) of 30µg/m³. Background nitrogen deposition levels are below the critical load in St Catherine’s Hill SSSI, but above it in the River Itchen SSSI and SAC.

Table 5-6 Background NO_x and nitrogen deposition rates for designated ecological sites

Site	Sensitive habitat	Critical load (kgN/ha/yr)	Background deposition (kgN/ha/yr)	Critical level (µg/m ³)	Background NO _x (µg/m ³)
St Catherine’s Hill SSSI	Sub-Atlantic semi-dry calcareous grassland	25	18.2	30	25.5
River Itchen SSSI, SAC	Broadleaved deciduous woodland	20	28.2	30	23.4

Pollution climate mapping (PCM)

- 5.1.23 Defra use the PCM model to assess the UK's compliance against the EU air pollution limit values (EU Directive 2008/50/EC). Projections of the PCM model are made for each year up to and including 2030.
- 5.1.24 The PCM data have been reviewed, and the Proposed Scheme's boundary intersects with a PCM link along sections of the M3. The highest roadside annual mean NO₂ concentration was 35.0µg/m³ in 2018 and 26.44µg/m³ for 2023 (opening year), extending from north of M3 Junction 9 to M3 Junction 10. While this concentration is high in the base year, no exceedances of the relevant AQS objectives or limit values have been identified.

Methodology

Study area

- 5.1.25 The study area for the air quality assessment will be determined by a screening assessment where traffic data are analysed against the HA207/07 (Highways Agency, 2007) screening criteria, as listed below. Road links that exceed the criteria will be classed as 'affected' and will create the assessment Affected Road Network and form the basis for the air quality assessment study area. The criteria for defining affected roads are set out in HA207/07, and include the following:
- Road alignment will change by 5 metres or more; or
 - Daily traffic flows will change by 1,000 Average Annual Daily Traffic (AADT) or more; or
 - Heavy duty vehicle flows will change by 200 AADT or more; or
 - Daily average speed will change by 10km/h or more; or
 - Peak hour speed will change by 20km/h or more.
- 5.1.26 The study area consists of all relevant sensitive air quality receptors that are within 200 metres of the road links identified within the Affected Road Network and all roads within 200 metres of these receptors.
- 5.1.27 At the time of writing this report, traffic data for the preliminary design to undertake the assessment is not yet available. This means that the screening assessment has not been carried out to determine the Affected Road Network or air quality study area. As new traffic data will be available for the preliminary design, the study area that will be identified is likely to be different from the Affected Road Network used in the option selection assessment.
- 5.1.28 Based on the option selection assessment, the Affected Road Network could potentially include the M3 from Junction 7 in the north to Junction 14 in the south, dependent on the updated traffic modelling data. The study area is also likely to cover the A34 from the junction with the A303 in the north to where it joins the M3 at Junction 9. The A33 (Basingstoke Road) running parallel to the M3 and routes within Winchester could also be part of the study area.
- 5.1.29 The Affected Road Network for the option selection assessment included Winchester Town Centre AQMA and Eastleigh AQMA's No. 1 (A335) and No. 2 (M3).

Assessment scenarios

- 5.1.30 The local air quality assessment will consider the following scenarios:
- Baseline (to be confirmed)
 - Opening year (2023) do-minimum (i.e. without the Proposed Scheme) and do-something (i.e. with the Proposed Scheme)
- 5.1.31 In addition, emissions for the same study area as local air quality will be calculated for the following scenarios to produce the regional assessment:
- Baseline (to be confirmed)
 - Opening year (2023) do-minimum and do-something
 - Design year (2038) do-minimum and do-something
- 5.1.32 The pollutants that will be assessed are oxides of nitrogen (NO_x), NO₂ and particulate matter (PM₁₀ and PM_{2.5}).

Traffic data

- 5.1.33 Traffic data will be used as the basis of any local air quality assessment. It is understood that peak, inter-peak and off-peak traffic data will be available and these periods will be used as a basis for the air quality assessment as discussed in the next section.

Local air quality assessment methodology

- 5.1.34 Highways England set out the nationally recognised approach to the assessment of road schemes for air quality in their Design Manual for Roads and Bridges (DMRB) (HA207/07). This guidance is supplemented by subsequent Interim Advice Notes (IANs), which must be viewed in the context of the latest published Defra emissions and assessment toolkits. When the traffic data is available, and the air quality modelling commences the status of IANs and the DMRB emissions tools will be reviewed. However, based on available guidance air quality effects from the Proposed Scheme will follow the general guidance described in DMRB HA 207/07 Air Quality and the following associated IANs:
- IAN 170/12v3 (Highways Agency, 2013)
 - IAN 174/13 (Highways Agency, 2013a)
 - IAN 175/13 (Highways Agency, 2013b)
 - IAN 185 (Highways Agency, 2015a)
- 5.1.35 Screening (changes in flows and speeds in the opening year due to the Proposed Scheme) will be used to define the roads to be modelled as per the DMRB HA207/07 guidance. Emissions will be calculated using the most current version of the UK Emission Factor Toolkit (using the same affected road network as for local air quality). However, in the absence of updated information the extant long-term trends (from IAN 170/12v3) will be applied. In the context of IAN 185 we will apply speed pivoting but not speed banding and will use the most recent version of the Defra Emission Factor Toolkit. Road contributions to ambient concentrations will be calculated for NO_x, primary NO₂ and PM₁₀ using ADMS-Roads and the Defra NO_x to NO₂ calculator used to estimate total NO₂

concentrations. Background (non-modelled) concentrations will be taken from the Defra website.

- 5.1.36 The overall judgement of significant effects on local air quality will be based on guidance as set out in IAN174/13 and IAN175/13. However, as IAN175/13 has been withdrawn the latest Defra Pollution Climate Modelling (PCM) data will be used to assess the likelihood of non-compliance with the EU Limit Values for air quality. Human receptors will be assessed against the annual mean objective values of 40 µg/m³ for both NO₂ and PM₁₀. Ecological receptors will be assessed in line with DMRB. Criteria contained within Institute of Air Quality Management and DMRB guidance documents will be used to support the determination of impact significance, which will be based on professional judgement.

Receptors

- 5.1.37 The air quality assessment will focus on the changes in air quality concentrations (with the Proposed Scheme in place) at receptors, or locations, where members of the public are deemed 'sensitive' to air quality in terms of vulnerability and length of potential exposure.
- 5.1.38 These include residential receptors, schools and educational facilities, nursing homes and prisons as well as nationally or internationally significant ecological site receptors (as defined in DMRB HA207/07). Sensitive receptors within 200 metres of the Affected Road Network (once determined) will be identified and included in the detailed modelling assessment. The exact number of receptors will be identified on receipt of the traffic data and the subsequent screening assessment to determine the Affected Road Network.
- 5.1.39 The reported receptors will be those presenting the highest concentrations, as they will be considered as the worst-case locations for local air quality.
- 5.1.40 Building usage will be determined using the Ordnance Survey Address Layer dataset, and calculations made at the nearest façade to the busiest road. All 'receptors' will be treated as being equally sensitive.

Background concentrations

- 5.1.41 For the purposes of the preliminary design assessment, the background air quality will represent the concentrations of pollutants that would be present if there were no emissions from the roads included in the dispersion modelling. The pollution concentrations derived from the Proposed Scheme will be added to the background pollution concentrations.
- 5.1.42 Defra provides national background maps (Defra, 2019a). The most up-to-date information has a base year of 2015 (released in November 2017).
- 5.1.43 To avoid double counting in the dispersion model, NO_x, PM₁₀ and PM_{2.5} background concentrations having motorway and trunk road contributions were removed from the background annual mean (known as 'in-square sector removed'), and background annual mean NO₂ estimates were corrected using the Defra's Background NO₂ Calculator.

Ecological assessment

- 5.1.44 The assessment of likely significant effects on ecological receptors will be carried out in accordance with HA207/07 and the associated IANs, as appropriate.

Construction assessment

5.1.45 For the construction phase of the Proposed Scheme, a construction dust assessment will be carried out following the methodology in Institute of Air Quality Management guidance, and appropriate mitigation referred to. The construction dust assessment will be based on assumptions if sufficient data is not available. If appropriate, local air quality modelling of construction traffic will also be carried out.

Constraints and limitations

5.1.46 This report is based on the data available from the assessment undertaken at the option selection stage for the Proposed Scheme including recent updates originating from local and national authorities.

5.1.47 As 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.

5.1.48 In future years, one such uncertainty relates to the projection of vehicle emissions and, in particular, the rate at which emissions per vehicle would improve over time. The guidance set out in IAN 170/12 advises on the adjustment of modelled concentrations of NO₂ (and NO_x) to take account of recent trends on roadside pollution concentrations and evidence on future vehicle emissions. The preliminary design assessment takes account of this guidance and will use the Long Term Trends Euro6 (LTT_{E6}).

Potential impacts during construction

5.1.49 Traffic management measures during construction could lead to changes in vehicle emissions which could, in turn, result in impacts on local air quality. The extent to which these emissions could be included within the air quality assessment will be determined by whether traffic management scenarios are included within the provided traffic modelling data.

5.1.50 There is the potential for dust nuisance during the construction phase of the Proposed Scheme. The level and distribution of construction dust emissions would depend on where within the Proposed Scheme boundary the dust raising activity took place, the nature of the activity and controls, and weather conditions. The potential impacts of construction dust will also be included in the assessment.

5.1.51 The assessment carried out at the option selection stage concluded that, during construction, no significant impacts on amenity, human health or designated ecological receptors would be expected, providing appropriate construction mitigation measures were put in place.

Potential mitigation for construction impacts

5.1.52 Mitigation measures and site controls would be used to reduce the impact of dust during the construction phase. The level of measures and controls differs in relation to the level of risk for potential for dust nuisance. The mitigation measures are generally suitable for inclusion in a Code of Construction Practice (CoCP) which may be agreed with the respective local authority before starting activity on site. Appropriate construction dust

mitigation measures would be based on those outlined by the Institute for Air Quality Management and would be detailed within the CoCP to be submitted with the DCO application.

5.1.53 It is considered that, with an appropriate CoCP implemented, there would be no significant effects on air quality during the construction phase of the Proposed Scheme.

Potential impacts during operation

5.1.54 The Proposed Scheme would result in changes to emissions of NO_x, NO₂, PM₁₀ and PM_{2.5} along the M3 and wider road network because of changes in traffic flows and speeds.

5.1.55 Improvements to the junction, while leading to an overall increase in traffic along the M3, are also expected to reduce congestion and provide a more consistent traffic speed. The latter impact could partially offset the impacts of increased flows on emissions. The predicted concentrations that will form part of the assessment on the preliminary design will clarify whether this is the case.

5.1.56 Conversely, reduced traffic flows are expected on minor roads within Winchester and along the A33 (Basingstoke Road), which runs parallel to the M3.

5.1.57 Therefore, the Proposed Scheme is anticipated to result in both beneficial and adverse changes to local air quality concentrations at both human and ecological receptors, and these changes are dependent on the specific changes to emissions from road traffic near the relevant receptors.

5.1.58 The assessment carried out for option selection concluded that, for local air quality, the future baseline scenario results show reductions of NO_x, NO₂ and PM₁₀ concentrations at all receptors when compared to the baseline. This reduction is expected to be in place due to improvements in vehicle technology.

5.1.59 Also, the option selection assessment concluded that none of the Proposed Scheme options would result in significant air quality impacts. None of the predicted increases in NO₂ concentrations at the receptors along PCM links would give rise to a compliance risk. The assessment concluded that no significant operational human health impacts would result from increased pollutant concentrations.

5.1.60 In relation to designated sites, the option selection assessment noted that the impacts on annual mean NO_x concentrations would be imperceptible and unlikely to give rise to significant effects, except for at the following locations:

- The River Itchen within 30 to 40 metres from the centreline of the northbound carriageway of the A34 to the north of M3 Junction 9
- The River Itchen within 30 to 40 metres from the centreline of the southbound carriageway of the M3 at Junction 9
- St Catherine's Hill within 35 metres from the centreline of the northbound carriageway of the M3

5.1.61 All impacts on nitrogen deposition were expected to be less than 1% of the lower critical level for the most sensitive features.

5.1.62 The extent and concentrations at the ecological receptors for the preliminary design will not be known until the detailed modelling air quality assessment is produced. It should be noted that the findings and conclusions of the option selection assessment could differ to the preliminary design assessment.

Potential mitigation for operational impacts

5.1.63 The option selection assessment concluded that no significant operational human health impacts as a result of increased pollutant concentrations are considered likely with any of the Proposed Scheme options. Also, all impacts on nitrogen deposition are expected to be less than 1% of the lower critical level for the most sensitive features. Subsequently, as no significant adverse effects were deemed likely, no mitigation measures were recommended.

5.1.64 Based on the conclusions of the option selection assessment, and in the absence of updated traffic data (for the purposes of the preliminary design assessment), operational mitigation measures would be unlikely to be required.

Summary

5.1.65 The Proposed Scheme aims to reduce traffic congestion at M3 Junction 9 via improvements including the introduction of free-flow movements to A34. Subsequent 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.

5.1.66 This section has summarised the available information regarding the current air quality situation, identified potential impacts during the construction and operational phases of the Proposed Scheme and made a reference to the outcomes of the assessment undertaken at the option selection stage. Traffic data for the detailed air quality assessment of the preferred design option are not yet available, so the Affected Road Network (which forms the basis for the air quality assessment study area) has not been identified at this time.

5.1.67 The Proposed Scheme itself falls within the local authority area of Winchester City Council, which has one AQMA for exceedance of the annual NO₂ objective. However, the Proposed Scheme does not fall within the AQMA.

5.1.68 Local authority air quality monitoring shows no exceedances at monitoring stations within 2 kilometres of the Proposed Scheme, apart from the Martyr Worthy Road, Kings Worthy, diffusion tube station (56.0µg/m³).

5.1.69 No exceedances of the NO₂, PM₁₀ and PM_{2.5} AQS objectives were identified within the Defra background map concentration data or at the relevant PCM links intersecting the Proposed Scheme. The project-specific monitoring surveys that Highways England carried out near the Proposed Scheme identified no exceedances of the NO₂ AQS objective. Two ecological sites are near the Proposed Scheme, namely the St Catherine's Hill SSSI and the River Itchen SSSI (also a SAC).

5.1.70 Potential impacts from the construction phase relate to changes in traffic emissions on the road network and the potential for nuisance dust as a result of the construction works. The option selection assessment concluded that no significant impacts on amenity, human health or designated ecological receptors would occur, providing appropriate mitigation measures were in place. The mitigation measures are expected to be detailed in the CoCP as the project progresses.

5.1.71 The potential impacts from the operational phase would be due to changes in emissions of NO_x, NO₂, PM₁₀ and PM_{2.5} along the M3 and wider road network because of changes in traffic flows and speeds. The option selection assessment concluded that no significant impacts on human health would be likely to occur, and so no mitigation was suggested. Significant impacts were identified at certain locations of the designated ecological areas. However, impacts on nitrogen deposition would be less than 1% of the lower critical level for the most sensitive features, and so no mitigation was suggested.

5.2 Cultural Heritage

Existing and baseline knowledge

5.2.1 Details of all cultural heritage assets included within the baseline are presented in Appendix B Cultural Heritage Gazetteer and are shown on Figures 5-2-1 to 5-2-3. Appendix B includes assets that have been added to the baseline since the production of the Scoping Report (Highways England, 2019) due to design amendments and data availability; however it does not include cultural heritage assets recorded during the current programme of archaeological evaluation.

5.2.2 Table 5-7 summarises the value of all cultural heritage assets included within the baseline.

Table 5-7 Summary of Cultural Heritage assets within the baseline

Sub-topic	Negligible	Low	Medium	High	Very high	All values total
Archaeological remains	58	33	19	10 (all Scheduled Monuments)	0	120
Historic buildings (Inc. Conservation Areas)	0	1	105 (comprising 3 Conservation Areas and 102 Grade II Listed Buildings)	15 (comprising 4 Grade I Listed Buildings and 11 Grade II* Listed Buildings)	0	121
Historic Landscape Types (HLTs)	0	11	2	0	0	13
TOTAL	58	45	126	25	0	254

5.2.3 An archaeological geophysical survey was carried out in areas where archaeological remains have the potential to remain in situ (Highways England, 2018a). One ditch-like anomaly was interpreted as possible archaeological remains. A number of former field boundaries and a pipe have also been identified. Several discrete anomalies and trends across the survey area have been classified as of uncertain origin and likely to be due to natural or agricultural soil effects.

5.2.4 Intrusive archaeological survey work took place in March and April 2019. The programme of intrusive archaeological survey aimed to:

- Test the results of the preceding geophysical survey
- To examine the remains of the Neolithic ring ditch that exists within the site, known through previous excavation and geophysical survey
- To identify areas of previous chalk fill resulting from the original construction of the junction, and to identify areas of archaeological potential

5.2.5 The evaluation comprised the excavation, investigation and recording of 32 trial trenches, and the monitoring of 11 geotechnical test pits. Six of the trial trenches revealed archaeological material. The remaining 21 trial trenches, and none of the geotechnical test pits contained any archaeologically significant features or deposits.

5.2.6 These investigations revealed also evidence of disturbance and horizontal truncation of the sub-surface deposits, potentially resulting from agricultural activity, previous excavation, and earlier construction work associated with the M3 motorway. However, this disturbance was not an assessment to substantially reduce the potential for archaeological remains to remain in situ within some area of the Proposed Scheme.

5.2.7 The invasive archaeological survey largely corroborated the results of the geophysical survey and recorded the level of survival of the Neolithic ring ditch and two associated pits which had been previously excavated and backfilled, as well as a number of other previously unknown discrete features such as two prehistoric pits, and a collection of undated post holes. Although areas of previous chalk fill do not appear to have been identified, these previously unknown discrete features provide further insight into the archaeological potential of the area of the Proposed Scheme.

Methodology

5.2.8 Based on the guidance contained in DMRB Volume 11, Section 3, Part 2 'Cultural Heritage' (Highways Agency, 2007a), the following sub-topics were considered:

- Archaeological remains – the material remains of human activity from the earliest periods of human evolution to the present. These may be buried traces of human activities, sites visible above ground or moveable artefacts
- Historic buildings – “*architectural or designed or other structures with a significant historical value*”. These may include structures that have no aesthetic appeal or structures not usually thought of as ‘buildings’, such as milestones or bridges
- Historic landscape – the current landscape, whose character is the result of the action and interaction of natural and/or human factors. The historic landscape has been divided into HLTs to facilitate assessment. HLTs are historic landscape parcels with a common character such as land use or field pattern

5.2.9 Collectively, the individual sites, buildings, landscapes and other remains that make up the three sub-topics are known as cultural heritage assets. The wider surroundings of any cultural heritage asset (i.e. its setting) can significantly contribute to its heritage value. The nature and extent of the feature’s setting is not fixed and could change over time as the asset and its setting evolve (Historic England, 2017).

5.2.10 An inner study area of 300 metres extending out from the limits of the Proposed Scheme was applied for the assessment of all designated and undesignated cultural heritage assets (see Figures 5-2-1 to 5-2-3) to establish the archaeological context of the Proposed Scheme and the potential impact of it on the immediate historic environment. An outer study area of 1 kilometre from the boundary of the Proposed Scheme was applied for the assessment of designated cultural heritage assets (comprising Conservation Areas, Listed Buildings, Registered Parks and Gardens, Protected Wreck Sites, Registered Battlefields, World Heritage Sites and Scheduled Monuments). As a Zone of Theoretical Visibility has not been defined, these study areas are based on industry standards for desk-based assessments and guidance outlined in DMRB (Highways Agency, 2007a) and are considered to be suitable for the assessment and for understanding all of the potential impacts of the Proposed Scheme on cultural heritage assets and their settings.

5.2.11 An assessment of the value of cultural heritage assets within the study area was carried out on a six-point scale of very high, high, medium, low, negligible and unknown. Assessment was based on professional judgement guided by criteria provided in DMRB

(Highways Agency, 2007a). The assessment of the settings of cultural heritage assets, including their contribution to the assets' historic legibility and capacity for change, was carried out based on the guidance contained in Historic Environment Good Practice Advice in Planning Note 3: The Setting of Heritage Assets (2nd Edition) (Historic England, 2017). The criteria used to assess the value of cultural heritage assets are presented in Table 5-8.

Table 5-8 Criteria to assess the value of Cultural Heritage assets (Highways Agency, 2007a)

Value	Criteria
Archaeological Remains	
Very high	World Heritage Sites (including nominated sites). Assets of acknowledged international importance. Assets that can contribute significantly to acknowledged international research objectives.
High	Scheduled Monuments (including proposed sites). Undesignated assets of schedulable quality and importance. Assets that can contribute significantly to acknowledged national research objectives.
Medium	Designated or undesignated assets that contribute to regional research objectives.
Low	Designated and undesignated assets of local importance. Assets compromised by poor preservation and/or poor survival of contextual associations. Assets of limited value, but with potential to contribute to local research objectives.
Negligible	Assets with very little or no surviving archaeological interest.
Unknown	The importance of the resource has not been ascertained.
Historic Buildings	
Very high	Structures inscribed as of universal importance as World Heritage Sites. Other buildings of recognised international importance.
High	Scheduled Monuments with standing remains. Grade I and Grade II* Listed Buildings. Other Listed Buildings that can be shown to have exceptional qualities in their fabric or historical associations not adequately reflected in the listing grade. Conservation Areas containing very important buildings. Undesignated structures of clear national importance.
Medium	Grade II Listed Buildings. Historic (unlisted) buildings that can be shown to have exceptional qualities in their fabric or historical associations. Conservation Areas containing buildings that contribute significantly to its historic character. Historic Townscape or built-up areas with important historic integrity in their buildings, or built settings (e.g. including street furniture and other structures).
Low	'Locally Listed' buildings. Historic (unlisted) buildings of modest quality in their fabric or historical association. Historic Townscape or built-up areas of limited historic integrity in their buildings, or built settings (e.g. including street furniture and other structures).
Negligible	Buildings of no architectural or historical note; buildings of an intrusive character.
Unknown	Buildings with some hidden (i.e. inaccessible) potential for historic significance.

Value	Criteria
Historic Landscapes	
Very high	World Heritage Sites inscribed for their historic landscape qualities. Historic landscapes of international value, whether designated or not. Extremely well preserved historic landscapes with exceptional coherence, time-depth, or other critical factor(s).
High	Designated historic landscapes of outstanding interest. Undesignated landscapes of outstanding interest. Undesignated landscapes of high quality and importance, and of demonstrable national value. Well preserved historic landscapes, exhibiting considerable coherence, time-depth, or other critical factor(s).
Medium	Designated special historic landscapes. Undesignated historic landscapes that would justify special historic landscape designation, landscapes of regional value. Averagely well-preserved historic landscapes with reasonable coherence, time-depth, or other critical factor(s).
Low	Robust undesignated historic landscapes. Historic landscapes with importance to local interest groups. Historic landscapes whose value is limited by poor preservation and/or poor survival of contextual associations.
Negligible	Landscapes with little or no significant historical interest.

5.2.12 The magnitude of impact has been assessed using a five-point scale of major, moderate, minor, negligible and no change. The assessment was based on professional judgement and guided by criteria provided in DMRB (Highways Agency, 2007a). Unless otherwise stated, all impacts are adverse. The criteria used to assess the magnitude of impact on cultural heritage assets are presented in Table 5-9.

Table 5-9 Criteria to assess the magnitude of impact on Cultural Heritage assets (Highways Agency, 2007a)

Magnitude	Criteria
Major	Change to most or all key archaeological materials, such that the resource is totally altered. Change to key historic building elements, such that the resource is totally altered. Change to most or all key historic landscape elements, parcels or components; extreme visual effects; gross change of noise or change to sound quality; fundamental changes to use or access; resulting in total change to historic landscape character unit. Comprehensive changes to setting.
Moderate	Changes to many key archaeological materials, such that the resource is clearly modified. Change to many key historic building elements, such that the resource is significantly modified. Changes to some key historic landscape elements, parcels or components, visual change to many key aspects of the historic landscape, noticeable differences in noise or sound quality, considerable changes to use or access; resulting in moderate changes to historic landscape character. Considerable changes to setting that affect the character of the asset. Changes to the setting of an historic building, such that it is significantly modified.
Minor	Changes to key archaeological materials, such that the asset is slightly altered. Change to key historic building elements, such that the asset is slightly different.

Magnitude	Criteria
	<p>Changes to few key historic landscape elements, parcels or components, slight visual changes to few key aspects of historic landscape, limited changes to noise levels or sound quality; slight changes to use or access: resulting in limited changes to historic landscape character.</p> <p>Slight changes to setting.</p> <p>Changes to setting of an historic building, such that it is noticeably changed.</p>
Negligible	<p>Very minor changes to archaeological materials, or setting.</p> <p>Slight changes to historic buildings elements or setting that hardly affect it.</p> <p>Very minor changes to key historic landscape elements, parcels or components, virtually unchanged visual effects, very slight changes in noise levels or sound quality; very slight changes to use or access; resulting in a very small change to historic landscape character.</p>
No change	<p>No change to elements, parcels or components; no visual or audible changes; no changes arising from amenity or community factors.</p> <p>No change to fabric or setting.</p>

5.2.13 For all three sub-topics, the significance of effect was determined from a combination of the assessed value of the asset and the magnitude of impact. The matrix used to assess the significance of effect is presented in Table 4-3.

Constraints and limitations

5.2.14 The assessment is based on the Proposed Scheme as presented. Any changes to the design could result in changes to the assessed magnitude of impact and significance of effect.

Potential impacts during construction

5.2.15 Potential impacts on cultural heritage assets during construction are divided into two categories:

- Physical – damage to, or destruction of, assets occurring during construction of the Proposed Scheme. Activities presenting a risk during construction to known and previously unknown archaeological remains include, but are not limited to, excavation associated with geotechnical trial pitting, boreholes, topsoil stripping, excavation of foundations, landscaping, the provision of services, the creation of roads both temporary and permanent, creation of compound areas and any other ground levelling. Physical impacts on historic buildings could arise from damage to the building fabric from vibration during piling and from demolition. Physical effects on historic landscapes could result from activities such as the removal of landscape features or vegetation or the addition of infrastructure that decreases the integrity of the historic landscape and/or severance causing dereliction or neglect
- Effects on setting – changes affecting the setting of cultural heritage assets arising from construction of the Proposed Scheme. Effects to setting most commonly arise from noise and visual intrusion

5.2.16 A potential significant effect before mitigation has been predicted for two cultural heritage assets comprising the Prehistoric Occupation Site at Easton Down (Asset 55) and a Square Enclosure (Asset 165).

- 5.2.17 Asset 55 incorporates an extensive 'Celtic' field system and has been assessed to be of medium value. Asset 55 extends to within the proposed Order Limits of the Proposed Scheme and there is the potential for partial removal or damage to Asset 55 during construction. There is the potential for the ring ditch recorded in trench 17, and prehistoric pits recorded in trench 22 during invasive survey to be associated with Asset 55. The confirmed presence of in situ archaeological remains suggest the potential for further surviving features that may be situated within the proposed Order Limits of the Proposed Scheme. While there is the potential for the group of post holes recorded in trench 3 and the indeterminate feature in trench 5 to also be associated with Asset 55 due to their proximity to this area, the lack of diagnostic material recovered makes this association unclear.
- 5.2.18 Asset 165 is a prehistoric square enclosure recorded through aerial photographs which has been assessed to be of medium value. It is situated within the vicinity of the construction compound location to the northwest of the Proposed Scheme. Although it is currently within the grounds of a BMX track, archaeological remains may still be present.
- 5.2.19 The potential magnitude of impact on Asset 55 and Asset 165 has been assessed to be moderate and the significance of effect is therefore moderate.
- 5.2.20 No further significant effects on known archaeological remains are predicted. However, there would be the potential for damage to or destruction of unknown archaeological remains during construction. The invasive surveys which took place in March and April 2019 confirmed the presence of further, previously unknown archaeological remains with the potential to extend into the proposed Order Limits of the Proposed Scheme and pose the potential for further remains associated with the prehistoric occupation at Easton Down (Asset 55). There are several previously recorded archaeological interventions within and around the Proposed Scheme from construction of the original M3 and the Easton Lane interchange. This includes excavations and geophysical survey at Easton Lane which uncovered a middle Bronze Age ditch as part of a watching brief, and during trial trench evaluations at the Winnall Industrial estate where four trenches in advance of proposed redevelopment revealed Late Prehistoric to Early Roman enclosure ditches. The findings include settlements, enclosures and cemeteries, suggesting that the area was occupied from the Bronze Age to the Roman Period. Aerial photography has also revealed a series of hollow ways, likely to be of medieval date, climbing the sides of the Itchen Valley (Morgan Evans, 1987). Although the identified sites could have been destroyed by the original construction of the M3, it is possible that more such features are present. Without mitigation, there would be potential for impacts on the unknown archaeological resource to have a significant effect.
- 5.2.21 No physical impacts during construction are predicted on the 10 Scheduled Monuments within 1 kilometre of the Proposed Scheme. At most, these cultural heritage assets could be subject to a temporary minor impact on their settings resulting from increased noise and visual intrusion during construction. This would be unlikely to impact on the value of these cultural heritage assets and would result in a slight adverse effect overall, which is not significant.
- 5.2.22 No physical impacts during construction are predicted for any historic building. Some of these assets could be subject to a temporary minor impact on their settings resulting from increased noise during construction. This would be unlikely to impact on the value of these cultural heritage assets and it is predicted that there would be no significant effects on the setting of historic buildings.

5.2.23 As the Proposed Scheme is mainly within or adjacent to the area of the pre-existing highway, there would be limited new land take that would physically affect HLTs. These cultural heritage assets could also be subject to a temporary minor impact resulting from increased noise and visual intrusion during construction. It is predicted that there would be no physical impacts or significant effects on the setting of HLTs during construction.

Potential mitigation for construction impacts

5.2.24 Further mitigation for archaeological remains could comprise a programme of archaeological investigation, recording, analysis, interpretation and dissemination. The extent and nature of the archaeological investigations have been assessed following the recent programme of archaeological evaluation. It is expected that a programme of strip, map and sample excavation will be conducted prior to construction in response to the findings of the invasive survey conducted in March and April 2019. There is also the potential for a programme of archaeological watching brief during construction.

5.2.25 There is also the potential within the area of the Proposed Scheme for previously unknown Palaeolithic remains to be present within the Itchen River Valley. Although these remains were not identified during the invasive survey in March and April 2019 during either trial trenching, or monitoring of geotechnical boreholes and, if present, would be unlikely to be impacted by the Proposed Scheme. A watching brief may be necessary to monitor the potential presence of Palaeolithic remains within the proposed Order Limits.

5.2.26 Maintaining and incorporating appropriate mitigation through design in the form of screening (for example by using cuttings, bunds and vegetation) and following considerate construction practices would further reduce any potential effects to the setting of cultural heritage assets.

Potential impacts during operation

5.2.27 Potential impacts during operation are limited to effects to setting which could arise from noise and visual intrusion. This would be unlikely to be a noticeable change from the current M3 environment, and therefore no significant effects on cultural heritage assets would occur.

Potential mitigation for operational impacts

5.2.28 Maintaining and incorporating appropriate mitigation through design in the form of screening (for example by using cuttings, bunds and vegetation) would further reduce any potential effects to the setting of cultural heritage assets.

Summary

5.2.29 There are two known archaeological sites recorded within the Historic Environment Records with likely in situ remains that may extend to within the footprint of the Proposed Scheme. A large number of assets within the Winchester Historic Environment Record and Hampshire Historic Environment Record for the 300 metres study area have been recorded during archaeological investigations in advance of previous redevelopment. This means that a large portion of the area that would have been the focus of potential impacts from the Proposed Scheme has already been subject to previous mitigation and impacts. The potential for in situ archaeological remains is therefore likely to be limited to within the field to the east of the current M3, in the thin strip of land between the M3 and the A34 and the location of the construction compound to the northwest (see Figure 5-2-3). The

potential impact to the known and to any unknown archaeological remains in these areas could be significant.

- 5.2.30 The archaeological remains uncovered during the period of invasive survey in March and April 2019 have the potential to be damaged or destroyed during construction of the Proposed Scheme. However, a number of these remains have been entirely removed during excavation and will not undergo significant impact during construction, or are not rare and are well understood, and are therefore lacking significant archaeological value (such as Post-Medieval boundary ditches). There is the potential for significant impact on the prehistoric ring ditch, which was established to have significant surviving archaeological value.
- 5.2.31 It is expected that a programme of strip, map and sample excavation will be conducted prior to construction due to the findings of the invasive survey conducted in March and April 2019. There is also the potential for a programme of archaeological watching brief during construction.
- 5.2.32 The historic buildings are primarily grouped within nearby built environments, with 27 Grade II Listed Buildings and one Grade II* Listed Building located within 300 metres of the Proposed Scheme. The value of these assets is related more to their village locations than to their relationship with the surrounding landscape. Furthermore, the presence of the current highways infrastructure means that the baseline setting already incorporates these elements within them and that effective screening measures for noise and visual intrusion tend to already be in place. The Proposed Scheme is largely on the same line or immediately adjacent to the current roads and the overall setting would not be greatly modified. If an adverse effect occurs, it would be unlikely to be significant. However, maintaining and incorporating appropriate mitigation through design in the form of screening (for example by using cuttings, bunds and vegetation) would further reduce any potential effects on the setting of historic buildings.
- 5.2.33 The settings of the historic landscapes within the study area would be unlikely to be significantly affected due to the nature of the Proposed Scheme and the limited new land take. Small portions of three low value HLTs have the potential to be physically affected during construction through partial intrusion into these landscape areas and the further encroachment of modern highway infrastructure. However, this would be unlikely to be significant. Maintaining and incorporating appropriate mitigation through design in the form of screening (for example by using cuttings, bunds, and vegetation) would further reduce any potential effects on the settings of historic landscapes.

5.3 Landscape and Visual

Existing and baseline knowledge

- 5.3.1 The existing area covered by the Proposed Scheme's proposed Order Limits comprises a complex landscape pattern which is dominated by the M3 and A34 roads, the existing grade separated M3 Junction 9 roundabout and slip roads, and other associated features including bridges, cuttings, slip roads and signage. The highways estate includes substantial areas of mixed native tree and shrub planting of mainly broadleaf species which has established to provide an element of screening and landscape integration of the M3 and A34, and associated infrastructure and traffic. The tree survey for the Proposed Scheme found that trees adjacent to the A33 and A34 are mainly fragmented woodland areas and established vegetation on embankments planted at the time of construction of these roads.
- 5.3.2 The wider area is primarily urban to the west of the M3 near Junction 9 and includes the commercial developments of Sun Valley Business Park, Tesco, Winnall Industrial Estate and Scylla Industrial Estate. Wykeham Trade Park and Highways England's maintenance depot are located to immediately northwest of the M3 Junction 9. Beyond the industrial area are the residential areas and historic town centre of Winchester. Further to the north, there are concentrations of residential properties close to the A34 and to the west of the M3, including Headbourne Worthy, Kings Worthy and Abbots Worthy.
- 5.3.3 The area to the east and south of the M3 is a highly valued landscape of rolling chalk downland, comprising large arable and pastoral fields interspersed with small woodlands and copses, hedgerow field boundaries and a small number of isolated farm holdings or rural dwellings. This landscape forms part of the SDNP, which is a statutory landscape designation of national importance, and which includes a stretch of the River Itchen and associated floodplain crossing the northern part of the Proposed Scheme, extending towards Winchester city centre. The extent of the SDNP is illustrated on Figure 1-2. The existing highway infrastructure has resulted in severance between the town of Winchester to the west and the downland of the SDNP to the east.
- 5.3.4 Important recreational Public Rights of Way near the Proposed Scheme include St Swithun's Way and the Itchen Way Long Distance Paths running along the Itchen Valley and National Cycle Network Route 23 which crosses the M3 Junction 9 and provides a recreational link from Winchester to the SDNP. Public Rights of Way near the Proposed Scheme are indicated on Figure 1-2.
- 5.3.5 The Proposed Scheme lies in a landscape that has been described in various published landscape character assessments, including the South Downs Integrated Landscape Character Assessment (SDNPA, 2011), The Integrated Landscape Character Assessment (HCC, 2012) and the Winchester District Landscape Character Assessment (Winchester City Council, 2004). These publications describe the varying landscape character of the landscape beyond the urban areas, ranging from chalk valley systems to open rolling downland. A description of the published landscape character areas will be included in the Environmental Statement.

Methodology

- 5.3.6 The methodology for the assessment of landscape and visual effects is described in the Scoping Report and will be based on current best practice guidance, including that

contained in latest Highways England guidance and the Guidelines for Landscape and Visual Impact Assessment (3rd Edition) (Landscape Institute and Institute of Environmental Management and Assessment (IEMA), 2013). Landscape and visual effects are related but distinct topics. How the Proposed Scheme would alter the landscape character and people's views and visual amenity will therefore be considered and assessed separately.

- 5.3.7 The assessment of landscape effects will consider 'primary landscape receptors' – landscape character areas identified in the published landscape character assessments and the SDNP. Smaller subtypes of landscape character could also be identified if it is thought that this would help to understand landscape effects, particularly in relation to the SDNP and Winchester.
- 5.3.8 The visual receptors considered in the EIA process will include:
- Residents
 - Users of Public Rights of Way and public open spaces
 - Users of public facilities such as schools and hospital
 - Road users
- 5.3.9 The visual effects on these receptors would be made based on 'representative views', i.e. typical views experienced by these groups of people. These viewpoints have been discussed and agreed with the SDNPA, Winchester City Council and HCC. The approximate locations of the representative viewpoints are shown in Figure 5-3-1. These viewpoints have been visited as part of landscape and visual assessment fieldwork carried out in March 2019, before existing deciduous vegetation had leafed out. Further fieldwork will be carried out in June 2019 when this vegetation is fully in leaf.
- 5.3.10 The effects of the Proposed Scheme on the night-time environment and the dark skies of the SDNP International Dark Skies Reserve will also be assessed. A visual appraisal of the existing night-time light sources and resulting sky glow and direct glare within the study area will be made to inform this assessment. The landscape and visual assessment fieldwork carried out in March 2019 included an assessment of the night time environment of the study area, particularly when viewed from the SDNP.
- 5.3.11 The assessment of landscape and visual effects will be informed by the tree survey for the Proposed Scheme, in line with the methodology detailed within BS 5837:2012 – Trees in relation to design, demolition and construction – Recommendations (British Standards Institution, 2012). This will be presented in the Environmental Statement and include a tree constraints plan.
- 5.3.12 Two overarching study areas have been defined for the assessment as follows:
- The landscape assessment will be based on a broad study area of mapping approximately 6 kilometres north to south and 4 kilometres east to west, to incorporate the settlements of Abbots Worthy and Kings Worthy beyond the River Itchen Valley to the north, the SDNP to the east, St Catherine's Hill to the south and the town of Winchester and the River Itchen to the west. This broad study area has been defined as a precautionary approach to make sure that effects on the 'setting' of the SDNP and the townscape of Winchester is appropriately assessed.

- The visual assessment will be based on a 2 kilometre study area, as illustrated on Figure 5-3-1. However, the assessment will focus on effects within 1 kilometre of the Proposed Scheme, since this is where the greatest effects are anticipated to occur.

5.3.13 Digitally generated 'Zone of Theoretical Visibility' mapping will be used as a desktop tool to refine the study areas for the detailed assessment of landscape and visual effects in the Environmental Statement and used to inform the assessment, though judgements on the likely extent of effects will be based on fieldwork and use of professional judgement.

5.3.14 The assessment of landscape and visual effects, including night-time effects, will consider construction and operational scenarios of the Proposed Scheme, including winter year 1 and summer year 15 following opening to traffic. The significance of landscape and visual effects of the Proposed Scheme will be considered by making judgements on the sensitivity of the receptors to the proposed type of change, and the magnitude of change (the size, scale and extent of change) that would be experienced by the receptors. In simple terms, the assessment will conclude whether the landscape and visual effects will be adverse or beneficial, both on a scale ranging from neutral to very large.

Constraints and limitations

5.3.15 The assessment will focus on the identification of significant effects on landscape and visual receptors and will not attempt to provide a catalogue of every conceivable effect of the Proposed Scheme.

5.3.16 Only visual receptors present at the time of assessment will be considered, unless there is detailed planning permission granted for development.

5.3.17 It is not practical to visit every possible viewpoint from which the Proposed Scheme would be visible to inform the assessment of visual effects, including private residential properties. 'Representative viewpoints' in publicly accessible locations will therefore be used to form the basis of the visual assessment.

5.3.18 If there is uncertainty about any aspect of the Proposed Scheme, the assessment will be based on 'worst case' assumptions.

Potential impacts during construction

5.3.19 Construction features are likely to be extensive and include construction compounds, haul roads, material stockpiles, temporary working and storage areas and temporary traffic management areas. There would also be movement and operation of plant and machinery, major earthworks and removal of large areas of existing established vegetation. These features and associated activity would be likely to have an adverse, urbanising impact on the local landscape character of the area and its tranquillity, including that of a localised part of the SDNP.

5.3.20 Given the Proposed Scheme alignment, there is an expectation that trees would be adversely impacted, with the largest trees being within the riparian and Easton Down areas. Within the land of Easton Manor Farm and the banks of the River Itchen there are a number of mature trees, but direct removals of these trees would be likely to be minimal. Within the wider proposed Order Limits, there are extensive stretches of the A34 and M3 where the impacts on trees would be negligible since the new works would only comprise signage and fencing works. However, at this stage no assessment on the impacts of haulage routes or dust pollution has been made with respect to trees to be retained.

- 5.3.21 The visual amenity of people at the representative viewpoints identified would be likely to be adversely affected by the construction features and activity. People that would be likely to experience adverse effects would include local residents living near Easton Lane and in localised parts of Winchester, Abbots Barton and Headbourne Worthy, and users of Public Rights of Way locally, including Easton Lane and St Swithun's Way and Itchen Way Recreational Paths.
- 5.3.22 Any lighting used during construction would be likely to adversely affect night skies, particularly away from the urban areas.

Potential mitigation for construction impacts

- 5.3.23 Mitigation of effects on landscape character and people's views during construction is integral to the 'Considerate Contractors' Scheme which would be adopted. This would include measures such as tidy site management to reduce visual clutter associated with the works and carefully controlling construction lighting in accordance with best practice to reduce light spill and nuisance caused by glare.
- 5.3.24 The removal of vegetation would be kept to the minimum practicable and retained vegetation would be protected in accordance with current best practice.
- 5.3.25 Temporary works to facilitate construction, such as construction compounds and material stockpiles, would be located away from the elevated parts of the Proposed Scheme where practicable, particularly in relation to Easton Down in the SDNP where there would be a risk of the works being visible on the skyline when viewed from the River Itchen Valley.

Potential impacts during operation

- 5.3.26 Potential significant landscape effects during operation include removal of or damage to landscape elements, including green infrastructure, as well as introduction of new highway infrastructure and traffic, likely to result in adverse effects on landscape character. Landscape elements likely to be impacted are existing vegetation and topography, which are key characteristics of the SDNP landscape. Perceptual characteristics of the landscape such as tranquillity, remoteness and 'sense of place', particularly within the SDNP, could also be affected.
- 5.3.27 Potential significant visual effects include changes to the composition of views currently experienced by local residents, users of Public Rights of Way and other visual receptors as a consequence of the Proposed Scheme making highway infrastructure and traffic more visible. For information, visualisations from a selection of viewpoints will be included in the Environmental Statement to provide an indication of the how the Proposed Scheme would change views.
- 5.3.28 Any light from lighting columns and changes to the visibility of lighting from headlights on the proposed roads due to loss of vegetation would also be likely to result in adverse effects on the night skies locally.

Potential mitigation for operational impacts

- 5.3.29 Earthworks will be designed, where possible, to help integration into the gently undulating topography of the study area. Any proposed embankments and cuttings would be graded to respect existing local landforms and reduce disruption to major topographical features. The use of false cuttings and land-raising with a return to chalk grassland, sensitively

graded to seamlessly marry in with the existing adjacent downland, will be considered on the east side of the M3, north of Easton Lane. This could soften the Proposed Scheme at the sensitive interface with the SDNP.

- 5.3.30 A comprehensive landscape scheme will be developed to mitigate vegetation loss and effects on green infrastructure due to the Proposed Scheme. Where practicable, planting would also be carefully located to screen or soften the new highway and its associated traffic and infrastructure in views experienced by sensitive visual receptors from key viewpoints. The planting of copses in field corners adjacent to the highway infrastructure would complement the existing vegetation patterns in the SDNP and help to integrate the Proposed Scheme into the landscape. The design of new planting would comprise native species of local provenance where practicable and reflect the character of the local landscape.
- 5.3.31 The landscape scheme will seek to enhance the quality of the surrounding environment and will accommodate a new walking, cycling and horse-riding facility on the eastern side of the M3 between Easton Lane and Long Walk, running parallel to (but separate from) the motorway. This will provide a link between Easton Lane and the Itchen Way to the north and enhance recreational opportunities in this part of the SDNP.
- 5.3.32 The landscape scheme is being developed as part of an iterative design process with input from the project engineers, environmental disciplines (including biodiversity and cultural heritage), as well as relevant stakeholders including the SDNPA, Winchester City Council and Natural England.
- 5.3.33 An initial indication of the landscape scheme is illustrated on the Preliminary Environmental Mitigation Design Plan (Figure 1-3) and the Preliminary Environmental Mitigation Design Cross Sections (Figure 1-4). This follows preliminary discussions held with stakeholders including the SDNPA and Hampshire County Council in May 2019. Visualisations of the Proposed Scheme both at winter year 1 and in summer year 15 following opening to traffic, will be prepared as part of the Environmental Statement to illustrate the effectiveness of the landscape scheme at different stages of establishment.
- 5.3.34 It is considered that the long-term adverse landscape and visual effects would be largely mitigated with the implementation and establishment of the landscape scheme.

Summary

- 5.3.35 This section has identified that, based on preliminary assessment of the Proposed Scheme, there would be likely to be significant adverse effects on the landscape and people's views as a result of construction and operation. However, there are also several mitigating measures proposed that would reduce these effects, including the use of earthworks to integrate the Proposed Scheme into the existing topography and replacing lost vegetation. The final detailed assessment of landscape and visual effects will be presented in the landscape chapter of the Environmental Statement. Further surveys will include an assessment of views in summer (June 2019) when existing deciduous vegetation is fully in leaf.

5.4 Biodiversity

Existing and baseline knowledge

5.4.1 Existing baseline information has been derived from the following ecological assessment work:

- M3 Junction 9 Improvement Scheme: Ecological Desk Study (WSP, 2016)
- M3 Junction 9 Improvement Scheme: Phase 1 Habitat Survey Report (WSP, 2017a)
- M3 Junction 9 Improvement Scheme: Botanical Survey Report (WSP, 2017b)
- M3 Junction 9 Improvement Scheme: Badger Survey Report (WSP, 2017c)
- M3 Junction 9 Improvement Scheme: Bat Activity Survey Report (WSP, 2017d)
- M3 Junction 9 Improvement Scheme: Preliminary Bat Roost Assessment (WSP, 2018a)
- M3 Junction 9 Improvement Scheme: Hazel Dormouse Survey Report (WSP, 2018b)
- M3 Junction 9 Improvement Scheme: Otter Survey Report (WSP, 2017e)
- M3 Junction 9 Improvement Scheme: Water Vole Survey Report (WSP, 2017f)
- M3 Junction 9 Improvement Scheme: Breeding Bird Community Walkover Survey Report (WSP, 2017g)
- M3 Junction 9 Improvement Scheme: Reptile Survey Report (WSP, 2017h)
- M3 Junction 9 Improvement Scheme: Great Crested Newt Survey Report (WSP, 2017i)
- M3 Junction 9 Improvement Scheme: Terrestrial Entomological Walkover Survey Report (WSP, 2017j)
- M3 Junction 9 Improvement Scheme: Wintering Bird Community Survey Report (WSP, 2018c)

5.4.2 We have undertaken a number of surveys in 2019, including breeding bird surveys, bat roost tree climbing surveys, great crested newt eDNA surveys and further badger surveys.

5.4.3 The following is a summary of the baseline desk study and field survey information gathered.

European designated sites

5.4.4 The following European designated sites have been identified in line with DMRB guidance (DMRB Volume 11, Section 2) including any sites within 2 kilometres of the Proposed Scheme and any site within 30 kilometres where bats are one of the qualifying features.

5.4.5 There is one European designated site within 2 kilometres of the Proposed Scheme – the River Itchen SAC, part of which passes under the existing A34, A33 and M3 and lies within the Proposed Scheme area (albeit below the carriageway).

5.4.6 The River Itchen SAC is designated primarily for the presence of the following habitats and species:

- Watercourses of plain to montane levels with a plant community that is typified by the species of *Ranunculion fluitantis* and *Callitriche-Batrachion* vegetation, for example pond water-crowfoot, stream water-crowfoot and river water-crowfoot
- Southern damselfly (*Coenagrion mercuriale*)
- Bullhead (*Cottus gobio*)

5.4.7 Qualifying features of the River Itchen SAC also include:

- White-clawed (or Atlantic stream) crayfish (*Austropotamobius pallipes*)
- Brook lamprey (*Lampetra planeri*)
- Atlantic salmon (*Salmo salar*)
- Otter (*Lutra lutra*)

5.4.8 In addition, Mottisfont Bats SAC is located approximately 16.7 kilometres to the west of the Proposed Scheme and is designated for supporting an important population of the rare barbastelle bat (*Barbastella barbastellus*).

Other statutory designated sites

5.4.9 The River Itchen is also a designated SSSI (approximately 748ha), due to the complex mosaic of riparian habitats including the chalk stream and associated fen meadow, flood pasture and swamp habitats which support species such as otter, water vole (*Arvicola amphibius*), breeding bird assemblages, southern damselfly and white-clawed crayfish. Unlike the SAC, the SSSI designation includes some of the habitats adjacent to the river channel.

5.4.10 In addition, St Catherine's Hill SSSI is located approximately 400 metres to the south of the Proposed Scheme and is designated for diverse chalk grassland habitats.

5.4.11 Statutory designated sites are shown on Figure 5-4-1.

Non-statutory designated sites

5.4.12 There are seven Sites of Importance for Nature Conservation, one of which is also a Road Verge of Ecological Importance, within a 2 kilometre radius of the Proposed Scheme area. There are no National Nature Reserves, Local Nature Reserves or parcels of ancient woodland within 2 kilometres of the Proposed Scheme.

5.4.13 Of these sites, Easton Down Site of Importance for Nature Conservation, is the closest and lies approximately 50 metres to the east of the Proposed Scheme area. Information received from Hampshire Biodiversity Information Centre identifies that this site is designated for "*grasslands which have become impoverished through inappropriate management, but which retain sufficient elements of relic unimproved grassland to enable recovery*".

5.4.14 Table 5-10 shows a summary of the baseline information gathered regarding ecological receptors.

Table 5-10 Baseline information on ecological receptors

Ecological receptor	Summary of baseline data
Terrestrial and freshwater habitats	<p>The River Itchen passes from northeast to southwest to the north of the Proposed Scheme and is characterised by chalk river and associated historic water meadow habitats.</p> <p>To the east of the M3, the landscape is dominated by arable farmland, with associated species-rich and species-poor hedgerows.</p> <p>Habitats between the A34/A33 and the M3 comprise grazed semi-improved pastures and plantation and semi-natural mixed woodlands.</p> <p>The southwest of the Proposed Scheme is mainly made up of Winchester's urban development, including industrial and commercial premises.</p> <p>Wall cotoneaster (<i>Cotoneaster horizontalis</i>), a non-native invasive plant species listed under Schedule 9 of the Wildlife and Countryside Act 1981, has been recorded within the Proposed Scheme area. No other non-native invasive plant species have been recorded.</p>
Badger	Multiple badger (<i>Meles meles</i>) signs were recorded near the Proposed Scheme, including pathways and latrines. A number of badger setts were recorded during surveys including a main sett.
Bats	<p>Bat activity surveys recorded a number of species, including barbastelle (<i>Barbastella barbastellus</i>), greater horseshoe bat (<i>Rhinolophus ferrumequinum</i>), Leisler's (<i>Nyctalus leisleri</i>), long-eared bat (<i>Plecotus</i> sp.), myotis (<i>Myotis</i> sp.), noctule (<i>Nyctalus noctule</i>), pipistrelle (<i>Pipistrellus</i> sp.) and serotine (<i>Eptesicus serotinus</i>).</p> <p>A number of trees and bridges were identified as being suitable for roosting bats.</p>
Hazel dormouse	Dormouse (<i>Muscardinus avellanarius</i>) was recorded in a number of suitable habitats including hedgerows, dense scrub and woodland within the Proposed Scheme area.
Otter	Signs of otters have been recorded within the River Itchen to the northern extent of the Proposed Scheme including prints and spraints. No laying up sites or holts were recorded near the Proposed Scheme.
Water vole	Water voles were recorded in river and ditch habitats to the west of the Proposed Scheme but are considered to be absent from habitats within the Proposed Scheme area.
Birds	<p>Surveys established that the habitats within and surrounding the Proposed Scheme area support a breeding bird community comprised of 28 species, including two declining farmland Species of Principal Importance under Section 41 of the Natural Environment and Rural Communities Act 2006: skylark (<i>Alauda arvensis</i>) and yellowhammer (<i>Emberiza citrinella</i>). Two species listed on Schedule 1 of the Wildlife and Countryside Act 1981, Cetti's warbler (<i>Cettia cetti</i>) and kingfisher (<i>Alcedo atthis</i>), were recorded along the River Itchen corridor. In addition, seven are featured in the Birds of Conservation Concern Red list (Eaton et al., 2015).</p> <p>Surveys also recorded a wintering bird community comprising 63 species, of which seven are Species of Principal Importance and 11 are featured in the Birds of Conservation Concern Red list.</p>
Reptiles	Common lizard (<i>Zootoca vivipara</i>) and slow worm (<i>Anguis fragilis</i>) were recorded in suitable habits within the Proposed Scheme area.
Amphibians including great crested newt	No records of great crested newt (<i>Triturus cristatus</i>) were recorded during environmental DNA (eDNA) surveys and this species is considered to be absent with the Proposed Scheme area. Common frog (<i>Rana temporaria</i>) and common toad (<i>Bufo bufo</i>) were recorded in wetland habitats to the northwest of the Proposed Scheme area. Common toad is listed under Section 41 of the Natural Environment and Rural Communities Act.
Terrestrial invertebrates	An entomology walkover survey identified two areas with high potential to support important invertebrate assemblages to the northeast of the Proposed Scheme area.

Ecological receptor	Summary of baseline data
	The survey also recorded a small number of habitats with moderate potential, including grassland, scrub edges and a road verge.
Freshwater fish	The River Itchen is known to support notable species including bullhead, Atlantic salmon and brook lamprey, and it is likely that the River Itchen supports a diverse fish community.
Freshwater invertebrates	It is considered likely that the River Itchen supports a diverse aquatic invertebrate community. Southern damselfly and white-clawed crayfish are qualifying features of the River Itchen SAC. However, given that these habitats are so well studied, the absence of records for these species near the Proposed Scheme is taken as a strong indication that these species are absent from the Proposed Scheme area.

Methodology

- 5.4.15 The assessment will be reported in accordance with Advice Note Seven: Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements (Planning Inspectorate, 2017a) and Annex to Advice Note 7 – Presentation of the Environmental Statement (Planning Inspectorate, 2017b) with additional guidance sought from DMRB Volume 11, Section 2, Part 5 (Highways Agency, 2008) and IAN 130/10 (Highways Agency, 2010) and the Guidelines for Ecological Impact Assessment in the UK and Ireland (Chartered Institute of Ecology and Environmental Management, 2018). Detailed assessment is appropriate because potentially significant effects have been identified for the Proposed Scheme.
- 5.4.16 Since there could be significant effects on biodiversity, in accordance with the National Policy Statement for National Networks (NPS NN) (Department for Transport, 2014) Paragraph 5.22, the Environmental Statement will clearly set out any likely significant effects on internationally, nationally and locally designated sites of ecological or geological conservation importance, on protected species, and on habitats and other species identified as being of principal importance for the conservation of biodiversity.
- 5.4.17 The Habitats Regulations Assessment Stage 1 Screening and Stage 2 Appropriate Assessment reports will provide information to inform the Habitats Regulations Assessment by the Secretary of State as the Competent Authority. The aim of the assessment is to identify whether the Proposed Scheme would result in Likely Significant Effects on qualifying interest features of European sites and this information will be reported alongside the Environmental Statement.
- 5.4.18 The Environmental Statement will also consider the full range of potential impacts on ecosystems and inform opportunities for enhancement. NPS NN Paragraph 5.23 requires applicants to show how the Proposed Scheme has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests.
- 5.4.19 The scope of further assessment work has been determined based on current baseline knowledge of the study area, a review of current best practice survey guidance and nature conservation legislation and policy frameworks.

Constraints and limitations

- 5.4.20 The following presents a summary of limitations of the surveys carried out to characterise the ecology of the Proposed Scheme.

- 5.4.21 Some of the Phase 1 habitat survey visits have been carried out outside of the optimal period for this type of survey (generally considered to be April to September, inclusive). Although botanical surveys are seasonally limited, and throughout spring and summer certain species will be more or less evident (dependent on flowering season), it is considered that enough information has been gathered to enable robust categorisation of habitat types. This is therefore not considered to be a significant limitation to the assessment.
- 5.4.22 Some of the survey work (Phase 1 and preliminary bat roost assessment) was carried out at night under traffic management. While this is not considered to have affected habitat classification, lower numbers of plant species have been generally recorded in these areas. It is considered that sufficient information has been gathered to enable robust categorisation of habitat types and this is not considered to be a significant limitation to the assessment.
- 5.4.23 Urban areas were not included within the Phase 1 habitat survey as these areas would be highly unlikely to support habitats of ecological interest and would not be directly affected by the Proposed Scheme. It is considered that this would not be a significant limitation.
- 5.4.24 Technical malfunctions and stolen equipment affected the otter and bat activity surveys. This is not thought to have significant implications on the findings of those reports.
- 5.4.25 Some areas of land were not accessible on occasion, either due to land access restrictions or issues relating to health and safety. It is not considered that these restrictions affected the robustness of the dataset.

Potential impacts during construction

- 5.4.26 The Proposed Scheme has the potential to result in the following impacts during the construction period:
- Disruption of ground water flows which provide aquatic habitats.
 - Permanent and temporary land take within the Proposed Scheme footprint.
 - Permanent manipulation of habitats, such as landscaping and ‘tidying-up’ of areas not within the footprint, felling of trees for health and safety reasons.
 - Species loss, displacement and isolation.
 - Temporary storage of construction materials within/adjacent to ecological resources with associated habitat contamination and compaction.
 - Habitat loss and fragmentation disrupting species dispersal causing genetic isolation.
 - Direct mortality during site clearance and construction.
 - Disturbance from construction activities including visual, noise, vibration and lighting.
 - Degradation through air borne and water borne pollution (water quality and sediment loading).
 - Pollution caused by use of hazardous materials and incidental release of dust, chemicals, fuels or waste materials.

Potential mitigation for construction impacts

- 5.4.27 It will be necessary to devise a robust pollution prevention strategy to avoid accidental pollution events, particularly with regard to the River Itchen.
- 5.4.28 Habitat clearance will be carefully programmed to avoid sensitive periods for fauna, such as badgers, otter, dormice, roosting bats, breeding birds and reptiles.
- 5.4.29 Natural England Protected Species Mitigation Licences will be required for species such as hazel dormouse and badger. Survey data will be used to inform appropriate mitigation strategies including staged vegetation clearance and artificial badger sett creation.
- 5.4.30 Where appropriate, consideration will be given to specific construction methods to reduce potential disturbance impacts, such as soft start piling techniques.
- 5.4.31 Specific construction practices will be implemented to reduce incidental harm to fauna including badgers, nesting birds, reptiles and amphibians through use of measures such as fencing and sensitive habitat clearance methods.
- 5.4.32 Staged vegetation clearance under supervision from a suitably experienced ecologist would be undertaken to encourage reptiles into suitable habitats outside of construction areas along with translocation of animals as needed.

Potential impacts during operation

- 5.4.33 The Proposed Scheme has the potential to result in the following impacts during operation:
- Change in surface or groundwater flows which provide aquatic habitats.
 - Direct mortality during operational use as a result of increased traffic flow.
 - Habitat fragmentation disrupting species dispersal causing genetic isolation.
 - Direct disturbance from operational use, including visual, noise, vibration and lighting.
 - Degradation of habitats through air borne and water borne pollution (water quality and sediment loading).

Potential mitigation for operational impacts

- 5.4.34 A groundwater management plan will be produced including best practice recommendations for the prevention of contamination as well as an effective Sustainable Drainage System (SuDS).
- 5.4.35 Fencing and alternative wildlife commuting routes would be included within the Proposed Scheme design as required.
- 5.4.36 Habitat continuity will be maintained where possible and enhancements made to existing habitats.
- 5.4.37 New areas of habitat will be created that are likely to include woodlands, trees, hedgerows, chalk grasslands, and ponds.

- 5.4.38 Features such as bat roosting boxes, dormouse boxes, bird nesting boxes and habitat piles will also be included within the landscape and habitat designs.
- 5.4.39 Best practice measures will be used in design of lighting, noise and vibration management and visual screening.
- 5.4.40 Outputs to air and water pollution will be monitored and controls put in place.

Summary

- 5.4.41 The Proposed Scheme could create a number of temporary and permanent effects on ecological receptors, including on sites designated at international to local levels as well as habitats and species. Many effects already exist due to the presence of the existing M3 and A34, including disturbance, fragmentation and pollution risks. These effects could be exacerbated by the Proposed Scheme or new effects could arise from habitat loss and temporary site clearance during construction.
- 5.4.42 A number of good construction practices as well as specific mitigation measures are available to reduce effects on biodiversity. There is also scope for ecology input into the landscape and habitat design and management plan to provide enhancements to biodiversity.
- 5.4.43 Enhancements could include the creation of areas of new habitat including woodlands, trees, hedgerows, chalk grassland and pond habitats as well as the addition of bat roosting boxes, bird nesting boxes, dormouse boxes and habitat piles to achieve a net gain for biodiversity.

5.5 Geology and Soils

Existing and baseline knowledge

5.5.1 The current baseline knowledge has been collated from the Preliminary Sources Study Report and the Environmental Assessment Report produced for the option selection assessment in 2017 and 2018, as well as further information obtained at the scoping and PEIR stages. The baseline will be further developed for the Environmental Statement as more information becomes available and the Proposed Scheme design evolves.

5.5.2 The following sources have been used in the assessment in this section:

- Preliminary Sources Study Report (WSP, 2017k)
- Environmental Assessment Report (WSP, 2018d)
- Envirocheck Report (Landmark, 2016)
- Environmental Scoping Report (Highways England, 2019)
- Regional Agricultural Land Classification Maps, South East (Natural England, 2010)
- Unexploded Bomb Risk Map (Zetica, 2019)
- UK maps of radon (Public Health England, 2019)
- Onshore Geology Viewer (British Geological Survey, 2019)
- Minerals & Waste Safeguarding in Hampshire (Hampshire County Council, 2016)
- Hampshire Minerals and Waste Plan (interactive map)
- Sites of Importance for Nature Conservation (SINCs) in Hampshire (Hampshire County Council)
- Magic website (Defra, 2019)

Ground conditions

5.5.3 A summary of the understanding of the geology in the Proposed Scheme area to date is presented below. A further ground investigation is being carried out to improve the knowledge of the ground conditions within the area.

Table 5-11 Summary of anticipated ground conditions

Geology	Type	Distribution	Aquifer Status ¹
Made Ground	Made Ground is not indicated on British Geological Survey records or previous ground investigation in the footprint of the Proposed Scheme area. It is expected to be present aligned with the road and historical landfilling. There are a number of areas of Made Ground/Artificial Ground adjacent to the Proposed Scheme area, including one area in the northern part, to the west of the River Itchen, and five in the southern part, around Junction 10 of the M3.	N/A	N/A
	Alluvium	Present north and northeast and northwest within the Proposed	Secondary A

Geology	Type	Distribution	Aquifer Status ¹
Alluvial and superficial deposits		Scheme area near the River Itchen	
	Head deposits (clay, silt, sand and gravel with lenses of silt, clay and peat)	Two bands of Head deposits run perpendicular across the M3/A34/A272 west-east, located north and south of the existing junction	Secondary undifferentiated
	River Terrace deposits (sand and gravel)	Could encroach onto the northwest and northern extents of the area of the Proposed Scheme associated with the River Itchen.	Secondary A
	Clay with flints (clay, silt, sand and gravel)	Present to the northeast of the Proposed Scheme, adjacent to the M3.	-
	Peat deposits	Recorded in British Geological Survey borehole logs near Junction 9	-
Bedrock	Seaford Chalk Formation (firm white chalk with nodular and tabular flint seams)	Underlies the Proposed Scheme area; mapping indicates that the Chalk is approximately 40m – 65m thick in this area.	Principal aquifer
	Lewes Nodular Chalk Formation	Underlies the Seaford Chalk Formation in the southern part of the Proposed Scheme area.	Principal aquifer
	New Pit Chalk Formation	Underlies the Lewes Nodular Chalk Formation in the southern part of the Proposed Scheme area.	Principal aquifer
	Holywell Nodular Chalk Formation	Underlies the New Pit Chalk Formation in the southern part of the Proposed Scheme area.	Principal aquifer
	Zig Zag Chalk Formation	Underlies the Holywell Nodular Chalk Formation in the southern part of the Proposed Scheme area.	Principal aquifer
	Newhaven Chalk Formation	Could be present along the eastern boundary of the Proposed Scheme area.	Principal aquifer
1. As classified by the Environment Agency			

Mining and mineral resources

5.5.4 Mineral resources comprising superficial sand and gravel are located in the northern part of the Proposed Scheme, in the area of the River Itchen as identified in the HCC Mineral and Waste Plan in the Minerals and Waste Consultation Area. Approximately nine hectares are within the Proposed Scheme area. This estimated extent will be confirmed during preparation of the Environmental Statement. Minerals under the plan are subject to potential safeguarding under policy 15 of the Hampshire Minerals and Waste Plan (2013).

- 5.5.5 Easton Lane Depot, a concrete batching plant, is located southeast of the M3 Junction 9 roundabout adjacent to the proposed Order Limits. This is a safeguarded site under HCC’s Minerals and Waste Plan.
- 5.5.6 Additionally, to the southwest of the Proposed Scheme is another site: ‘Bar End Depot’. There is no additional information available for this site on the Hampshire minerals interactive map. This is a safeguarded site under HCC’s Minerals and Waste Plan.
- 5.5.7 The British Geological Survey have recorded an historical opencast chalk quarry to the northwest of the Proposed Scheme.

Geological sites

- 5.5.8 Based on the Sites of Importance for Nature Conservation in Hampshire (Hampshire County Council, 1996), there are no listed ‘8A’ sites within the Proposed Scheme area.
- 5.5.9 8A sites are defined as those “*which have been designated as Regionally Important Geological/Geomorphological Sites (RIGS). Regionally Important Geological/Geomorphological Sites are sites of regional importance excluding SSSIs. RIGS are analogous to biological non-statutory sites*” (Hampshire County Council, 1996).

Ground Stability

- 5.5.10 The Environmental Assessment Report (WSP, 2018d) describes the potential stability hazards, which are shown in Table 5-12.

Table 5-12 Ground stability hazards

Type of Instability	Risk
Collapsible Ground	No hazard – very low
Compressible Ground	No hazard – moderate
Ground Dissolution	Very low – moderate
Landslide	No hazard – low
Running Sand	No hazard – low
Shrinking/Swelling Clay	No hazard – very low

- 5.5.11 Multiple solution features are recorded within 200 metres northwest of the study area associated with the chalk. The Highways Agency Geotechnical Data Management System indicates one natural cavity within 250 metres of the option selection assessment study area. Further information on ground stability will be reviewed in the Environmental Statement.

Groundwater

- 5.5.12 There are a number of groundwater SPZs associated with the chalk aquifer status and abstraction licences. There are two abstraction points for potable drinking water supply in the north of the Proposed Scheme area. The north eastern part of the Proposed Scheme area lies within a SPZ Zone I, Inner Protection Zone. The area immediately to the north of the proposed compound area is a SPZ Zone II. The groundwater body underlying the Proposed Scheme (chalk bedrock) is classified as having poor chemical and quantitative

quality and considered to be at risk. Aquifer status is summarised in Table 5-11. The risks to groundwater are outlined in the preliminary conceptual site model in section 5.5.23 to 5.5.26.

Hydrology

5.5.13 The River Itchen crosses the northern part of the Proposed Scheme area in multiple places, with several associated watercourses. Nun's Walk Stream is located running parallel to the River Itchen in the northern part of the Proposed Scheme. Hydrology is assessed further in Section 5.9.

Radon

5.5.14 The southern area and a central portion of the Proposed Scheme are within bands of elevated radon potential, with a maximum radon potential of 3–5%. The remaining areas of the Proposed Scheme are within the lowest band of radon potential, with less than 1% of homes above the action level.

Agricultural land quality

5.5.15 The agricultural land within the Proposed Scheme site is classified as subgrade 3a (good quality) land and subgrade 3b (moderate quality) land. The southernmost area of the Proposed Scheme is classified as urban land. Further information on potential areas impacted will be reviewed in the Environmental Statement.

Environmentally sensitive sites

5.5.16 The River Itchen is designated as a SSSI and SAC due to its ecological status. The north eastern part of the Proposed Scheme lies within the SNDP. The eastern and southern parts of the Proposed Scheme border the SDNP. These sensitive sites are potential receptors to potential contamination sources, as outlined in the preliminary conceptual site model in section 5.5.23 to 5.5.26.

Unexploded ordnance

5.5.17 The Zetica Unexploded Bomb Risk Map indicates that the Proposed Scheme is within an area classified as having low risk of Unexploded Ordinance.

Site history

5.5.18 Land that has been contaminated because of former industrial or agricultural processes could be a constraint. Construction activities have the potential to remobilise contamination in disturbed ground, so post-construction impacts must be considered.

5.5.19 According to the earliest publicly available historical map (dated 1870), the study area comprises agricultural fields with the village of Headbourne Worthy located to the northwest, Kings Worthy to the north and the City of Winchester located to the southwest. A summary of the historical land use within the area of the Proposed Scheme and the surrounding 250 metres study area is provided in Table 5-13 below. It should be noted that this is based on the information provided in the Preliminary Sources Study Report, Environmental Assessment Report and Scoping Report, based on the Proposed Scheme area at that time. Available information will be obtained and reviewed for the Environmental Statement.

Table 5-13 Summary of historical land uses in and within 250m of the Proposed Scheme

Map Dates	Former Use	Comment
1874 – 1898	Smithy	A small smithy is located approximately 400m west of the north western extent of the Proposed Scheme area.
1874 – 1960s	Chalk Pits	A number of open chalk pits are located near the Proposed Scheme area. The closest is shown approximately 450m northeast of the Proposed Scheme area.
1897 – 1969	Didcot Newbury & Southampton Railway Line	A railway line crosses the northwest length of the Proposed Scheme area and continues to run along the western Proposed Scheme boundary. By 1969, the railway is shown as dismantled, although embankments are still present.
1897 – Present	Vulcan Iron Works and Factory	A small iron works is shown approximately 400m north of the north western extent of the Proposed Scheme area. By 1962 the works have extended to approximately 300m north of the north western Proposed Scheme area.
1947 – Present	Winchester By-Pass (A34)	A new road runs across the Proposed Scheme area from southeast to northwest on a 1947 aerial photo and is subsequently shown on later Ordnance Survey mapping. By 1977, the existing bypass has been expanded with a new spur (A33) running to the north west along the route of the former railway line.
1910 – 1966 (Gasometer remained until 1989)	Gas Works	A small gas works is shown approximately 100m west of the western boundary of the Proposed Scheme area from 1910. The Gas Works consisted of nine buildings or structures. By 1931, the works had expanded with two additional gasometers and buildings. A gasometer was located approximately 50m west of the Proposed Scheme area.
1969 – Present	Engineering Works and Saw Mills, and Industrial Estate	By 1969, a saw mill and engineering works are present adjacent to the gas works site. The buildings remain to present day.
1931 – Present	Abattoir, Works and Warehouses	A triangular parcel of land to the southwest of the Proposed Scheme area is shown as an allotments/storage area from 1931. By 1962, the area is occupied by a number of large warehouse/factory buildings. These are later labelled as Winchester Abattoir, works, warehouses, garages and depot. By 1977, the industrial estate/warehouse to the southwest has expanded to the north, along the route of the A33/A34 to join up with the former gas works complex.
1980s to Present	M3	The M3 is first shown from 1983 running south to north through the Proposed Scheme area.
1990s to Present	Depot	A depot comprising two large industrial buildings and associated storage areas is present on the southwestern portion of the site off the A33.

Landfill sites

5.5.20 There are no authorised landfills within the Proposed Scheme area. Three historical landfills lie within the immediate area of the Proposed Scheme, which are summarised in Table 5-14.

Table 5-14 Landfills within the Proposed Scheme area

Landfill Name	Location	Additional Information
Spitfire Link Landfill	Beneath the existing M3/A34 interchange	No details of waste accepted or operational dates available.
Land adjacent to Winchester bypass	Adjacent to the A34	Active between 1967 and 1968, accepting Inert waste
King George V Playing Fields	Beneath the existing M3 carriageway and land adjacent to the M3 and A31 in the south of the Proposed Scheme	No details of waste accepted or operational dates available.

5.5.21 There are two additional historical landfills identified within 250 metres of the Proposed Scheme. These include Winnall, located approximately 200 metres west of the Proposed Scheme in the area of the M3 Junction 9, and at Morestead Waste Water Treatment Works, approximately 50 metres east of the southern end of the Proposed Scheme.

Potential contaminated land uses

Table 5-15 Potential contaminated land uses

Process/Land use	Location	Potential Contaminants
Use as a motorway. Potential Made Ground associated with construction of existing roads, spills and leaks from vehicles using roads.	Along the route alignment in areas of existing road and surrounding the Proposed Scheme area in various locations	Metals and metalloids, polycyclic aromatic hydrocarbons, oil/fuel hydrocarbons, sulphates, asbestos, landfill gas, acids, ammonia.
Agricultural land	Along the route alignment	Hydrocarbons and lubricating oils associated with machinery and nitrates from fertilisers. Potential pesticides and herbicides. Asbestos (e.g. on farm tracks due to possible use of demolition rubble for surfacing).
Landfills (unknown waste but could include inert, industrial, commercial, household, hazardous waste, liquids or sludge wastes)	Historical landfills in the south of Proposed Scheme by the roundabout and in the north. Two additional historical landfills within 250m of the Proposed Scheme	Metals and metalloids, polycyclic aromatic hydrocarbons, oil/fuel hydrocarbons, sulphates, asbestos, landfill gas, leachate, acids, ammonia.
Historical and current industrial land uses	Adjacent to the area of the Proposed Scheme, including depots, factories, former gas works.	Metals and organo-metals, polycyclic aromatic hydrocarbons, oil/fuel hydrocarbons, sulphates, asbestos.
The historic railway line	To the northwest of the area of the Proposed Scheme	Metals and metalloids, polycyclic aromatic hydrocarbons, oil/fuel hydrocarbons, lubricating oils, creosotes, sulphates, asbestos.

Receptor sensitivity

5.5.22 A number of sensitive receptors which could be affected by the Proposed Scheme during the construction and operational phases have been identified from the baseline information. The sensitivity of each has been assessed according to the methodology described in the methodology section below. Further refinement of receptor sensitivity will be carried out during the Environmental Statement when further information is available.

Table 5-16 Summary of receptors (methodology for determining sensitivity is in line with DMRB, Volume 11, Section 3, Part 11, Geology and Soils (Highways Agency, 1993))

Receptor	Detail	Sensitivity
Geological resources - Mineral Sites	There are superficial sand and gravel deposits identified in the Minerals and Waste Consultation Area in the River Itchen area. Approximately 9ha are within the Proposed Scheme area. Additionally, there is a protected site, Easton Lane Depot, adjacent to the proposed Order Limits to the southeast of Junction 9 of the M3.	Medium
Geological Listed Sites	The Proposed Scheme area does not lie within an area where nationally important geological or geomorphological features have been recorded (geological SSSIs) and there are no RIGS within the area.	Low
Agricultural soils	The Proposed Scheme is associated with Agricultural Land Classification Grade 3 (moderate to good) agricultural land	Medium
Groundwater in Secondary A, Secondary Undifferentiated and Principal aquifers, SPZ	Aquifers beneath the Proposed Scheme area have been classified as Principal (bedrock), Secondary A and Secondary Undifferentiated aquifers (superficial). Also, the northernmost part of the Proposed Scheme area lies within a Zone 1 SPZ, and the northern part of the proposed satellite compound lies within a Zone 2 SPZ. Two abstraction points for potable drinking supply are also located in the north of the Proposed Scheme area.	Very high - Principal aquifer sections with substantial contribution to the SAC High - Principal aquifers, providing locally important resource Medium – Secondary aquifers
Surface waters (River Itchen & Nun's Walk Stream)	The River Itchen flows through the north and along the west of the Proposed Scheme area with several associated water courses. The River Itchen is designated both as an SSSI and an SAC. Nun's Walk Stream flows in a channel roughly parallel to the River Itchen and is classified by the Environment Agency as a Main River.	High
Sensitive sites	The nearest environmentally sensitive area is the River Itchen valley designated as an SSSI and an SAC. The Proposed Scheme area lies partly within the SDNP.	Very high
Built environment receptors	Residential, school and commercial properties. Roman road in the northwest. Immediately west of the Proposed Scheme there is a commercial zone which includes Sun Valley Business Park, Tesco, Winnall Industrial Estate, Scylla Industrial Estate. Wykeham Trade Park and Highways England's maintenance depot. All of these are located to the northwest of the junction. Agricultural buildings and leisure activity area borders the south of the proposed satellite compound area.	Medium

Receptor	Detail	Sensitivity
Construction workers	The Proposed Scheme is considered likely to potentially include extensive earthworks which could contain contamination. However, best practice and appropriate health and safety controls would be implemented during construction.	Medium
Residents of adjacent properties	Surrounding land uses comprise residential developments in Headbourne Worthy, Kings Worthy, Abbots Worthy and the outskirts of Winchester. A small number of isolated farm holdings or rural dwellings lie to the east of the Proposed Scheme. There are also local schools within the study area.	Low
Existing and proposed future site users	The Proposed Scheme is to remain mainly a 'hard end use' and there would be little exposure to the underlying soils and geology/contamination.	Low

Preliminary conceptual site model

5.5.23 A preliminary conceptual site model has been developed for this report. The conceptual site model and risk assessment will be updated with ground investigation data for the Environmental Statement.

Potential sources of contamination

5.5.24 The following potential sources of contamination have been identified within the Proposed Scheme area and from the surrounding area (within 250 metres of the Proposed Scheme area), including current and historical sources.

- Within the Proposed Scheme area:
 - Current use – road network
 - Potential made ground
 - Historical landfills
 - Agricultural land use
- Within 250 metres of the Proposed Scheme:
 - Historical landfills
 - Historical and current industrial land use
 - Historical railway line
 - Agricultural land use

Potential pathways

5.5.25 Pathways for contamination exposure are related to the end receptor. The identified potential pathways specific to the Proposed Scheme are outlined below.

- Human health:

- Ingestion
- Inhalation of dust/fibres (including asbestos)
- Dermal absorption from direct contact
- Inhalation of vapours
- Accumulation of ground gases within enclosed spaces leading to potential risk of asphyxiation and/or explosion
- Controlled waters:
 - Leaching of contaminants to aquifer
 - Migration of contaminants from off-site sources onto/under the site
 - Leaching/migration of contaminants to surface water
- Infrastructure:
 - Accumulation of ground gases within enclosed spaces leading to potential risk of explosion
 - Direct contact with potentially aggressive ground (i.e. areas of landfill) – potentially cause degradation of infrastructure

Potential receptors

5.5.26 Potential receptors for the Proposed Scheme are:

- Human health – construction workers, off-site users, future site users
- Minerals area – sand and gravel deposits identified in the Minerals and Waste Consultation Area
- Groundwater – Principal, Secondary A and Secondary Undifferentiated aquifers. SPZ 1 and SPZ 2
- Surface water – River Itchen
- Existing and future infrastructure
- Sensitive sites
- Agricultural soils

Methodology

5.5.27 Potential impacts on geology and soils have generally been assessed in line with DMRB, Volume 11, Section 3, Part 11, Geology and Soils (Highways Agency, 1993). However, the DMRB guidance is quite limited on the assessment of potential impacts relating to geology and soils, and some of the reference documents referred to by DMRB have been superseded since the document was produced (for example, the DMRB guidance refers to the assessment of soil contaminants against Interdepartmental Committee on the Redevelopment of Contaminated Land, which has been superseded by the soil screening assessment methodology outlined below). Therefore, an element of professional

judgement has been applied when assessing impacts, and the DMRB guidance has been adapted to take account of current legislation and guidance as outlined below.

5.5.28 Several methodologies have been used in the study of geology and soils and will be used to assess ground investigation data.

- Desk Studies. Desk studies were originally carried out for the M3 Junction 9. These gathered relevant information on the baseline conditions of geology and soils along the Proposed Scheme. This information forms much of the 'existing and baseline knowledge' above
- Soil Screening Assessment (Human Health). Category 4 Screening Levels (C4SL) and Suitable 4 Use Levels (S4UL) will be used to assess the risks from soil contamination to human health. This is considered a conservative approach to assessment
- Soil Waste Disposal. Waste assessment will be made using HazWaste Online. This uses Waste Classification Technical Guidance (WM3 guidelines) (Environment Agency, 2015) to classify waste as 'Hazardous' or 'Non-Hazardous' providing a European waste code. Waste Acceptance Criteria testing will also be carried out to understand the suitability of materials for landfill disposal
- Groundwater Assessment. Results from groundwater testing will be assessed against Environmental Quality Standards from the Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 or the UK Drinking Water Standards
- Gas risk assessment. Ground gas data collected from the ground investigation will be assessed using the Construction Industry Research and Information Associated (CIRIA) C665 guidance (CIRIA, 2007)
- Conceptual site model. The Contaminated Land Report 11 guidance (Defra and Environment Agency, 2004) was used to carry out a preliminary conceptual site model, including sources, pathways and receptors for the Proposed Scheme. This will be further developed and updated in the Environmental Statement using the information from the ground investigation if available

Constraints and limitations

5.5.29 The assessment carried out to date is desk based, using a number of sources assumed to be reliable. Where no data are available, a qualitative land contamination risk assessment is necessary, applying a 'matrix approach' to account for the probability and consequence associated with the contaminant linkages. The assessment is based on data available at the time which could update throughout the project.

5.5.30 Data have been obtained from various statutory and non-statutory bodies and external sources. However, the ground conditions underlying the Proposed Scheme are not known in detail and there are gaps in information, which will be addressed with the intrusive ground investigation and in the Environmental Statement.

Potential impacts during construction

5.5.31 The Proposed Scheme has the potential to result in the following impacts during the construction period:

- Physical effects of the development, e.g. change in topography, soil compaction, ground stability
- Dewatering if shallow groundwater is present
- Pollution of sensitive surface water receptors due to construction activities (migration of contamination, groundwater, runoff, soil erosion)
- Effects associated with the potential for polluting substances to cause new ground contamination issues, e.g. contaminants introduced to the site during construction/operation
- Pollution of Principal, Secondary A and Secondary Undifferentiated aquifers in the Proposed Scheme area due to construction activities, particularly in landfilled areas
- Potentially aggressive ground conditions (i.e. in areas of landfill), which could degrade Proposed Scheme infrastructure
- Health impacts to construction workers in direct contact with contaminated soil or groundwater
- Build-up of gases in confined spaces in site infrastructure or trenches
- Effects on geology as a valuable resource, including potential sterilisation of the mineral deposits within the Minerals and Waste Consultation Area
- Effects on agricultural soils – potential loss of soils during construction
- Effects on SSSIs
- Effects associated with ground contamination that could already exist on site, e.g. introducing/changing pathways and receptors

Potential mitigation for construction impacts

Table 5-17 Potential mitigation for construction impacts

Impact	Design measures and potential mitigation
Physical effects of the development, e.g. change in topography, soil compaction, ground stability	The construction of all earthworks and rock cuttings along the alignment of the Proposed Scheme will be designed to an appropriate factor of safety to reduce the potential for slope instability. These profiles should maintain long-term slope stability and remove the need for direct, active slope stabilisation measures during construction.
Dewatering impacts. If shallow groundwater is encountered, dewatering could be required at the site during the construction phase. If this water is contaminated and discharged locally, e.g. to land or into surface waters, its contamination status could have a detrimental impact on the environment. Additionally, there could be a significant impact from dewatering in a locality that affects the River Itchen.	Monitoring of groundwater and surface water should be carried out during construction. Control of discharge water should be carried out depending on chemical results of groundwater sampling.
Soil erosion risk. Introducing sediment which could be potentially contaminated into surface water bodies.	There would be the potential for soils to be retained and re-used as engineered fill in the Proposed Scheme, in landscaping works or in other requirements for the Proposed Scheme. The CoCP will specify methods of handling and storage conditions, to reduce the level of damage and deterioration in soil quality during storage and transit.

Impact	Design measures and potential mitigation
Introduction of potential contaminating materials (e.g. inappropriate storage and use of fuels, spillages), which could impact water resources, soil and humans.	Use of sediment and surface water capture systems, bunded fuel storage areas and use of good environmental controls to be detailed within the CoCP and implementation of new drainage system and any remedial works identified following the completion of the ground investigation.
Potentially aggressive ground conditions.	The potential 'aggressivity' of ground conditions to concrete should be investigated during the ground investigation. The concrete type used across the Proposed Scheme would be tailored to the ground conditions present to prevent the risk of future attack.
Health of construction workers arising from contact with potential contaminants within the Made Ground and historical landfill or inappropriate procedures and working methods	Risk assessments and method statements to be produced to limit potential exposure through working methods where possible. Personal protective equipment to be provided where potential exposure cannot be eliminated. Any construction worker would stop working if in potential danger and personal protective equipment would be provided where required.
Elevated gas levels	The potential for elevated gas levels in the project area will be assessed using the ground investigation data and subsequent gas risk assessment. Further design and construction mitigation will follow on from this.
Effects on geology as a valuable resource (including mineral sites and geological resources), i.e. the potential sterilisation of the mineral deposits within the Minerals and Waste Consultation Area	There are no listed geological sites within the Proposed Scheme area. However, a materials management plan will be used to manage potential change to geology or geomorphology. Appropriate refinements to the design will be agreed after the ground investigation when further ground conditions are understood. Consideration should be given to the extraction and re-use of the mineral deposits in the Minerals and Waste Consultation Area, before construction of the Proposed Scheme. Consultation should be carried out with the local authority concerning deposits.
SSSIs and agricultural land, i.e. the loss or damage of Grade 3 agricultural land/soils	Earthworks design takes into consideration the potential loss of farm land and infringement on the SSSI on the River Itchen. Soils from within the Proposed Scheme area would be re-used or re-instated where possible following the completion of the works. The loss of areas of agricultural land cannot be fully mitigated against. The area of loss will be reduced during the design process where feasible.
Effects associated with ground contamination that could already exist on site, e.g. introducing/changing pathways and receptors	The potential contamination will be understood from the ground investigation. Further design mitigation could follow on from this.

Potential impacts during operation

5.5.32 It is considered that if the potential impacts are addressed through the design of the project the potential for environmental effects during operation would be limited. At this stage, the Proposed Scheme has the potential to result in the following impacts during operation:

- Build-up of ground gases in future infrastructure
- Sterilisation of mineral safeguarding area once the Proposed Scheme is built
- Loss of agricultural land
- Contamination during operation as a result of spills during ongoing use of road and major accidents

Potential mitigation for operational impacts

Table 5-18 Potential mitigation for operational impacts

Impact	Design measures
Build-up of ground gases in future infrastructure	Gas protection measures built into the design in any identified elevated gas risk areas where build-up of gases could occur
Sterilisation of mineral deposits within the Minerals and Waste Consultation Area	Operation of the Proposed Scheme would limit any planned extraction works under the Proposed Scheme footprint. Unless materials are extracted before completion of construction, no mitigation would be possible.
Loss of agricultural land	The loss of areas of agricultural land cannot be fully mitigated against. The area of loss will be reduced during the design process where feasible.
Contamination of Principal and Secondary (A and Undifferentiated) aquifers and soils as a result of spills during ongoing use of road and major accidents.	Appropriate drainage and protection measures built into the design of the Proposed Scheme, including lining of drainage courses and balancing ponds if necessary.

Summary

5.5.33 A number of sensitive receptors that could be affected by the Proposed Scheme during the construction and operational phases have been identified.

- Further information will be obtained for the Environmental Statement to gain a more detailed understanding of baseline conditions and allow refinement of assessment of impacts and mitigation measures.
- The ground investigation is currently being carried out, findings will be incorporated into the Environmental Statement.
- The majority of impacts could be readily mitigated through design and the implementation of good practices to be set out in a CoCP.
- The loss of areas of agricultural land could not be fully mitigated against. The area of loss will be reduced during the design process where feasible.
- Operation of the Proposed Scheme would limit any planned mineral extraction works under the Proposed Scheme footprint. Unless minerals are extracted before construction is completed, no mitigation is possible.

5.6 Material assets and waste

Material assets

- 5.6.1 Material resources include both primary materials, such as aggregates and minerals, and secondary manufactured products. Road schemes require significant quantities of both primary materials and secondary manufactured products. Many material resources originate off-site and some arise on-site, such as excavated soils or recycled road planings (old road surface materials removed from redundant carriageways or areas to be resurfaced).
- 5.6.2 The production, sourcing, transport, handling, storage and use of these materials, as well as the disposal of any surplus, could have environmental impacts. Alternatively, materials that arise from construction activities could be re-used on site, which would prevent the need for off-site disposal. Materials re-use would also reduce the amount of new material needing to be brought in.

Waste

- 5.6.3 The generation of waste in road schemes has the potential to impact on available waste management infrastructure through permanently occupying landfill void space and/or the temporary use of waste transfer recycling and other recovery capacity, and non-compliance with relevant policies and plans.
- 5.6.4 A range of waste types, including inert, non-hazardous and small volumes of hazardous wastes, would be generated by the Proposed Scheme. The majority of wastes produced are construction and demolition waste, a large proportion of which could be suitable for reuse, recycling or recovery, although a proportion could require disposal.
- 5.6.5 It is important to define when, under current legislation and understanding, a material is considered to be a waste. The Waste Framework Directive (European Directive 2006/12/EC, as amended by Directive 2008/98/EC) defines waste as “*any substance or object that the holder discards or is required to discard*”.
- 5.6.6 Once a material has become waste, it remains 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 and other measures required by the Directive.
- 5.6.7 The management and/or use of surplus materials and waste would be carried out in accordance with the waste hierarchy, outlined in the Waste (England and Wales) Regulations 2011.

Existing and baseline knowledge

Material assets

- 5.6.8 Identification of the baseline conditions for waste material disposal have been considered, where possible, according to conditions likely to be present at the start of construction (programmed for 2021) and up until the Proposed Scheme is operational (programmed for 2023).
- 5.6.9 Table 5-19 provides a summary of the availability of the main construction materials in South East England and the UK required to deliver typical highways schemes. Table 5-19

provides a context in which the assessment of impacts and significant effects from the consumption of materials on the Proposed Scheme could be carried out.

Table 5-19 *Materials availability in the South East of England and the UK*

Material type		Materials Sales	
		South East England	UK
Aggregate	Sand and gravel	5.9 Mt (land) ⁽¹⁾	62.7 Mt (land won and marine) ⁽²⁾
	Crushed rock	1.7 Mt ⁽¹⁾	113.9 Mt ⁽²⁾
	Recycled and secondary	4.2 Mt ⁽¹⁾	70.4 Mt ⁽²⁾
Ready-mix concrete		1.5 Mm ³ ⁽²⁾	56.1 Mt ⁽²⁾
Asphalt		1.6 Mt ⁽²⁾	25.2 Mt ⁽²⁾
Concrete products		No data	25.8 Mt ⁽²⁾
Steel		No data	7.5 Mt (production) ⁽³⁾
<p>(1) South East Aggregates Monitoring Report 2018 - all 2017 data (South-East England Aggregates Monitoring, 2018)</p> <p>(2) Profile of the UK Mineral Products Industry 2018 Edition – national data 2016, regional data 2017</p> <p>(3) World Steel in Figures 2018 – 2017 data World Steel Association (2018)</p>			

5.6.10 Data on the general availability of construction materials in the South East of England and across the UK indicate significant availability of materials for the construction of the Proposed Scheme.

5.6.11 Recovery of materials or wastes (ultimately recycled or re-used to become materials) from the Proposed Scheme would adhere to the principles of the waste hierarchy and limit the amount of primary materials required by the Proposed Scheme, or on other construction if recycled and sold onwards for use.

5.6.12 Defra’s data - UK Statistics on Waste, data up to 2016 (Defra, 2019b) (Table 5-20) show that, within England, the recovery rate for non-hazardous construction and demolition arisings has remained above 90% since 2011. This exceeds the EU target of 70%, which the UK must meet by 2020.

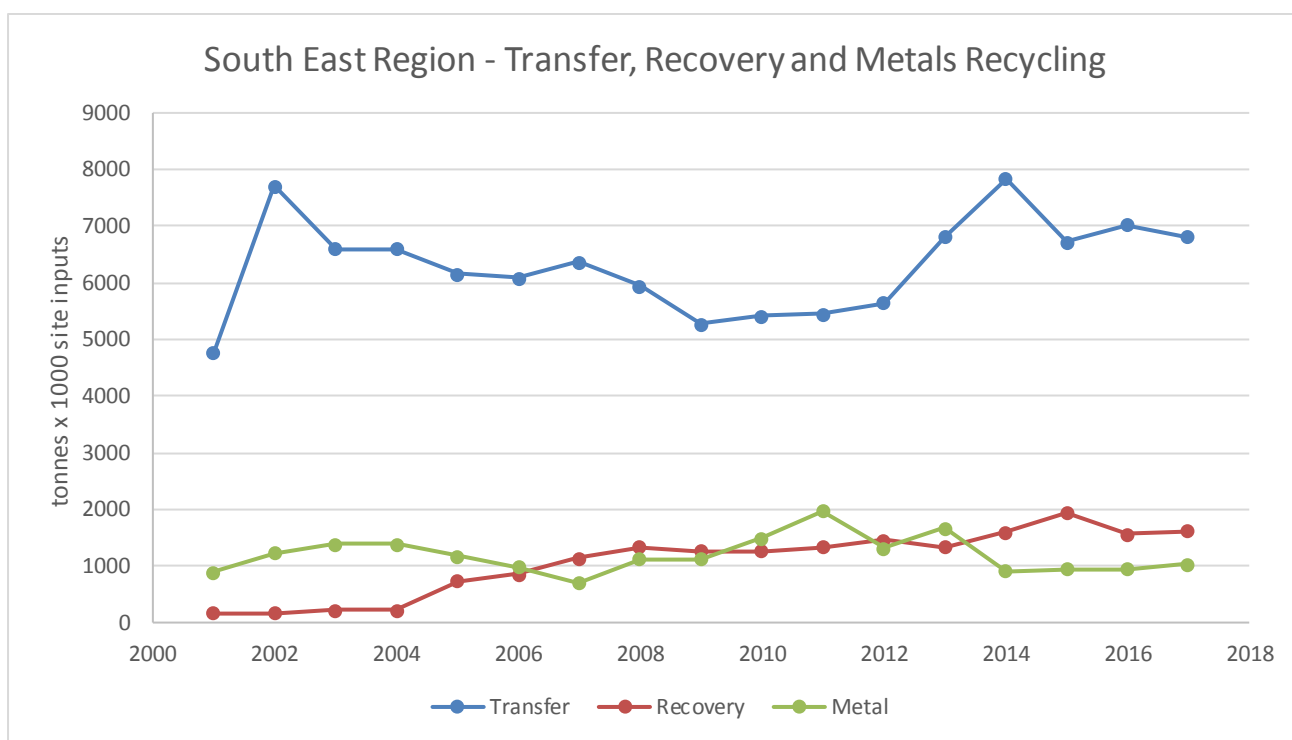
Table 5-20 *Non-Hazardous construction and demolition arisings recovery in England*

UK	Generation (Mt)	Recovery (Mt)	Recovery Rate (%)
2010	59.2	53.1	89.7
2011	60.2	55.0	91.4
2012	55.8	50.8	91.1
2013	57.1	52.0	91.2
2014	61.5	56.3	91.5
2015	63.8	58.1	91.1
2016	66.2	60.2	91.0

5.6.13 Data on secondary and recycled materials facilities and markets on a regional level is limited. However, the South East Aggregates Monitoring Report 2018 concluded that, in 2017, sales of secondary and recycled aggregate in South East England were 4.87 million tonnes, with a total production capacity of 12.92 million tonnes and a percentage sales/production capacity of 38%. However, the South East Aggregate Working Party suggests that this information should be treated with caution, as the response rate to the survey was variable, and there is a suspicion that the capacity data are based on environmental permit limits issued by the EA, which are set higher than could practically be achieved.

5.6.14 Figure 5-6-1 shows that rates of material recovery within South East England have risen steadily over the past 16 years. Metal recycling shows a consistent and relatively flat profile. However, trends for transfer data are more variable, and no clear profile is discernible. Data provided include all waste types in the region and hence include, but are not specific to, construction, demolition and excavation (CDE) arisings.

Figure 5-6-1 Transfer, material recovery and metal recycling in the South East of England



5.6.15 Trends for materials recovery infrastructure in South East England suggest that there is strong potential to divert site arisings generated by the Proposed Scheme from landfill and potential to recover these arisings (materials and wastes) to off-set material requirements.

5.6.16 During construction of the Proposed Scheme, road planings/waste would be likely to be generated, containing coal tars. Such coal tar bearing materials would be classified as hazardous waste and dealt with accordingly. It is anticipated that a significant proportion of these wastes could be re-used within the Proposed Scheme via mobile plant, although some treatment could be required at appropriate facilities within the region.

Waste

5.6.17 EA (EA, 2017) data demonstrate an increasing shortage of landfill capacity in England: 723Mm³ of capacity was recorded in 1998/99 but only 422Mm³ in 2017, representing a

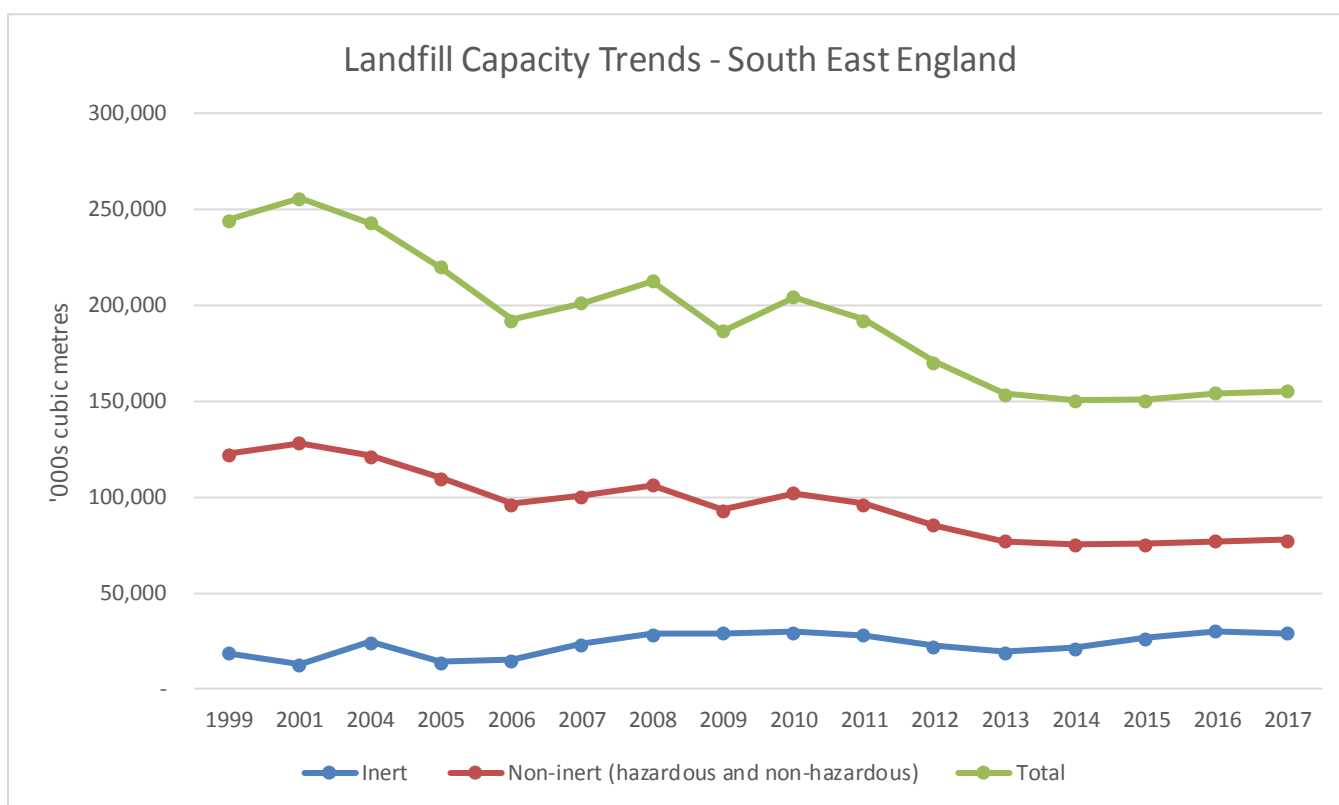
41% reduction over a period of 17 years. At the end of 2017, licensed landfill sites in South East England have been recorded as having 77.4 Mm³ of remaining capacity.

Table 5-21 Remaining landfill capacity, South East England (2017)

Landfill Type	Remaining capacity '000m ³
Hazardous (merchant and restricted)	119
Inert	29,121
Non-hazardous (inc. stable hazardous waste cells)	48,159
Total	77,400

5.6.18 Figure 5-6-2 shows the remaining landfill capacity in the South East of England.

Figure 5-6-2 Landfill Capacity Trends in the South East of England



5.6.19 Baseline data indicate that total and non-inert landfill capacity in the South East of England indicates that, although capacity has fallen since 1999, there has been stabilisation of the capacity of both inert and non-inert capacity. It is anticipated that this level of capacity is likely to remain available through the construction period up to the first year of operation.

Mineral safeguarding areas and peat

5.6.20 The National Planning Policy Framework (NPPF) requires that local planning authorities define mineral safeguarding areas and adopt appropriate policies so that known locations of specific mineral resources of local and national importance are not needlessly sterilised by non-mineral development. Mineral consultation areas are then defined based on these mineral safeguarding areas. However, the NPPF does not identify peat as a mineral resource of local and national importance and requires that local planning authorities do

not identify new sites or extensions to existing sites for peat extraction given that the current policy drive is towards carbon sequestration.

5.6.21 A review of the Hampshire Minerals and Waste Plan 2013 (HCC, 2013) suggests there are areas designated as mineral safeguarding areas for sharp sand and gravel and also a safeguarded mineral processing site in the northern part of the Proposed Scheme.

5.6.22 The mineral safeguarding areas include:

- Superficial sand/gravel – Sub-alluvial River Terrace deposits – Inferred resources
- Easton Lane Depot – Mineral Processing – Concrete Batching

5.6.23 In line with the requirements of the NPPF, the Hampshire Minerals and Waste Plan 2013 does not include any mineral safeguarding areas for peat resources.

Methodology

5.6.24 The assessment being completed focuses on the environmental impacts and effects arising from construction in the form of depletion of natural resources, the generation and management of waste on site, potential impacts on the available waste management infrastructure and impact on mineral safeguarding areas and peat resources.

5.6.25 The assessment of materials follows the interim guidance on the scope of the materials topic and the approaches/methodologies to be applied as set out in IAN 153/11 (Highways Agency et al., 2011) and the latest Highways England guidance.

5.6.26 In accordance with the latest Highways England guidance, the assessment of material assets and waste uses two geographically different study areas to examine the use of primary, secondary, recycled and manufactured materials; and generation and management of waste by the Proposed Scheme:

- The first study area is based on the area of completed works within the proposed Order Limits. Within this area, construction materials would be consumed (used, reused and recycled) and waste generated.
- The second study area has been defined by professional judgement and is sufficient to identify suitable waste infrastructure that could accept arisings and/or waste generated by the project and feasible sources and availability of construction materials typically required for motorway and all-purpose trunk road projects. For the Proposed Scheme, this is considered on a regional (South East England) basis.

Constraints and limitations

5.6.27 Baseline data and information for the assessment are (unless otherwise stated) only available up until 2016/2017.

5.6.28 Waste management operators could claim commercial confidentiality for their data at the time of submission. Data for sites with commercial confidentiality in place are therefore unavailable for the analyses presented in this section.

5.6.29 Defra has been consulted by email to determine whether generation and recovery rates for CDE arisings are available by region (e.g. for South East England). Defra confirmed that it does not publish CDE figures at a regional level, and only national (England) data

are accessible through the publicly available Waste Data Interrogator Database (2017). This database is held and operated by the Environment Agency.

- 5.6.30 Until such a time that CDE generation and recovery rates by region are available, transfer (non-civic), recovery and metal recycling data (available through the Waste Data Interrogator Database) will be used as the closest possible proxy.
- 5.6.31 The absence of the above data is not expected to materially influence the outcome of the assessment of material assets and waste. Where new data to fill the stated gaps are identified, they will be used during the assessment process.

Potential impacts during construction

Material assets and waste

- 5.6.32 The Proposed Scheme would have the potential to consume material resources (including those recovered from site arisings) and produce and manage waste during the construction of the Proposed Scheme and its supporting infrastructure.
- 5.6.33 The direct impact of using primary materials is the consumption of non-renewable environmental resources. Associated indirect impacts include the release of greenhouse gas (GHG) emissions, water consumption and scarcity, environmental degradation and pollution, and nuisance to communities (visual, noise, dust).
- 5.6.34 At this stage it is not possible, until the engineering aspects have been identified (e.g. in the form of a Detailed Highway Bill of Quantities), to identify precisely the environmental impacts and effects that would be associated with the use and consumption of materials during the construction of the section options. Nevertheless, experience of previous projects suggest that the materials used during construction would be likely to include those identified in Table 5-22.

Table 5-22 Material resources required for the Proposed Scheme

Project Activity	Material resources required for the Proposed Scheme	Quantities of material resources required
Site remediation/preparation/earthworks	During site preparation works, timber, steel and other products would be required for the erection of perimeter fencing, and aggregate and stone would be needed for ground improvement at the site, before use by heavy plant.	Unknown at this stage
Demolition	It is not anticipated that material consumption would be required during demolition.	N/A
Site construction	During construction, a wide range of material resources would be required to deliver the Proposed Scheme, including: - bulk materials for earthworks (volumes would be dependent on the cut and fill balance) - road paving materials, including subbase and bituminous products - steel – for structures and sheet piling	Unknown at this stage

Project Activity	Material resources required for the Proposed Scheme	Quantities of material resources required
	<ul style="list-style-type: none"> - concrete including for pre-cast or prefabricated elements - bricks and aggregate - timber for fencing and formwork - new street furniture and signage - cabling - other general construction materials 	

5.6.35 The generation and management of waste directly impacts on the capacity of waste management facilities within the region. Disposal to landfill would have a range of indirect impacts, including the release of GHG emissions, environmental pollution and nuisance to communities (visual, noise, dust). As per materials, at this stage there is no waste quantity information. However, experience of previous projects suggests that the wastes generated during construction are likely to include those identified in Table 5-23.

Table 5-23 Waste types likely to be generated during construction of the Proposed Scheme

Project Activity	Waste arisings from the Proposed Scheme	Quantities of waste arisings
Site remediation/preparation/earthworks	<p>Wastes likely to be generated during site preparation would include:</p> <ul style="list-style-type: none"> - vegetation and other above ground materials produced by site clearance (potentially including invasive weeds) - surplus topsoil or subsoil materials - hazardous or contaminated material found on or beneath the site, including asphalt waste containing coal tar (road planings) 	Unknown at this stage
Demolition	<p>Wastes generated during demolition would be likely to include:</p> <ul style="list-style-type: none"> - broken out concrete, cut steel and road surface planings - hazardous or contaminated material found on or at the surface of the site - other demolition wastes 	Unknown at this stage
Site construction	<p>It is anticipated that the following wastes would be generated during construction:</p> <ul style="list-style-type: none"> - green waste - timber - concrete, bricks and aggregate waste - road paving materials including subbase and bituminous products - hazardous or contaminated material found or generated on site, including asphalt waste containing coal tar (road planings) - cabling - redundant street furniture and signage - steel waste, e.g. safety barriers - general construction waste, e.g. packaging, ducting. 	Unknown at this stage

Mineral safeguarded areas and peat resources

- 5.6.36 If the Proposed Scheme transects mineral safeguarding areas or peat resources, there would be potential for this resource to be impacted. For example, if a road scheme were to be built over a mineral safeguarded area it could mean that the resource could no longer be accessed, and any future extraction compromised. If peat resources are located within the Proposed Scheme they would be likely to be damaged.
- 5.6.37 Sterilisation could occur through constructing the Proposed Scheme directly overlying these mineral safeguarding sites. This could restrict their future workability through immediate land take, or through construction on or close to the boundary of the mineral safeguarding sites which could indirectly sterilise the mineral resource. Indirect sterilisation could occur through closing off or limiting the access to a resource. Sensitive receptors could be introduced that are affected by noise, blast vibration or visual intrusion should a resource be worked in future.

Potential mitigation for construction impacts

- 5.6.38 Most non-contaminated site arisings generated during demolition, site preparation and construction (including any surplus from materials required to deliver the Proposed Scheme) would have the potential for diversion from landfill and be reused on site where possible. In particular, bulk materials for earthworks, road paving materials, steel, concrete, bricks, aggregate, timber and cabling would be readily recoverable. Table 5-24 summarises the potential design, enhancement and other mitigation measures that could be adopted by the Proposed Scheme to limit impacts to material resources and the generation and management of waste.

Table 5-24 Design, enhancement and other mitigation measures

Mitigation and enhancement	Lifecycle stages
Identification and specification of materials that can be acquired responsibly, in accordance with BES 6001 Responsible Sourcing of Construction Products	Design, construction
Design for resource optimisation: simplifying layout and form, using standard sizes, balancing cut and fill with consideration of local topography, maximising the use of renewable materials and materials with recycled or secondary content, and setting material balance as a goal	Design
Design for off-site construction: maximising the use of pre-fabricated structures and components	Design
Design for the future: considering how materials can be designed to be more easily adapted over an asset's lifetime, and how deconstruction and demounting of elements can be maximised at end-of-first-life	Design
Design for recovery and re-use: identifying, securing and using materials at their highest value, whether they already exist on site, or are sourced from other locations.	Design
Identify opportunities to reduce the export and import of materials	Design, construction
Working to a proximity principle, making sure arisings generated are handled, stored, managed and re-used or recycled as close as possible to the point of origin	Design, construction
Identify areas for stockpiling and storing arisings in a manner reducing quality degradation and leachate, and damage and loss	Design, construction

Mitigation and enhancement	Lifecycle stages
Making sure potential arisings and waste are properly characterised before or during design, to maximise the potential for highest value reuse	Design
Capturing information and data on site arisings recovered and diverted from landfill by developing a Design Site Waste Management Plan once a preferred option has been selected	Design
Implementing a Materials Management Plan in accordance with the CL:AIRE Definition of Waste: Code of Practice	Construction

5.6.39 Key mitigation measures would be included within the CoCP to be developed for the Proposed Scheme. The CoCP will set out the approach to managing environmental issues on site during construction.

5.6.40 The CoCP will include the requirement to develop a Site Waste Management Plan. Site Waste Management Plans are prepared before a construction project starts so that waste is considered throughout the project. Site Waste Management Plans identify the type of waste expected to be produced during the project, estimate the quantity of waste that would be produced and identify the planned waste management action proposed for each type of waste.

Potential impacts during operation

5.6.41 Key operational and maintenance activities would be likely to include inspection and repair of barriers and signage, drain inspection and clearance, road repairs and road verge/vegetation maintenance. Principal wastes arising from these activities would be likely to include cleared vegetation waste, waste from gully emptying, oil separator waste and litter. It is anticipated that impacts associated with the operation and maintenance of the Proposed Scheme would be minimal and mitigated by continued application of the waste hierarchy principle and upkeep of the Proposed Scheme in terms of regular road sweeping and collection of any motorway debris by the appointed maintenance contractor.

5.6.42 It is not anticipated that there would be large quantities of material resource use or waste generation associated with operation and maintenance of the Proposed Scheme. Therefore, it is considered that the effect of material use and waste generation from the Proposed Scheme would be unlikely to have significant environmental impacts during operation and has therefore been scoped out of any further environmental assessment.

Potential mitigation for operational impacts

5.6.43 It is considered that the effect of material use and waste generation from the Proposed Scheme would be unlikely to have significant environmental impacts during operation and has therefore been scoped out of any further environmental assessment.

Summary

5.6.44 A 'Detailed Assessment' will be carried out and included in the Environmental Statement, in line with IAN 153/11 (Highways Agency et al. 2011) and the latest Highways England guidance. Detailed Assessment is a qualitative and quantitative exercise using available forecast data and information (as provided by the appointed designer and other scheme delivery partners) which will aim to identify the requirements list in paragraph 11.6.8 of the M3 Junction 9 Improvements EIA Scoping Report.

5.6.45 The Proposed Scheme would require use of materials and generate waste arisings during construction. Any adverse effects on the use of natural resources and off-site waste disposal facility capacity would be proactively managed to reduce any potential adverse effects.

5.7 Noise and Vibration

Existing and baseline knowledge

Sensitive receptors

- 5.7.1 There are a number of sensitive receptors near the Proposed Scheme. DMRB, Volume 11, Section 3, Part 7 - Noise and Vibration, HD 213/11 - Revision 1 (HD 213/11) (Highways Agency, 2011) provides examples of sensitive receptors, including dwellings, hospitals, schools, community facilities, designated areas (e.g. Areas of Outstanding Natural Beauty, National Parks, SACs, Special Protection Areas, SSSIs, Scheduled Ancient Monuments) and Public Rights of Way.
- 5.7.2 The construction and operational assessment study areas will be defined once sufficient information is available, including updated traffic data. For this PEIR, the study areas detailed in the Environmental Assessment Report (WSP, 2018d), drafted for the option selection stage, have been used.
- 5.7.3 The operational study area encompasses residential properties to the north and east of Winchester, including Headbourne Worthy to the north (west of the A31), Kings Worthy to the north (east of the A31) and the eastern fringes of Winchester including the neighbourhoods of Winnall, St Giles Hill and Highcliffe, which lie immediately west of the M3 and to the south of M3 Junction 9 (from north to south).
- 5.7.4 The construction study area is likely to encompass a smaller area and would include those sensitive receptors (both residential properties and other sensitive receptors such as the SDNP, the River Itchen SSSI and SAC and a number of long-distance footpaths) closest to the proposed construction works, anticipated construction traffic routes and near to any construction compound(s) identified at this stage.
- 5.7.5 A summary of potentially sensitive receptors identified during the option selection assessment as lying within the noise model calculation area is provided in Table 5-25. The study area, noise model calculation area and sensitive receptors will be re-visited during the EIA following receipt of traffic data and construction phase information.

Table 5-25 Potentially sensitive receptors

Potentially Sensitive Receptors	
Residential Areas	Headbourne Worthy
	Kings Worthy
	Eastern fringes of Winchester, including (from north to south) Winnall, St Giles Hill and Highcliffe
Nursery Schools	Springvale Playgroup, St Mary's Church, Kings Worthy, SO23 7QL
	Sparklers Sure Start Children's Centre, Winnall Community Centre, Winchester SO23 0NY
	Yellow Dot Nursery, Wales Street, Winchester, SO23 0ET
	Stepping Stones Preschool, Winnall Community Centre, Winchester SO23 0NY
Primary Schools	Winnall Primary School, Winchester SO23 0NY
	St Swithun's Junior School, Winchester SO23 1HA

Potentially Sensitive Receptors	
Secondary Schools, Colleges and Further Education (FE)	St Swithun's Senior School, Winchester SO23 1HA
Places of Worship	Kingdom Hall, Winchester SO23 0NY
	St Swithun's Church, Headbourne Worthy SO23 7JX
	St Mary's Church, Kings Worthy SO23 7QL
Scheduled Monuments	Round barrow cemetery on Magdalen Hill Down
	Site of St Gertrude's Chapel
Designated Areas	South Downs National Park (SDNP)
	River Itchen SSSI
	River Itchen SAC
Public Rights of Way	Itchen Way
	St Swithun's Way
	Three Castles Path
	Allen King Way
	South Downs Way

Source – Option selection assessment.

Noise Important Areas

5.7.6 The current Noise Action Plan for major roads (Defra, 2014) outlines a number of Noise Important Areas (NIAs) at Round 2 of the UK noise mapping project, identified in accordance with the requirements of the EU Environmental Noise Directive and associated English regulations. The Round 2 NIAs include the top 1% of the population in terms of exposure to road traffic noise (LA_{10,18h}).

5.7.7 The Round 2 NIAs for both Highways England and local authority maintained roads are available under the Open Government Licence. The Round 2 NIAs within (whether partially or wholly) the noise model calculation area defined for the option selection assessment are set out below. Note that this list will be updated once the noise model calculation area for preliminary design has been confirmed.

- NIA 4006, M3, north of Junction 9 – owned by Highways England
- NIA 4007, A34, north of Junction 9 – owned by Highways England
- NIA 4008, M3, south of Junction 9 – owned by Highways England

5.7.8 In accordance with the provisions of the Round 2 Noise Action Plan for Roads and the objectives of the RIS, it is understood that the aim should be to bring about improvements to the noise environment in these areas. The NIAs can be seen in Figure 1-2.

Existing noise climate

5.7.9 The existing noise climate varies across the study area. Much of the study area would be dominated by road traffic noise, particularly the areas close to the M3, A34 and A33. However, the study area includes relatively large areas where there are no major roads – these areas would be exposed to lower noise levels.

- 5.7.10 In addition to road traffic noise, there would be localised noise from commercial areas clustered around the west side of Junction 9, as well as some limited noise associated with aircraft arriving at and departing from Southampton Airport. The train line running from Winchester, northwards to Basingstoke, lies more than 1 kilometre to the west of the motorway junction. Consequently, it is considered unlikely that rail noise would substantially affect the existing noise climate in the calculation area. These assumptions will be revisited once updated traffic data are available and the model calculation area has been accurately defined.
- 5.7.11 The existing road traffic noise climate within the calculation area was determined at the option selection stage using a 3D noise model, populated with traffic flow data.
- 5.7.12 Baseline noise monitoring will be carried out at locations close to the M3 and A34. The M3 and A34 is the main corridor for freight traffic from Southampton and Portsmouth Docks to the midlands and the north. Substantial volumes of heavy goods vehicle traffic are likely, particularly at night. Evaluation of daytime and night-time noise levels from measured data will be used to assist in the accuracy of predictions for the night-time period using the Transport Research Laboratory (2002) methods detailed in the document 'Converting the UK traffic noise index LA_{10,18h} to EU noise indices for noise mapping', referenced within DMRB HD 213/11 guidance. The baseline noise data will also be used as the basis of the ambient noise level within the construction noise assessment. As detailed in HD 213/11, the baseline operational noise levels, against which noise level change predictions will be made, will generally be established through prediction using the noise model.
- 5.7.13 The extent of and locations for baseline noise monitoring have been discussed and agreed with Winchester City Council. It is anticipated that baseline noise monitoring will take place at three locations, subject to receiving permissions for access from local residents. The three locations identified are as follows:
- Willis Way in Kings Worthy, close to A34
 - Cottage, north of M3 Junction 9
 - Longfield Road in Winnall, south of M3 Junction 9
- 5.7.14 It is anticipated that baseline noise measurements would take place over a period of 7–14 days at each location, subject to suitable weather conditions.

Methodology

- 5.7.15 National and local planning policy will inform the assessment and be described in the Environmental Statement. Guidance such as the Road Investment Strategy (RIS) for the 2015/16 – 2019/20 Road Period (DfT, 2016) and Highways England: Licence will also inform the assessment. Part 9 details the policies that will inform the assessments.
- 5.7.16 The Noise Policy Statement for England (NPSE) was published in March 2010 by Defra and is the overarching statement of noise policy for England.
- 5.7.17 The Explanatory Note to the NPSE introduces three concepts to the assessment of noise in England:
- No Observed Effect Level (NOEL) – This is the level below which no effect could be detected and below which there is no detectable effect on health and quality of life due to noise

- Lowest Observable Adverse Effect Level (LOAEL) – This is the level above which adverse effects on health and quality of life could be detected
- Significant Observed Adverse Effect Level (SOAEL) – This is the level above which significant adverse effects on health and quality of life occur

5.7.18 None of these three levels are defined numerically in the NPSE. For the SOAEL, the NPSE makes it clear that the noise level is likely to vary depending on the noise source, the receptor and the time of day/day of the week. The NPSE acknowledges the need for more research to investigate what could represent a SOAEL for noise and asserts that not stating specific SOAEL values provides policy flexibility in the period until further evidence and guidance is published.

5.7.19 The Department for Transport's RIS was published in March 2015 and sets out policies relating to the strategic planning and funding of the road network. The RIS identifies a capacity to improve noise levels through the management and redevelopment of Highways England assets, via low noise road surfacing, noise barriers, etc. Highways England is expecting to deliver mitigation measures to at least 1,150 NIAs, helping to improve the quality of life of around 250,000 people by the end of the first road period.

Construction noise and vibration

5.7.20 HD 213/11 states that, when determining the need for the assessment of potential noise and vibration effects during the construction phase, the potential for exceeding the criteria provided in BS 5228 should be considered. This should also include the effects of any road closures resulting from construction works.

5.7.21 BS 5228 Part 1 (British Standards Institute, 2009) refers to two methods for assessing construction noise based on the level of pre-construction ambient noise at the receptor. Method 1, the ABC method, uses the pre-construction ambient noise level to determine an appropriate threshold value, with a significant effect being indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the pre-determined threshold value. Method 2, the 5dB(A) change method, indicates a potentially significant effect if the total noise (pre-construction ambient plus site noise) exceeds the pre-construction ambient noise by 5dB or more, subject to lower cut-off values, which are dependent on the time of day. BS 5228 Part 1 also mentions that potentially significant effects could be indicated if a fixed noise level, which depends on the nature of area in which the works are occurring, is exceeded.

5.7.22 The guidance in BS 5228 Part 1 has been used to derive LOAELs and SOAELs for construction noise, as detailed in Table 5-26 below.

Table 5-26 Effect levels for construction noise

Period	LOAEL	SOAEL
Daytime weekday (07:00–19:00) Saturdays (07:00–12:00)	Exceeds existing $L_{Aeq,T}$ noise level	Threshold level determined as per BS 5228-1: 2009+A1:2014 Section E3.2
Evenings weekday (19:00–23:00) Saturdays (12:00–23:00) Sundays (07:00–23:00)	Exceeds existing $L_{Aeq,T}$ noise level	Threshold level determined as per BS 5228-1: 2009+A1:2014 Section E3.2

Night-time weekday and weekend (23:00–07:00)	Exceeds existing $L_{Aeq,T}$ noise level	Threshold level determined as per BS 5228-1: 2009+A1:2014 Section E3.2
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Source – Based on guidance in BS 5228 Part 1 (BSI, 2008)

- 5.7.23 The LOAEL is set at a noise level where construction noise becomes the dominant noise source, whereas the SOAEL is set at a level where construction noise exceeds BS5228-1 thresholds.
- 5.7.24 Existing noise levels will be determined using the results of the baseline noise monitoring exercise or the noise model predictions. At the time of writing, the only data available to inform this would be from the Defra noise mapping exercise carried out in 2015. The noise survey exercise proposed and noise model predictions for the do-minimum opening year scenario will be used to inform the selection of appropriate LOAEL and SOAEL values, as these data are likely to be more accurate than the Defra noise mapping.
- 5.7.25 An impact could be significant when the noise level at sensitive receptors during construction works exceeds the SOAEL values listed in Table 5-26. A significant effect would be determined if this noise level is predicted to be exceeded for a period of 10 or more days of working in any 15 consecutive days, or for a total number of days exceeding 40 in any six consecutive months, unless works of a shorter duration would be likely to result in a significant effect (e.g. very high noise events). Similarly, adverse effects could be expected where noise levels exceed the LOAEL. Other factors would also be considered in determining if there is the potential for adverse and significant adverse effects, such as the number of receptors affected, the duration and character of the impact.
- 5.7.26 Consideration would be given to the potential need for working outside of the typical working hours (commonly Monday to Friday from 07:00 to 19:00 and 07:00 to 12:00 on Saturdays).
- 5.7.27 It is not anticipated that a construction contractor will be appointed before the final EIA findings will be reported in Environmental Statement. Detailed information regarding the construction programme, likely construction methods, as well as typical plant and equipment used to inform the assessment of worst-case scenarios (those likely to generate the highest noise and vibration levels), will be based on reasonable assumptions. The assessment will also consider the likely need for construction works outside of typical daytime working hours and highlight potential noise mitigation measures likely to be required.
- 5.7.28 For this PEIR, reference has been made to the findings of the qualitative assessment carried out for the option selection assessment, as reported in the Environmental Assessment Report (WSP, 2018d). A qualitative, constraints-based assessment was carried out at the option selection stage, based on the limited available information available at the time and professional judgement based on experience of similar schemes.
- 5.7.29 BS 5228 Part 2 (British Standards Institute, 2009a) contains guidance on vibration levels in structures from construction works. It provides a prediction methodology for some mechanised construction works, such as compaction and piling works. The standard also presents guidance for the control of vibration from construction works.

5.7.30 For building structure response, BS 5228 Part 2 reproduces the advice given in BS 7385-2: 1993 Evaluation and measurement for vibration in buildings: guide to damage levels from ground borne vibration (BS 7385-2) (British Standards Institution, 1993). The response of a building to ground borne vibration is affected by the type of foundation, underlying ground conditions, the building construction and the state of repair of the building. Table 5-27 reproduces the guidance detailed on building classification and guide values for cosmetic building damage.

Table 5-27 Construction vibration limits – potential for cosmetic building damage

Receptor	PPV in frequency range of predominant pulse	
	4Hz to 15Hz	15Hz and above
Reinforced or framed structures	50mm/s	50mm/s
Industrial and heavy commercial buildings		
Un-reinforced or light framed structures	15mm/s at 4Hz increasing to 20mm/s at 15Hz	20mm/s at 15Hz increasing to 50mm/s at 40Hz and above
Residential or light commercial buildings		

Source – BS 5228 Part 2 (BSI, 2008a)

Values referred to are at the base of the building.

At frequencies below 4Hz, a maximum displacement of 0.6mm (zero to peak) is not to be exceeded.

5.7.31 Minor damage is possible at vibration magnitudes greater than twice those given in Table 5-27, with major damage at values greater than four times the values in the table. BS 7385-2 also notes that the probability of cosmetic damage tends towards zero at 12.5mm/s peak component particle velocity. Significant adverse effects are expected at levels where vibration could cause cosmetic damage to structures.

5.7.32 However, significant adverse effects could occur at lower levels of vibration than this. Table 5-28 (reproduced from BS 5228 Part 2) shows potential adverse effect levels for the human response to vibration in terms of peak particle velocity (PPV).

Table 5-28 Guidance on effects of vibration levels – potential for disturbance

PPV vibration	Effect
0.14mm/s	Vibration could be just perceptible in most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3mm/s	Vibration could just be perceptible in residential environments.
1.0mm/s	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
> 10mm/s	Vibration would be likely to be intolerable for any more than a very brief exposure to this level in most building environments.

Source – BS 5228 Part 2 (BSI, 2008a)

5.7.33 The following effect levels for vibration on humans have been derived from the above. Table 5-29 provides the effect levels for construction vibration works.

Table 5-29 Effect levels for vibration on humans

Effect level	Peak particle velocity (PPV)
SOAEL	1.0mm/s
LOAEL	0.3mm/s

Source – BS 5228 Part 2 (BSI, 2008a)

5.7.34 If the predicted vibration level at a sensitive receptor is above the SOAEL, then there would be the potential for a significant effect to occur and mitigation should be proposed. However, the duration of the works and the character of the impact should also be considered in determining the significance of effect. If necessary, the potential impact on structures should also be considered.

5.7.35 As for the construction noise assessment, in the absence of a construction contractor, the assessment of construction vibration impacts will be based on reasonable assumptions as to the likely construction programme, construction methods and typical plant and equipment that would be used. The assessment will also consider the likely need for construction works outside typical daytime working hours and highlight potential vibration mitigation measures likely to be required.

5.7.36 For this PEIR, reference has been made to the findings of the qualitative assessment carried out for the option selection assessment. A qualitative, constraints-based assessment was carried out at the option selection stage, based on the limited available information available at the time and professional judgement based on experience of similar schemes.

Operational road traffic noise and vibration

5.7.37 The EIA will include the usual range of assessments specified in HD 213/11. The assessment of permanent road traffic noise impacts arising from the M3 Junction 9 improvements will involve predictions for all sensitive receptors in the calculation area, as well as a basic noise level assessment for affected routes outside the calculation area (i.e. the wider road network).

5.7.38 This aspect of the assessment will consider the following scenarios:

- Opening year – Do-minimum (i.e. without the Proposed Scheme)
- Opening year – Scheme do-something (i.e. with the Proposed Scheme)
- Future year – Do-minimum
- Future year – Scheme do-something

5.7.39 The assessment will make the following comparisons, as specified in HD 213/11:

- Do-minimum in the opening year versus do-minimum in the future year (long-term, without Proposed Scheme)
- Do-minimum in the opening year versus scheme do-something in the opening year (short-term, with Proposed Scheme)
- Do-minimum in the opening year versus scheme do-something in the future year (long-term, with Proposed Scheme)

5.7.40 All road traffic noise predictions will be carried out in accordance with the calculation methodology presented in the former Department of Transport/Welsh Office technical memorandum Calculation of Road Traffic Noise (Department of Transport, 1988) and the advice contained in Annex 4 of HD 213/11. Traffic speed bands will be derived in accordance with IAN 185/15 (Highways Agency, 2015).

5.7.41 The classification of magnitude of noise impacts associated with short and long-term changes in noise levels will be determined in accordance with the criteria presented in Table 5-30 below, which are taken from HD 213/11. Both adverse and beneficial changes will be considered in the assessment. For the assessment of night-time noise impacts, HD 213/11 advises that, until further research is available, only noise impacts in the long-term should be considered.

Table 5-30 Classification of magnitude of noise impacts

Magnitude of impact	Noise change, dB (L _{A10,18h})	
	Short-term	Long-term
No change	0	0
Negligible	0.1 – 0.9	0.1 – 2.9
Minor	1.0 – 2.9	3.0 – 4.9
Moderate	3.0 – 4.9	5.0 – 9.9
Major	+5.0	+10.0

Source – DMRB HD 213/11 (Highways Agency, 2011)

5.7.42 A noise nuisance and airborne traffic vibration nuisance assessment will be carried out in accordance with the approach described in HD 213/11.

5.7.43 Particular consideration will be given to both noise change and noise levels within the three NIAs that have been identified.

5.7.44 An assessment of likely eligibility for sound insulation measures under the Noise Insulation Regulations 1975 (as amended 1988) will be carried out to identify residential dwellings that could potentially qualify under the Regulations.

5.7.45 Operation road traffic ground-borne vibration will be addressed qualitatively and will reference HD 213/11, whereby a level above 0.3mm/s PPV or any increase above an existing level of 0.3mm/s PPV could result in a significant effect, depending on the sensitivity of the receptor.

5.7.46 In addition to the requirements of the HD 213/11, the Proposed Scheme will be considered with respect to national policy.

Road traffic noise – significant environmental effects

5.7.47 For the operational noise assessment, appropriate noise level criteria have been defined for identifying potential significant environmental effects arising from operation of the Proposed Scheme. The criteria have been defined based on the guidance provided in the NPSE and Planning Practice Guidance.

5.7.48 For the operational noise assessment, the noise levels detailed in Table 5-31 will be considered as the LOAEL and SOAEL in this assessment:

Table 5-31 SOAEL and LOAEL values for operational noise

Parameter	Value for daytime (06:00–24:00) ¹	Value for night-time (23:00–07:00) ²
SOAEL	68dB LA10,18h (façade) 63dB LAeq,16h (free-field)	55dB Lnight,outside (free-field)
LOAEL	55dB LA10,18h (façade) 50dB LAeq,16h (free-field)	40dB Lnight,outside (free-field)
¹ The daytime LOAEL is based on the onset of moderate community annoyance, and the daytime SOAEL is based on the onset of cardiovascular health effects (WHO, 1999) and the Noise Insulation Regulations 1975 threshold. The slightly lower Noise Insulation Threshold should be used for consistency with other parts of the DMRB HD 213/11 methodology		
² The night-time LOAEL is defined using the World Health Organisation Night Noise Guidelines, and the night-time SOAEL is equivalent to the levels above which cardio vascular health effects become a major public health concern (WHO, 2009).		

Source – Derived from guidance outlined in table

5.7.49 For the operational road traffic noise assessment, groups of receptors, or individual receptors where appropriate, will be assessed. A noise change of 3dB or more in the short-term (i.e. a moderate increase in noise level) for any receptor or receptor group is likely to be significant. However, other factors should be considered in determining whether the impact would be significant or not. Other such factors include, but are not limited to:

- The actual short-term change, i.e. a change of 2.9dB or less (in the short-term) could still be considered a significant environmental effect
- The predicted long-term change in noise, i.e. comparison of the do-minimum scenario in baseline year against do-something in the future assessment year
- Absolute noise level with reference to the LOAEL and SOAEL values provided in Table 5-31
- Circumstances of the receptor or receptor group, e.g. locations of windows, outdoor spaces, use of receptor
- Existing acoustic character of the area
- Changes to the landscape or setting of the receptor or receptor group

Road traffic noise – significant policy effects

5.7.50 In terms of complying with government policy on noise, the assessment of the preliminary design will demonstrate how the Proposed Scheme intends to comply with the three aims of the NPSE, which are repeated below together with a description of how the aim has been interpreted.

5.7.51 The assessment of significant policy effects will involve the following:

- Aim 1: To avoid significant adverse noise effects (significant adverse noise effects occur when noise levels are above SOAEL):

- Set out the mitigation measures used to reduce noise exposure to below SOAEL at each receptor or group of receptors
- Where it has not been possible to reduce noise levels below the SOAEL, clearly state the reasons why, in terms of government policy on sustainable development
- Aim 2: To mitigate and reduce adverse noise effects (adverse noise effects occur when noise levels are between LOAEL and SOAEL):
 - Set out mitigation measures used to reduce adverse noise effects at all receptors or groups of receptors above LOAEL (including those also above SOAEL). Refer to the mitigation set out in response to Aim 1 as appropriate
 - Set out measures considered to reduce noise levels further but not ultimately included within the Proposed Scheme and explain why they were not ultimately included
- Aim 3: To improve the noise environment where possible (this applies to all noise levels):
 - Set out mitigation measures used to improve the noise environment, including reference to mitigation measures listed under Aims 1 and 2 as appropriate

5.7.52 Mitigation measures set out for all three aims should include the following measures:

- Measures incorporated into Proposed Scheme to reduce overall environmental impact, which could include, but are not limited to, alignment and design
- Measures used solely to mitigate noise, which could include, but are not limited to, noise barriers or quieter road surfaces

5.7.53 To put the aims of the NPSE into context, the following will be reported:

- For daytime and night-time periods, count and report the number of properties in the following categories:
 - Above the SOAEL
 - Between the SOAEL and LOAEL
 - Below the LOAEL

5.7.54 Determine the change, in terms of the number of properties in each category above, over the short-term (do-minimum opening year vs do-something opening year) and the long-term (do-minimum opening year vs do-something design year) with the Proposed Scheme.

5.7.55 For this PEIR, reference has been made to the findings of the assessment carried out for the option selection assessment. For that assessment, the general principles of the simple assessment in the DMRB were followed, although the noise and vibration assessment presented did not follow the full reporting requirements of the simple assessment. For example, night-time road traffic noise and traffic induced vibration were not assessed as they were considered less critical in the optioneering process.

Constraints and limitations

- 5.7.56 The study area for the EIA cannot be determined until further detailed information has been received, including construction information and detailed traffic data (allowing for affected road links to be identified).
- 5.7.57 The BS 5228 calculation methods enable the level of noise during various construction activities to be determined. However, the precision of any such predictions is necessarily limited by the number of assumptions made regarding the number and type of plant proposed to be used, their location and detailed operating arrangements. Some of this information will be clarified as the Proposed Scheme design progresses and later when a contractor has been appointed and resources mobilised. Other information such as exactly where the plant operates and for how long would remain uncertain, even after works had started.
- 5.7.58 For this PEIR, reference has been made to the findings of the qualitative assessment carried out for the option selection assessment. A qualitative, constraints-based assessment was carried out at the option selection stage, based on the limited available information available at the time and professional judgement based on experience of similar schemes.
- 5.7.59 The assessment of operational noise impacts will be based on the traffic data provided by the transportation team. Vehicle flows and the proportion of heavy vehicles in the form of 18-hour (06:00 – 00:00) Average Annual Weekday Traffic (18hr AAWT) will be used. Traffic speeds will be determined by the transportation team in accordance with IAN 185/15.
- 5.7.60 The noise modelling incorporates many different data sources. Therefore, the outcome of the modelling is reliant on the quality of these data. Any limitations of these data sources will be reported in the noise and vibration assessment, along with any associated implications.
- 5.7.61 It is anticipated that night-time noise levels will be estimated using the guidance within Transport Research Laboratory document 'Converting the UK traffic noise index LA_{10,18h} to EU noise indices for noise mapping'. The availability of appropriate traffic data will influence the prediction methodology adopted.
- 5.7.62 For this PEIR, reference has been made to the findings of the assessment carried out at the option selection stage. For that assessment, the general principles of the simple assessment in the DMRB were followed, although the noise and vibration assessment presented did not follow the full reporting requirements of the simple assessment.

Potential impacts during construction

- 5.7.63 Temporary noise and vibration effects could be defined as those that would occur between the start of advance works and end of the construction period. Although temporary, construction-related effects could nevertheless require mitigation. Typical construction effects could include a localised increase in noise and/or vibration and a loss of amenity due to the presence of construction traffic.
- 5.7.64 The following are generally applicable to temporary construction related effects:

- Construction disruption tends to be more localised at receptors close to a scheme, compared to operational effects (once a scheme has opened to traffic), which tend to be experienced more widely in the area
- It has been shown that disturbance arising from construction diminishes rapidly with distance
- The duration of the effects is important when considering the potential for disturbance

5.7.65 Construction activities such as piling, breaking and demolition, could cause high levels of noise and vibration. Whether such levels could cause significant effects would depend on other factors such as the time of day, duration and proximity of receptors.

5.7.66 It is anticipated that the construction compound could be located to the north west of the M3 Junction 9. Although this area is remote from residential receptors, care would still be required to organise and manage the compound to reduce noise and vibration effects.

5.7.67 In addition to the effects arising from the construction of the Proposed Scheme itself, disruption could occur during advance works, for example to divert utilities. These works could extend beyond the immediate construction site. Where materials need to be transported to or from the site, the impacts of the additional traffic along access routes could require assessment and this will be given due consideration. The need for (and approach to) such an assessment will depend on, among other things, the type of road(s) (e.g. major or local) forming the access route to each construction compound/work area and the proximity of any noise-sensitive receptors to each route.

5.7.68 It is anticipated that two lanes would be kept open on the M3 and A34 throughout most of the construction period, with the exception of overnight lane closures, as required. It is likely that there would be complete closures of the M3 (possibly full weekend closures) during the lifting-in of the new Junction 9 bridges and later the removal of the existing Junction 9 bridges. There would probably need to be overnight closures of the A34 to carry out tie-in works at various times during construction.

5.7.69 As a consequence of the proposed works, it is likely that there would be some re-distribution of traffic at times, whether enforced or through choice. It follows that receptors near any routes carrying redistributed traffic could experience increased levels of noise and vibration. Conversely, where works occurred near live traffic, vehicle speeds would be restricted for safety reasons. Such decreases in speed could lead to a temporary reduction in road traffic noise level for nearby receptors.

5.7.70 Certain activities and operations would be more likely than others to generate potentially significant levels of noise and vibration (for example, piling or large-scale earthworks). These should be identified at the earliest opportunity, along with the likelihood of any night-working, as all these aspects could increase the chance of disturbance. Given the nature of the area in which M3 Junction 9 is situated and the construction of various highway links that could form the junction, the construction would involve construction of at least one substantial structure, along with varying lengths of retaining walls.

5.7.71 The plans illustrating the Proposed Scheme show that there are few, if any, dwellings close to the centre of construction activity (i.e. the heart of Junction 9). However, as the junction improvements lie within or close to the SDNP, the River Itchen SSSI and SAC and a number of long-distance footpaths, some temporary adverse effects would be

expected for any users within these designated areas, should they find themselves close by when the works are being carried out. Many of those so affected would be transient users and so would be exposed to noise/vibration over a short period only (i.e. a matter of a few minutes).

5.7.72 Despite the lack of information, which currently prevents any quantitative assessment of construction noise and vibration, the proximity of certain sensitive receptors to M3 Junction 9, combined with the scale and complexity of the works and associated construction traffic and traffic management, means that the potential for disruption during the construction phase cannot be discounted. This conclusion would be strengthened where night-working was required.

5.7.73 Although construction-related effects are temporary, they could still be sufficient to require mitigation. Specific measures that could be employed are considered in the following section.

Potential mitigation for construction impacts

5.7.74 A mitigation strategy will be developed during the EIA to reduce any residual noise and vibration impacts during construction and these will be set out in a CoCP. This will include a requirement on the contractor to apply Best Practicable Means. Further detail is provided below.

5.7.75 The noise and vibration effects arising during construction could be mitigated to an extent through contractual means. Contract conditions could be used, for example, to limit noise from a construction site, to control working hours (especially for potentially disruptive operations), to prevent access to sensitive areas, and to restrict construction traffic to suitable haul routes. It is important that contractual working restraints are discussed in advance with the Environmental Health Practitioner (Winchester City Council). Monitoring of noise and vibration could be required during construction.

5.7.76 Section 61 of the Control of Pollution Act 1974 sets out procedures for those carrying out works to obtain 'prior consent' for construction works. Applications for such consent are made to the relevant local authority and contain a method statement for the works and the steps to be taken to reduce noise and vibration. Under Section 60 of Control of Pollution Act 1974, the local authority has powers to serve a notice imposing requirements as to the way in which the works are to be carried out and could specify plant or machinery which is (or is not) to be used, the hours during which the works could be carried out and the level of noise or vibration which could be emitted at any specified point. Although it is generally for those carrying out the works to decide whether or not to seek a Section 61 consent, this is also dependent on the custom and practice of the local authority. Some local authorities request demonstration of Best Practicable Means rather than a formal 'prior consent' application.

5.7.77 It will be important to manage and control noise and vibration throughout the construction period. To this end, it is expected that a mitigation strategy will be developed during the EIA, once information is available regarding how the Proposed Scheme might be constructed. It is anticipated that this mitigation strategy would be formalised within a CoCP, or similar, developed by the principal contractor in liaison with Winchester City Council. The CoCP would include, but not necessarily be limited to, the following aspects:

- Environmental management responsibilities and activities

- Monitoring and auditing processes
- Complaints handling and response procedures
- Community and stakeholder liaison processes

5.7.78 During the construction phase, the contractor will be required to apply Best Practicable Means to reduce any residual noise impact. General methods of noise control include:

- Appropriate selection of plant, construction methods and programming. Only plant conforming with, or being better than, relevant national or international standards, directives or recommendations on noise or vibration emissions should be used. Construction plant should be maintained in good condition with regards to reducing noise output and workers' exposure to harmful noise and vibration
- Construction plant should be operated and maintained appropriately, having regard to the manufacturer's written recommendations. All vehicles and plant should be switched off when not in use
- The positioning of construction plant and activities to reduce noise at sensitive locations
- The design and use of site hoardings and screens to provide acoustic screening at the earliest opportunity
- Choice of routes and programming for the transport of construction materials, spoil and personnel
- Vehicles and mechanical plant used for the purposes of the works should be fitted with effective exhaust silencers, be maintained in good working order and operated in such a manner as to reduce noise emissions. Only plant items complying with the relevant EU/UK noise limits applicable to that equipment should be used
- Use of equipment that breaks concrete by munching (or similar) rather than by percussion should be used as far as is practicable
- The use of mufflers on pneumatic tools
- Where practicable, rotary drills actuated by hydraulic or electrical power should be used for excavating hard materials
- The use of non-reciprocating construction plant wherever practicable

5.7.79 The risk of significant construction noise and vibration effects should be reduced by appropriate measures contained in the CoCP, applied throughout the construction phase.

Potential impacts during operation

5.7.80 The level of road traffic noise affecting any receptor is dependent on a number of variables, all of which are accounted for within the road traffic noise prediction methodology. In summary these are:

- Traffic related factors: volume, speed and composition of vehicles
- Road related factors: surface (e.g. concrete or bituminous) and gradient
- Propagation factors: distance, the presence of any screening and type of ground cover intervening between the road and any receptor
- Receptor specific factors: view of the road and reflections

- 5.7.81 Therefore, should any of these factors alter, such as changes along an existing road or with the introduction of a new length of carriageway, then noise levels would also be likely to change. Individually, these variables could cause noise levels to increase or decrease for any particular receptor.
- 5.7.82 The noise modelling work carried out for the option selection stage included a total of 2,027 residential dwellings within the calculation area. Non-residential, but potentially noise sensitive receptors (such as churches and schools) were also considered.
- 5.7.83 On Proposed Scheme opening, it was predicted that the vast majority of dwellings and all of the other sensitive receptors would experience a negligible magnitude of impact. Assuming that the road surface installed was a hot rolled asphalt (HRA) surface, it has been predicted that two dwellings would have minor adverse magnitudes of impact, with one dwelling predicted to have a minor beneficial magnitude of impact. None of the short-term noise changes were greater than ± 1.5 dB. However, if a low noise road surface (LNRS) was installed, the minor adverse magnitudes of impact would be eliminated, and 103 dwellings were predicted to experience minor beneficial magnitudes of impact.
- 5.7.84 For the long-term assessment, noise impacts were predicted to be no greater than negligible magnitude for any dwelling or other sensitive receptor. This conclusion was the same, irrespective of whether an HRA or LNRS surface was assumed. With an LNRS in place, there were fewer dwellings predicted to experience a negligible adverse magnitude of impact and more with a negligible beneficial magnitude of impact.

Noise levels above the SOAEL

- 5.7.85 The number of residential receptors with noise levels above the adopted daytime SOAEL of 65dB LA_{10,18h} free-field was considered at the option selection stage.
- 5.7.86 In the opening year, assuming an HRA road surface, the number of residential receptors with noise levels above the adopted SOAEL did increase, compared to the do-minimum scenario, although proportionally these increases were fairly inconsequential. The application of an LNRS did little to affect the analysis, although there was a slight improvement. This was to be expected given that there are few receptors close to the proposed Order Limits of the Proposed Scheme. This in turn means that noise levels at considered receptors would tend to be more influenced by road links outside the proposed Order Limits, which would not be mitigated by any LNRS applied within the proposed Order Limits.
- 5.7.87 The results presented for the future year showed a similar pattern to those presented for the opening year.
- 5.7.88 At the option selection stage, an indication was gained of the number of dwellings where the predicted future year noise level was above the adopted SOAEL and the long-term noise change was at least +1dB. This is when comparing the do-minimum opening year scenario with the do-something future year scenario.
- 5.7.89 The assessment indicated that, with an HRA road surface assumed, between 15 and 17 dwellings would meet the criteria as outlined in 5.7.88.
- 5.7.90 All of the identified dwellings had a predicted future year (2038) do-something noise level above the adopted SOAEL (65dB LA_{10,18h} free-field) as well as a long-term noise change of between 1dB and 3dB. This is when comparing the do-minimum opening year scenario

with the do-something future year scenario. While ordinarily such a change in the long-term would be considered negligible, the particular circumstances mean this could be considered a significant effect arising from the Proposed Scheme, in line with the guidance contained in the Planning Practice Guidance.

5.7.91 With an LNRS road surface instead, no dwellings were predicted to meet the proposed criteria outlined in 5.7.88.

Night-time noise levels

5.7.92 Night-time noise levels affecting dwellings within each NIA was considered. In line with HD 213/11, only long-term noise changes were considered and only for dwellings where the predicted noise level was 55dB $L_{\text{night, outside}}$ or greater in any scenario.

5.7.93 The assessment considered the number of dwellings with noise levels above 55dB $L_{\text{night, outside}}$ free-field which meet at least one of the qualifying long-term criteria from DMRB HD 213/11:

- Where the introduction of a project results in a sensitive receptor being exposed to night-time noise levels in excess of 55dB $L_{\text{night, outside}}$ where it is currently below this level
- Where a receptor is exposed to pre-existing $L_{\text{night, outside}}$ in excess of 55dB and this is predicted to increase

5.7.94 All receptors in NIA 4006 and NIA 4007 were predicted to meet at least one of the qualifying long-term criteria, while some of the receptors in NIA 4008 were predicted to meet at least one of the qualifying long-term criteria.

5.7.95 The use of an LNRS did make some difference to the analysis, although a sizeable proportion of receptors meeting at least one of the qualifying long-term criteria would remain. The reason for this is that receptors within the three NIAs would tend to be influenced more by noise from road links outside the proposed Order limits, which would not be mitigated by any LNRS applied within the proposed Order Limits. Consideration will be given to the most cost-effective mitigation for reducing road traffic noise affecting the three NIAs lying within the study area.

Designated sites predictions

5.7.96 While there are few dwellings located close to the heart of the junction, there are a number of designated sites. To determine the potential effects of operational road traffic on these designated sites, the following approach has been adopted, depending on whether such designations are defined by area (i.e. the River Itchen SSSI and SAC and the SDNP) or rather are a linear feature (i.e. the long-distance footpaths):

- *Designated areas*: a regular grid of receptor points has been modelled within each area – based on a 25 by 25 metre grid spacing
- *Designated paths*: a regular line of receptor points has been modelled along each path – based on a 25 metre linear spacing

5.7.97 In this way, a number of fixed receptor points were generated within each designated area or along each footpath within the calculation area and noise levels predicted for the same scenarios adopted for the receptor specific assessment. The percentage of points, rather

than the actual number of points, was reported in the assessment which is presented in this section of the report.

River Itchen SSSI

- 5.7.98 It is predicted that with an HRA road surface assumed, the vast majority of points in the SSSI would have a negligible magnitude of impact on Proposed Scheme opening, 4.3% of points would have a minor adverse magnitude of impact and 0.1% of points would have a moderate adverse magnitude of impact.
- 5.7.99 With an LNRS in place, the adverse impacts of minor and moderate magnitude would be eliminated, with a majority of points (56.8%) predicted to have a minor beneficial magnitude of impact.
- 5.7.100 In the long-term, magnitudes of impact would be no greater than negligible, with either an HRA or LNRS road surface. With LNRS, it is predicted that there would be fewer points with a negligible adverse magnitude of impact and more with a negligible beneficial magnitude of impact.

River Itchen SAC

- 5.7.101 It is predicted that with an HRA road surface assumed, the vast majority of points in the SAC would have a negligible magnitude of impact on Proposed Scheme opening, with 1.6% of points experiencing a minor adverse magnitude of impact.
- 5.7.102 With LNRS in place, the minor adverse magnitudes of impact would be eliminated, with half (50%) of the points having a minor beneficial magnitude of impact.
- 5.7.103 In the long-term, magnitudes of impact would be no greater than negligible, with either an HRA or LNRS road surface. It is predicted that with LNRS there would be fewer points with a negligible adverse magnitude of impact and more with a negligible beneficial magnitude of impact.

South Downs National Park

- 5.7.104 It is predicted that with an HRA road surface assumed, the majority of the points in the National Park would have a negligible magnitude of impact on Proposed Scheme opening. However, given the proximity of Junction 9 to the National Park, it was unsurprising that there would be some points (5.6%) with a minor or moderate adverse magnitude of impact. 0.4% of points would have a major adverse magnitude of impact. It is also predicted that although far fewer in number, some points (0.3%) would have a minor or moderate beneficial magnitude of impact.
- 5.7.105 With an LNRS in place, it is predicted that the majority of points would have a minor beneficial magnitude of impact, with a much smaller number (0.1%) having a moderate beneficial magnitude of impact. Despite the use of an LNRS, some points would have an adverse impact, with 0.7% of points having a minor adverse magnitude of impact and 0.6% of points a moderate or major adverse magnitude of impact.
- 5.7.106 In the long-term without the Proposed Scheme, and assuming an HRA road surface, all points would have a negligible magnitude of impact.

- 5.7.107 By comparison, in the long-term with the Proposed Scheme in place, and assuming an HRA road surface, there would be small numbers of points with predicted minor adverse (0.7%) and moderate adverse (0.4%) magnitudes of impact. There would be an even smaller number of points (0.1%) with a predicted minor beneficial magnitude of impact. The vast majority of points would continue to experience negligible magnitudes of impact.
- 5.7.108 With an LNRS road surface instead, there would be little difference, with the vast majority of points predicted to have negligible magnitudes of impact. There would be a small number of points with minor adverse (0.3%) and moderate adverse (0.4%) magnitudes of impact. There would be a remainder of an even smaller number of points (0.1%) with a minor beneficial magnitude of impact.
- 5.7.109 It should be noted that the receptor points used in the model did not relate to any specific receptors but were notional pre-set points, a few of which lay very close to new sections of road. It is likely that visits to the SDNP would ordinarily be occasional and of short duration. A limited number of points would have an adverse impact of at least minor adverse magnitude and there would be limited durations for any exposures. For these reasons, any adverse effects in the SDNP would be expected to be of little or no consequence.

Long-distance footpath predictions

- 5.7.110 It is predicted that with an HRA road surface assumed, the vast majority of points along the footpaths would have a negligible magnitude of impact. A number of points (3.3%) would have a minor or moderate adverse magnitude of impact, whilst fewer points (0.5%) would have a minor beneficial magnitude of impact.
- 5.7.111 With an LNRS road surface instead, adverse minor and moderate adverse magnitudes of impact would be eliminated. A substantial number of points (45.8%) would have a minor beneficial magnitude of impact.
- 5.7.112 In the long term, with an HRA road surface assumed, the vast majority of points would have a negligible magnitude of impact, with 0.5% of points having a minor adverse magnitude of impact.
- 5.7.113 With an LNRS road surface instead, the minor adverse magnitudes of impact would be eliminated, with the vast majority of points having a negligible magnitude of impact.

Potential mitigation for operational impacts

- 5.7.114 Mitigation measures will need to be considered in the EIA where perceptible noise increases and/or significant effects are predicted from operation of the Proposed Scheme.
- 5.7.115 Potential enhancement measures would also be considered for areas currently exposed to high noise levels from road traffic noise, but which did not require mitigation measures as part of the assessment. Any proposed enhancement measures would have to demonstrate value for money.
- 5.7.116 A number of measures are available, which could be applied either in isolation or in combination, to mitigate the adverse effects of road traffic noise. Some scheme-related measures are set out below.
- *Horizontal alignment* – moving a route away from sensitive receptors.

- *Vertical alignment* – keeping a route low within the natural topography to exploit natural screening.
- *Environmental barriers* – in the form of earth mounding or acoustic fencing of various types, or a combination of the two.
- *Low noise road surface (LNRS)* – most effective for noise generated by tyres of vehicles travelling at speeds in excess of 75km/h (approximately 47mph).
- *Speed and volume restrictions* – above about 40km/h (approximately 25mph), noise level increases with the speed of the vehicle; the volume and composition of traffic could also have a direct effect on noise levels.

5.7.117 The measures set out in the first two bullet points above should always be the primary objective when determining the vertical and horizontal alignment of new and/or altered roads. However, it is acknowledged that it might not be possible to apply some of these techniques to the Proposed Scheme. For example, there could be good engineering, environmental or structural reasons why the route could not be aligned further away from the nearest dwellings, or placed so as to maximise screening.

5.7.118 Environmental barriers could provide reductions of 10dB or more for well-screened locations relatively close to the source. But, at further distances, and particularly where the barrier provided only a small deflection of the transmitted sound, actual reductions might only be 1dB or 2dB. Beyond 200 to 300 metres, the effects might typically be zero as the attenuation of absorbent ground cover would become a substantial factor. Other considerations with respect to barriers are:

- The primary objective of any barrier should be to prevent a direct line of sight between the receptor and the noise source
- The higher the barrier, the greater the sound reduction, although there is a point at which additional benefit is not cost effective
- The closer a barrier is to the source, the greater will be the sound reduction
- Where a road is located on an embankment, the most efficient location for the barrier will usually be on the embankment as close to the edge of the carriageway as possible
- Where a road is located in a cutting, there will be less need for a barrier
- A barrier will usually be less effective at screening upper floors of sensitive buildings
- Unless specifically designed and constructed to prevent this, a barrier could reflect sound, increasing noise levels at certain receptors located opposite barriers

5.7.119 The benefits likely to accrue from an LNRS will vary according to traffic speed and the type and age of surface. HD 213/11 notes that the maximum allowable surface correction that could be claimed from using a thin surfacing system would be -3.5dB. Such a difference is substantial in that to achieve a comparable reduction in noise by reducing traffic flow, for example, would require at least a halving of traffic.

5.7.120 However, HD 213/11 also advises that an LNRS is much less effective where traffic speeds are below 75km/h. The reason for this is that an LNRS will influence noise emissions from the interaction of tyres with the road surface. Where vehicle speeds are lower, noise from the engine, transmission and exhaust becomes more substantial, so it

would be precautionous to claim less benefit from a thin surfacing system where vehicle speeds are less than 75km/h. The advice from HD 213/11 (paragraph A4.27) is as follows:

“where the mean traffic speed is <75km/h, a -1dB(A) surface correction should be applied to a low-noise surface. Although it is likely that thin surfacing systems will provide more acoustic benefit at lower speeds, until further research is carried out to provide reliable estimates, it is advised that a qualitative statement highlighting the possible acoustic benefits is also included in the assessment.”

5.7.121 Vehicle speed and the proportion of heavy vehicles combine to form a correction that is applied to the noise level determined from the vehicle flow. Above about 40km/h, the higher the speed, and the higher the proportion of heavy vehicles, the greater will be the correction. This correction could be substantial. For example, with 6% heavy vehicles, reducing vehicle speed from 80km/h to 64km/h (50mph to 40mph) would result in a 1.5dB reduction in road traffic noise, all else remaining equal. This is equivalent to a reduction in overall flow approaching 30%.

5.7.122 In accordance with Infrastructure Planning (EIA) Regulations 2017, the Handover Environmental Management Plan could contain a requirement for noise monitoring to be carried out once the Proposed Scheme is open to traffic. If required, the methodology will be agreed with the Environmental Health Practitioners at Winchester City Council, including appropriate actions to be taken depending on the results of the monitoring.

Summary

5.7.123 Accurate study areas for the construction and operational assessments will be determined following receipt of updated information, including traffic data.

5.7.124 By necessity, the assessment provided within this PEIR has made use of the work carried out at the option selection stage, as reported in the Environmental Assessment Report.

5.7.125 Certain construction activities and operations would be more likely than others to generate potentially significant levels of noise and vibration (for example, piling or large-scale earthworks). These should be identified at the earliest opportunity, along with the likelihood of any night-working, as all these aspects could increase the chance of disturbance. Given the nature of the area in which M3 Junction 9 is situated and the construction of the various highway links that could form the junction, the construction would involve construction of at least one substantial structure, along with varying lengths of retaining walls.

5.7.126 The plans illustrating the Proposed Scheme show few, if any, dwellings close to the centre of construction activity (i.e. the heart of Junction 9). However, as the junction improvements lie within or close to the SDNP, the River Itchen SSSI and SAC and a number of long-distance footpaths, some temporary adverse effects would be expected for any users within these designated areas, should they find themselves close by when the works were being carried out. Many of those affected would be transient users and so would be exposed to noise/vibration over a short period only (i.e. a matter of a few minutes).

5.7.127 The proximity of certain sensitive receptors to M3 Junction 9, combined with the scale and complexity of the works and associated construction traffic and traffic management,

means that the potential for disruption during the construction phase cannot be discounted. This conclusion would be strengthened where night-working was required.

5.7.128 Although construction-related impacts would be temporary, they could still be sufficient to require mitigation.

5.7.129 A mitigation strategy will be developed during the EIA to reduce any residual noise and vibration impacts during construction and these will be set out in a CoCP. This will include a requirement on the contractor to apply Best Practicable Means.

5.7.130 It is predicted that on Proposed Scheme opening, the vast majority of dwellings and all of the other sensitive receptors would experience a negligible magnitude of impact. Assuming that the road surface installed was an HRA surface, two dwellings would have minor adverse magnitudes of impact, with one dwelling predicted to have a minor beneficial magnitude of impact. None of the short-term noise changes would be greater than ± 1.5 dB. However, if an LNRS were installed, the minor adverse magnitudes of impact would be eliminated, and 103 dwellings were predicted to experience minor beneficial magnitudes of impact.

5.7.131 For the long-term assessment, noise impacts would be no greater than negligible for any dwelling or other sensitive receptor. This conclusion is the same, irrespective of whether an HRA or LNRS surface is assumed. With an LNRS in place, there would be fewer dwellings experiencing a negligible adverse magnitude of impact and more with a negligible beneficial magnitude of impact.

5.7.132 In the opening year, assuming an HRA road surface, the number of residential receptors with noise levels above the adopted SOAEL would increase, compared to the do-minimum scenario, although proportionally these increases would be fairly inconsequential. The application of an LNRS did little to affect the analysis, although there would be a slight improvement. This was expected given that there are few receptors close to the proposed Order Limits of the Proposed Scheme. This in turn means that noise levels at considered receptors would tend to be more influenced by road links outside the proposed Order Limits, not mitigated by any LNRS applied within the proposed Order Limits.

5.7.133 The results presented for the future year showed a similar pattern to those presented for the opening year above.

5.7.134 An indication was obtained of the number of dwellings where the predicted future year noise level would be above the adopted SOAEL with a long-term noise change of at least +1dB. This compares the do-minimum opening year scenario with the do-something future year scenario.

5.7.135 The assessment indicated that, with an HRA road surface assumed, between 15 and 17 dwellings would meet the criteria. All of the identified dwellings had a predicted future year (2038) do-something noise level above the adopted SOAEL (65dB $L_{A10,18h}$ free-field) as well as a long-term noise change of between 1dB and 3dB. This compares the do-minimum opening year scenario with the do-something future year scenario. While ordinarily such a change in the long-term would be considered negligible, the particular circumstances mean this could be considered a significant effect arising from the Proposed Scheme, in line with the guidance contained in the Planning Practice Guidance.

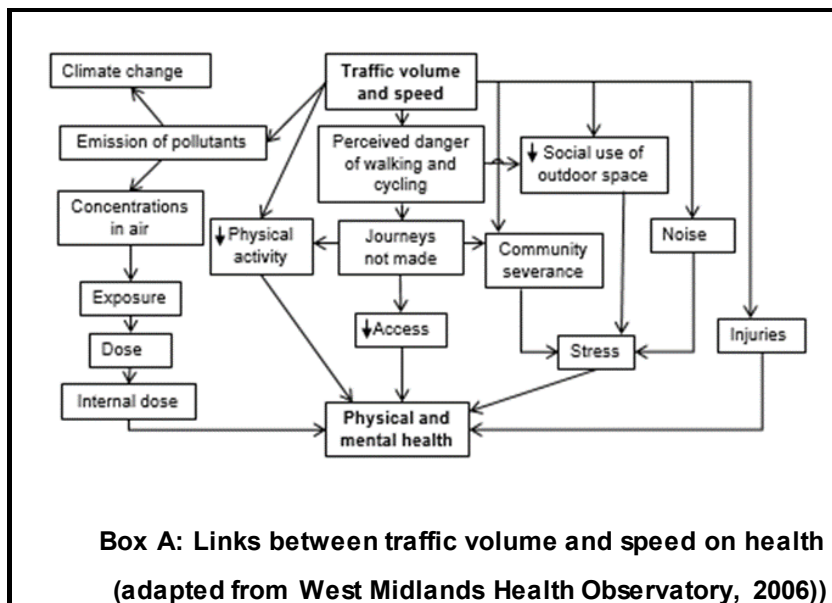
- 5.7.136 With an LNRS road surface instead, no dwellings have been predicted to meet the proposed criteria.
- 5.7.137 Night-time noise levels affecting dwellings within each NIA has been considered. All receptors in NIA 4006 and NIA 4007 have been predicted to meet at least one of the qualifying long-term criteria, while some of the receptors in NIA 4008 have been predicted to meet at least one of the qualifying long-term criteria.
- 5.7.138 The use of an LNRS did make some difference to the analysis, although a sizeable proportion of receptors meeting at least one of the qualifying long-term criteria would remain. The reason for this is that receptors within the three NIAs would tend to be more influenced by noise from road links outside the proposed Order Limits, which would not be mitigated by any LNRS applied within the proposed Order Limits. Consideration will be given during the EIA to the most cost-effective mitigation for reducing road traffic noise that would affect the three NIAs lying within the study area.
- 5.7.139 For the River Itchen SSSI and SAC and the SDNP, a regular grid of receptor points has been considered. The majority of the points have been predicted to have a negligible magnitude of impact on Proposed Scheme opening for each of the designated sites. A small number of points have been predicted to experience minor and moderate adverse impacts with an HRA road surface assumed. This is with a reduced number of points with an LNRS in place.
- 5.7.140 For the long-distance footpaths assessed, the vast majority of points along the footpaths have been predicted to have a negligible magnitude of impact, assuming an HRA road surface, with a small number of points having a minor or moderate adverse magnitude of impact. With an LNRS road surface instead, the adverse minor and moderate adverse magnitudes of impact have been eliminated, with a significant number of points (over 45%) predicted to have a minor beneficial magnitude of impact.
- 5.7.141 Mitigation measures will need to be considered in the EIA where it has been predicted that there would be perceptible noise increases and/or significant effects from operation of the Proposed Scheme.
- 5.7.142 Potential enhancement measures would also be considered for areas currently exposed to high noise levels from road traffic noise, but that did not require mitigation measures as part of the assessment. Any enhancement measures proposed would have to demonstrate value for money.
- 5.7.143 A number of measures are available, which could be applied either in isolation or in combination, to mitigate the adverse effects of road traffic noise and include the use of an LNRS and environmental barriers.

5.8 Population and Health

5.8.1 This section of the report identifies potential impacts on population and human health resulting from the construction and operation of the Proposed Scheme. As a highways scheme, it would have potential to affect a number of determinants of health, which are the broad social, environmental and economic circumstances that influence human health. These include factors such as air quality, noise levels, availability of recreational facilities, access to education, employment, healthcare and social support networks. The following diagram (Box A) illustrates pathways through which highway schemes are considered likely to influence population health outcomes.

5.8.2 Key pathways to potential health outcomes specific to the Proposed Scheme relate to:

- Improvements in access to community facilities and to the countryside
- Improved opportunities for active travel journeys
- Temporary effects on community cohesion and driver stress during construction relating to changes in traffic flows through smaller settlements



Existing and baseline knowledge

Socio-economic and health profile

5.8.3 As a general overview of the study area, the more densely populated areas are to the west of the M3 (Winchester and The Worthys), while to the east of the M3, the area is very sparsely populated (small villages and hamlets dispersed through the SDNP).

5.8.4 The wards coinciding with the Proposed Scheme area are St Bartholomew; St Michael; Alresford and Itchen Valley; and The Worthys. Table 5-32 below sets out key population and health data for these wards. The age demographics of wards within the study area are roughly aligned to the England average. Several of the more rural wards within the study area have a slightly higher proportion of older people (aged over 65) than the England average, with some of the more urban wards having a slightly lower proportion.

Table 5-32 Socio-economic and health data

Population and Health Indicator	St Bartholomew ward	St Michael ward	Alresford and Itchen Valley ward	The Worthys ward	England average
Population	9,589	8,917	8,686	5,966	N/A
Population 65+ years (%)	17.5	19.9	28	17.6	17.8
Population 0-15 years (%)	17	18.4	17.2	20.4	19
Index of Multiple Deprivation (IMD) (Open Data Communities, 2015)	13.8	12.7	7.7	6.4	21.8
Life expectancy at birth for males, 2011–2015 (years)	78.5	81.0	82.5	83.9	79.4
Life expectancy at birth for females, 2011–2015 (years)	84.6	85.5	86.5	84.6	83.1
Deaths from all causes, under 65 (Standardised Mortality Ratio (SMR))	109.9	84.1	70.2	64	100
Deaths from respiratory diseases, all ages (SMR)	95.2	72.3	70.2	76.8	100
Deaths from stroke, all ages (SMR)	98.7	90.5	63.3	88.4	100
Deaths from coronary heart disease, all ages (SMR)	102.4	68.5	74.4	73.5	100
Deaths from all cancer, all ages (SMR)	88.8	78.4	82.1	83.7	100
Emergency hospital admissions for Chronic Obstructive Pulmonary Disease (COPD) (Standardised Admission Ratio (SAR))	97.7	110.6	37.8	44.6	100

Notes:

Population data from 2015 mid-year Office for National Statistics (ONS) © Crown Copyright 2016

Life expectancy data - ONS 2017

SMR data - Public Health England, produced from ONS data © Copyright 2017

Emergency hospital admissions for Chronic Obstructive Pulmonary Disease, standardised admission ratio, 2011/12-2015/16 (Hospital Episode Statistics (HES) Copyright © 2017)

- 5.8.5 There are relatively low levels of general deprivation across the wards. However, there are some pockets of deprivation – the neighbourhood of Winnall, which abuts the M3 Junction 9, is among the 30% most deprived neighbourhoods in England¹. As made clear in the Marmot Review, ‘Fair Society, Healthy Lives – Strategic Review of Health Inequalities in England post-2010’, there is a social gradient in lifespan, with people living in the most deprived areas in England having on average the lowest life expectancy, while those living in areas with lower deprivation on average have a higher life expectancy. The ward in which Winnall is located, St Bartholomew, has higher rates of all cause premature death (deaths under 65 years) than its neighbouring wards within 2 kilometres of Junction 9. St Bartholomew and St Michael (see Figure 5-8-2) have notably higher rates of hospital admissions for Chronic Obstructive Pulmonary Disease (COPD). St Bartholomew ward also has a relatively high rate of deaths caused by respiratory diseases compared to the average for Winchester district and for England. These latter two indicators would suggest that the population could be more susceptible to the harmful effects of air pollution because of the higher rates of underlying respiratory conditions.
- 5.8.6 A preliminary review of health data for the wards surrounding the Proposed Scheme area indicates that one of the more prominent health inequalities appears to relate to the life expectancy of males. The average life expectancy for males in The Worthys ward, in which the villages of Kings Worthy and Headbourne Worthy are located, is over five years more than for males in St Bartholomew ward. Differences in life expectancy among females between St Bartholomew ward and the neighbouring wards are less pronounced.
- 5.8.7 In general, however, life expectancy within the urban wards abutting the M3 is aligned with the England average, whereas those in the more rural wards within the study area are slightly higher than both the Winchester and England averages.

Land use, community and local access

- 5.8.8 Land use to the east of the Proposed Scheme area is rural, mainly comprising farmland interspersed with small villages, such as Chilcomb and Easton, and isolated residential and commercial properties.
- 5.8.9 Land use to the west of the Proposed Scheme area is largely urban and semi-urban in nature and comprises the Winnall industrial estate abutting the western edge of the M3 Junction 9, while the residential neighbourhoods of Winnall, Fairdown and Highcliffe are located south of the industrial estate, also abutting the M3 motorway corridor. An exception is the Winnall Moors Nature Reserve and farmland along the Itchen River Valley which is discussed below under ‘Outdoor Recreation and Public Rights of Way’.
- 5.8.10 The Worthys (Headbourne Worthy, Kings Worthy and Abbots Worthy) are villages abutting the northern extents of the Proposed Scheme area alongside the A34 and A33 and represent the main residential areas within the study area outside of Winchester itself. Significant further housing development within Winchester and the wider south Hampshire area is identified within Winchester District Local Plan Part 1 - Joint Core Strategy (Winchester City Council and South Downs National Park Authority, 2013) and Winchester District Local Plan Part 2 – Development Management and Site Allocations (Winchester

¹ This is based on data for the lower layer super output area, which is a geographic scale used for reporting small area statistics in England and Wales.

City Council, 2017), including 4,000 residential properties within the city of Winchester itself and 250 residential properties within Kings Worthy (currently under construction).

- 5.8.11 Winchester contains important community facilities such as a hospital, university and numerous retail outlets and acts as a service centre for outlying smaller settlements to the north and west including Kings Worthy, Abbots Worthy, Headbourne Worthy, Eaton and Abbots Barton (see Figure 5-8-1). There are limited community facilities within these outlying communities, with the exception of the Kings Worthy, which has a primary school, post office, village pub and small business park.
- 5.8.12 The Winnall industrial estate contains a number of businesses (including a fuel station, coffee shop and a Tesco Extra superstore, which also contains a pharmacy) located off the Easton Lane access to the junction. Further south of this area is a primary school, community centre and convenience store. Local residents within Winnall and employees of the businesses can use the pedestrian and cycle route within Winnall to access the Tesco superstore, and local residents will use the smaller convenience store and the primary school (Figure 5-8-1).
- 5.8.13 Since the Winnall area offers substantial employment and retail opportunities, it is likely to generate trips between The Worthys and Winnall along the A34 and A33. The distance between the Winnall industrial estate and residential areas in Kings Worthy and Headbourne Worthy is less than 2 kilometres and so is within a distance that most people could travel by active modes (i.e. walking or cycling). However, traffic conditions on the A34 are reported to be intimidating due to the high speeds of traffic, relatively high numbers of heavy goods vehicles and very limited footway provision.
- 5.8.14 Anecdotal evidence from local cyclists², suggest that the B4307, which links The Worthys with Winchester city centre, is preferred as a cycle route since it is a quieter road. However, this provides a less direct (over 4 kilometres) route to the industrial estate. As a consequence, it is likely that pedestrian and cycle trips between these areas are limited by the current road and traffic conditions. It is therefore likely that most of journeys between Winchester and outlying villages are carried out via motor vehicle due to the lack of convenient provision for pedestrians and cyclists.
- 5.8.15 The Easton Lane Depot (motorway maintenance compound) is located in the M3 Junction 9 interchange area sandwiched between the northbound M3 on-slip and the A34 Winchester Bypass. Although there is a shared-use path into the compound area and within the island of the interchange (a spur off the National Cycle Network (NCN), there is no controlled crossing point to allow for pedestrians and cyclists to safely cross. At this point there are six lanes of traffic where the A34 meets the circulatory carriageway and so few people would risk crossing at this location during busy periods. This greatly limits the opportunity for people who work at this location to travel to work by sustainable and active modes.
- 5.8.16 Leigh House Hospital and St Swithun's School are located outside of the Winchester settlement boundary, east of the M3 from Alresford Road (B3404) (see Figure 5-8-1). They may be accessed on foot by residents of Winnall as there is a footway on either side

² Workshop with stakeholders from walking and cycling groups, February 2019.

of the carriageway. There is also a hotel, cemetery, Winchester Science Centre and Planetarium and a caravan and camping site in this area east of the M3.

Outdoor recreation and public rights of way

- 5.8.17 The SDNP is a nationally important attraction for outdoor recreation which falls within the study area. The majority of the SDNP is located to the east of the M3 corridor, meaning that the motorway acts as a partial barrier between residents in Winchester and access to the National Park. The main routes into the National Park from Winchester are indicated on Figure 5-8-1.
- 5.8.18 National Cycle Network (NCN) Route 23 runs between Reading and Southampton. The cycleway is routed onto Easton Lane in the industrial estate from the south of Junction 9, crossing the motorway junction via two underpasses, before continuing along Easton Lane to the east. Easton Lane at this point is bridleway 502 as it crosses the junction for approximately 200 metres until it becomes a small, single carriageway metalled track from which some isolated residential properties/farms east of the junction could be accessed. There is no through-route for motorised traffic across the junction via Easton Lane.
- 5.8.19 Between the two underpasses, users must negotiate a short section of shared-use path alongside the circulatory section of carriageway crossing the motorway itself. This short section is quite intimidating for pedestrians and cyclists since it is quite narrow, there is limited separation from the traffic, and the traffic noise levels are high. The entrances and exits to the subways have been observed to be quite steep, which may be inconvenient. While part of the cycleway is along bridleway 502, the underpasses and conditions make this an unsuitable location to ride a horse. Although, there is relatively little reason within Winnall to attract equestrian use across this interchange, it is noted that there is a location approximately 700 metres southwest of the Proposed Scheme area where horses are kept, so the desire to cross the M3 Junction 9 area into the SDNP cannot be ruled out.
- 5.8.20 Overall, the NCN Route 23 access across the M3 Junction 9 area has low amenity, being inconvenient, disjointed and intimidating in places. As a consequence, the usage of this route would be unlikely to be as high as it could be. It is therefore likely that many residents are unaware that there is a means to cross at this location.
- 5.8.21 There are five long distance paths which provide links between Winchester and the National Park. The Allan King Way and St Swithun's Way follow the same route on the west side of the Itchen River Valley, crossing the A34 immediately north of the Proposed Scheme area via a box culvert into Kings Worthy. The Itchen Way and Three Castles Path follow another route on the east side of the valley, crossing under the A34 on a raised footway along the edge of the A34 river bridge. The footway under the A34 lacks sufficient headroom, and is dark and intimidating (Box B), which could discourage some use, particularly in the evenings.



- 5.8.22 The South Downs Way crosses the M3 via a footbridge adjacent to the Highcliffe area towards the south of the Proposed Scheme area and continues eastwards through Chilcomb.
- 5.8.23 The above described routes provide the main access for walkers and cyclists between Winchester and the SDNP east of the M3 corridor. Some parts of the SDNP extend west of the M3 corridor, following the River Itchen valley. Notably, the Winnall Moors Nature Reserve is within the National Park and sited between Winnall and Abbott's Barton. The nature reserve provides a popular outdoor recreational asset for residents in Winchester, including for families, joggers and dog walkers. It is likely that this area provides a more convenient space for outdoor recreation for residents in Winchester than the long distance paths and areas of National Park east of the M3 corridor.

Summary of key baseline issues

- 5.8.24 In summary, the preliminary baseline assessment of population and human health issues considered to be relevant the Proposed Scheme are:
- A local resident population with higher than average rates of respiratory issues, meaning the population is potentially more susceptible to effects of air pollution
 - Residents within the Winnall neighbourhood who are relatively deprived compared to neighbouring communities, and with potentially fewer means to cope with changes in the area and a higher likelihood to experience poorer health outcomes
 - Poor provision for potential active travel journeys, particularly between The Worthys and Winnall industrial estate, suppressing the number of local journeys that can be done by sustainable and active modes
 - Poor access between Winchester and the SDNP east of the M3 corridor due to inconvenient crossing points with low amenity, which could discourage residents from accessing the countryside and participating in outdoor recreation.

Methodology

- 5.8.25 The assessment of likely significant effects on population and human health uses the following combination of guidance set out in the DMRB Volume 11, Section 3, Parts 6 (Land Use) (Highways Agency, 2001), 8 (Pedestrians, Cyclists, Equestrians and Community Effects) (Highways Agency, 1993a) and 9 (Vehicle Travellers) (Highways Agency, 1993b). It should be noted that the DMRB guidance dates back to 1993 and has limitations in relation to the assessment of health effects and active travel. Therefore, some more recent guidance from the Department for Transport has been used, together with professional judgement, to determine the sensitivity and significance of issues against more recent research into health effects of transport, as well as national and local policy priorities.
- 5.8.26 The proposed methodology for the assessment was set out in the Scoping Report (Highways England, 2019) for the Proposed Scheme and a Scoping Opinion was issued by the Planning Inspectorate in March 2019. With respect to the assessment of effects on population and human health, the Planning Inspectorate sought justification of the proposed 2 kilometre study area for the Proposed Scheme.
- 5.8.27 A 2 kilometre study area has been applied for the assessment of effects on the local community and land use. This is sufficient to capture the likely potential effects on the

amenity of community resources and local residents, such as from noise and air pollution during the construction and operation of the Proposed Scheme. It is also sufficient to capture the likely day-to-day pedestrian movement and interaction throughout the Proposed Scheme area on the basis that the majority of regular pedestrian journeys are up to 2 kilometres (Department for Transport, 2017).

5.8.28 For cycling, horse riding and general outdoor recreational access, a wider study area of 10 kilometres has been applied. This is sufficient to capture the majority of active travel cycle journeys (Department for Transport, 2017) and to identify routes used for recreational journeys (walking, cycling and horse riding), which could potentially attract people to cross the Proposed Scheme area.

5.8.29 Community resources, including rights of way, are considered to have a higher value or sensitivity where they:

- Provide essential services or employment for a large population
- Are important to groups who are considered less able to adapt to change such as the elderly, disabled and children
- Offer good opportunities for public health benefits, such as key routes for pedestrians and cyclists, or outdoor recreational resources, which are important for physical and mental wellbeing.

5.8.30 Resources are considered to experience a greater magnitude of change where the Proposed Scheme would alter the nature of the resource enough to either encourage or dissuade the use of the resource, or where it would result in permanent change to the availability of the resource.

5.8.31 Effects are considered significant where there would be an effect on health outcomes for a population as a result of effects on local community resources and opportunities. Effects could be beneficial (for example, where a new opportunity enables healthier lifestyles within a community) or adverse (for example, where access to an essential service or resource is severed by the Proposed Scheme, preventing its use by the community).

5.8.32 In the case of assessing likely significance on population health, the assessment is largely qualitative, drawing on available research. This is because of the level of uncertainty and available techniques in attributing and quantifying health outcomes to a specific impact on a determinant of health.

Constraints and limitations

5.8.33 This is a preliminary assessment carried out at a stage where the design proposals are still being developed and yet to be fully consulted on. There is currently limited information available regarding:

- Scheme design
- Traffic modelling
- Construction methods, traffic management requirements and locations of construction compounds, construction plant and materials storage areas

5.8.34 The assessment relies, in part, on data provided by third parties (for example Ordnance Survey Mapping, local authorities, Office of National Statistics and Public Health England), which are the most up-to-date data and available at the time of the assessment.

5.8.35 The final assessment, to be reported in the Environmental Statement, will draw on the results of the air quality, noise, and landscape and visual assessments being carried out for the Proposed Scheme to understand the likely extent of effects on the amenity of community and recreational resources. However, at the time of this assessment the details of those impacts are not yet available.

Potential impacts during construction

- 5.8.36 Potential impacts on population and human health during the construction phase of the Proposed Scheme would be likely to be related to:
- Temporary loss of access as a result of construction activities and the construction footprint of the Proposed Scheme
 - Temporary changes in traffic flows due to traffic management measures
 - Noise, vibration, dust and visual intrusion from the construction activities

Potential effects on land use, community and local access during construction

- 5.8.37 The potential combination of construction noise, vibration, dust and visual intrusion from construction would have the potential to cause disturbance and affect the wellbeing of local residents in adjacent communities, particularly Winnall but also potentially residents in Abbotts Barton, Headbourne Worthy, Kings Worthy, nearby farms and boarders at St Swithun's School. Potential impacts would be potentially more significant should night-time construction be required, since impacts could result in sleep disturbance and associated health issues.
- 5.8.38 There is potential for temporary disruption to pedestrian and cycle journeys near the Proposed Scheme area, particularly around the A34 and Easton Lane arms of the Junction 9 roundabout and for people seeking to access the Easton Lane Depot. This could potentially affect regular commutes into the Winnall industrial estate. Disruption to journeys could be caused by the physical footprint of construction activities affecting existing routes, or it could be as a result of traffic management creating difficult conditions on the adjacent road network. However, as identified in the baseline, no routes have been identified that currently support high numbers of active travel journeys, and therefore the potential magnitude of this impact would be unlikely to be high.
- 5.8.39 There is potential for temporary severance (the separation of residents from facilities and services they use within their community) as a result of changes in traffic flows during construction or disruption to community routes. However, owing to the Proposed Scheme being located at the edge of the Winchester settlement, it is unlikely that severance effects during construction would be severe.
- 5.8.40 A small amount of land take from the SDNP would be needed for construction of the Proposed Scheme, as well as minor land take immediately adjacent to the M3 corridor. While it is noted that the National Park is a statutory designation, and therefore of high value, it is not considered that the small amount of land take involved would have a noticeable impact on the value of the resource in terms of population and human health. Potential land take for the Proposed Scheme is not considered likely to affect the overall function and availability of resources supporting the health and wellbeing of the local community.

Potential effects on outdoor recreation and public rights of way during construction

- 5.8.41 There would likely be temporary disruption to, or loss of, physical access to the section of NCN Route 23 (including bridleway 502) and the existing shared use footway/cycleway adjacent to the southbound carriageway of the A34 within the footprint of the Proposed Scheme. Since the NCN Route 23 is part of the NCN and provides access to the National Park, this would likely be a significant effect.
- 5.8.42 The amenity of Public Rights of Way and other routes and recreational resources within study area would also be likely to be affected by noise, vibration, dust and visual intrusion. Refer to the air quality, noise, and landscape and visual assessments reported elsewhere in this PEIR for further details of the likely extent of such effects.
- 5.8.43 There is potential that the loss of amenity, and disruption to usual routes, would be enough to deter people from accessing the SDNP for outdoor recreation. There is strong evidence that direct contact with the natural world can have beneficial effects on mental health and wellbeing and the immune system. Therefore, any disruption to access to the National Park is potentially significant in terms of local health. However, there would be alternative routes, such as via Alresford Road and the South Downs Way, that would likely remain unaffected by the Proposed Scheme.

Driver stress during construction

- 5.8.44 There would be potential for driver stress caused by frustration, route uncertainty and/or fear of accidents as a result of temporary changes in traffic flows and any route diversions needed to construct the Proposed Scheme. This would potentially affect drivers on the M3 Junction 9 and wider affected highway network. Traffic data will be used to support further assessment of this issue for the forthcoming Environmental Statement.

Potential mitigation for construction impacts

- 5.8.45 Construction activities would be carried out in accordance with a CoCP. The CoCP will set out measures to reduce impacts on motor vehicle drivers and local residents during the construction period for the Proposed Scheme.
- To mitigate potential effects on local access and community severance, the CoCP would set out requirements for the contractor to liaise with the relevant local authorities regarding the management of traffic, pedestrians, cyclists and other road users when planning the works. Alternative routes and diversions for pedestrians and cyclists would be provided where construction activities did not impinge on existing routes. Appropriate signage to inform and protect pedestrians and cyclists would be provided.
 - To mitigate potential effects on driver stress, it is anticipated that the CoCP would set out requirements relating to traffic management. The contractor would likely be required to liaise with Highways England, HCC, Winchester District Council and the police to agree and implement a Traffic Management Plan. Mitigation to help reduce disruption to the highway network, where reasonable and practicable, could include the use of intelligent transport systems to implement variable speed limits, lane control and variable message signs. The contractor could also be required to provide Highways England with regular updates regarding any disruption caused by construction works on the road network.

- Residents would be informed of construction activities in advance, particularly where night-time working could be required. Any task lighting associated with the works should be directional and avoid light spill onto sensitive neighbouring land uses such as residential areas.
- Mitigation measures to address air quality (dust), visual and noise impacts associated with construction are set out in Sections 5.1, 5.3 and 5.7 respectively.

Potential impacts during operation

Potential effects on land use, community and local access during operation

- 5.8.46 It is anticipated that there would not be significant effects on land use once the Proposed Scheme was in operation (i.e. any permanent land take would have occurred during the construction phase).
- 5.8.47 It is not anticipated that there would be any significant effects on the availability of community facilities during operation.
- 5.8.48 There would be potential for improvements in opportunities for active travel and connectivity of local access as a result of the Proposed Scheme. For example, the provision of a new shared use pedestrian/cycle path proposed to be routed parallel with the A34 between Kings Worthy and Winnall. This would make active travel journeys easier between The Worthys and the employment and retail areas in Winnall.
- 5.8.49 Similarly, proposed improvements to pedestrian and cyclist provision around the M3 Junction 9 itself would make active travel journeys easier and safer for residents who live in the SDNP east of the M3, within Winnall and Winchester City Centre. This would support individuals in changing their behaviour and help people to maintain healthier lifestyles. Promotion of active travel could bring important health benefits by encouraging more physical activity (see below), but also contribute to objectives in relation to sustainability and congestion. This could in turn improve local amenity for residents and provide more opportunities for social interaction.

Potential effects on outdoor recreation and public rights of way during operation

- 5.8.50 The Proposed Scheme incorporates opportunities to improve provision for pedestrians, cyclists and potentially equestrians, when crossing the M3 Junction 9 area. It is proposed to provide an improved standard of shared use (pedestrian/cycle) route across the junction area, offering a more direct means of accessing the countryside east of the Proposed Scheme. This would replace the existing NCN Route 23 in this location.
- 5.8.51 There would also be potential improvements to the local Public Rights of Way network as part of the Proposed Scheme, for example by providing a new bridleway parallel to the eastern edge of the M3 corridor linking Easton Lane and Long Walk. The inclusion of this proposal would be potentially beneficial to horse riders by providing a recreational loop to follow.

Potential effects on population health during operation

- 5.8.52 Daily physical activity is hugely important for maintaining health, and for most people the easiest forms of physical activity are those that can be built into everyday life such as trips to places of study and work. There is also growing evidence that access to green spaces

are important for both physical and mental health. However, across the UK people who live in more deprived areas are less likely to have good access to green space. Improving equality of access to green space is thought to be important for addressing health inequalities. The Proposed Scheme would improve opportunities for active travel journeys within the study area, and also improve access to the surrounding countryside, particularly for residents of the urban areas with higher levels of deprivation on the eastern fringe of Winchester.

5.8.53 Two further pathways by which the Proposed Scheme could affect population health – through changes in air pollutant levels and noise levels for local residents. Preliminary air quality and noise modelling carried out at an earlier stage of the Proposed Scheme development suggests that air quality pollutant levels would increase in some areas and decrease in others (including within Winchester city centre), but that the degree of change expected would not be significant. Noise levels would generally increase, but the degree of change would be relatively small. Updated air quality and noise modelling for the Proposed Scheme will be completed to support the Environmental Statement, and this will be used to carry out further assessment of the potential impact of these aspects of population health.

Driver stress

5.8.54 The intention of the Proposed Scheme is to relieve congestion through M3 Junction 9 and the Proposed Scheme design has been developed to this end. Therefore, it is anticipated that the Proposed Scheme would reduce driver stress for people using routes within the study area.

Potential mitigation for operational impacts

5.8.55 The following measures would help reduce or avoid adverse impacts on local communities:

- Use of best practice design concerning safety of pedestrians and cyclists, including appropriate lighting, would improve the amenity of users of the footpaths in the surrounding areas. Additionally, landscaping providing screening of the road where possible and reduce noise level for the wider network of Public Rights of Way would also improve amenity for people.
- Existing footways, cycleways and Public Rights of Way may be retained where practicable, and where appropriate, enhanced to address past severance and prevent potential new severance. Types of access could also be considered, for example, by not introducing new barriers such as stiles to Public Rights of Way, which could restrict certain users.
- Existing roads could be incorporated into the Proposed Scheme, allowing for crossing points within the design to help avoid community severance.

Summary

5.8.56 In summary, the preliminary baseline assessment of population and human health issues considered to be relevant the Proposed Scheme are:

- A local resident population with higher than average rates of respiratory issues, meaning the population is potentially more susceptible to effects of air pollution

- Residents within the Winnall neighbourhood who are relatively deprived compared to neighbouring communities, and with potentially fewer means to cope with changes in the area and a higher likelihood to experience poorer health outcomes
- Poor provision for potential active travel journeys, particularly between The Worthys and Winnall industrial estate, suppressing the number of local journeys that can be done by sustainable and active modes
- Poor access between Winchester and the SDNP east of the M3 corridor due to inconvenient crossing points with low amenity, which could discourage residents from accessing the countryside and participating in outdoor recreation

5.8.57 During construction, there would likely be some short term, temporary disruption to access along routes used by pedestrians and cyclists for either active travel or recreational purposes. However, during operation the Proposed Scheme would be likely to improve connectivity and opportunity for pedestrians and cyclists for either active travel or recreational purposes and therefore contribute to health benefits and improve amenity in the local community. In particular, the quality of route along NCN Route 23 and access into the SDNP would be likely to be improved and therefore encourage more use.

5.8.58 The Proposed Scheme would be likely to have beneficial effects in relation to the key baseline issues identified above.

5.8.59 It is anticipated that there would be some disruption to traffic flows during construction which would be likely to increase driver stress for people using the M3 Junction 9 and the surrounding local highway network on a temporary basis. Once constructed, improved design standards and reduced congestion would be likely to reduce driver stress.

5.9 Road Drainage and the Water Environment

- 5.9.1 This section of the report provides a description of the existing road drainage and water environment and the potential effects of the Proposed Scheme during the construction and operation phases. This encompasses the potential for flood risk, geomorphology (including the Water Framework Directive (WFD)), water quality and groundwater impacts associated with the Proposed Scheme. This is a preliminary assessment based on existing studies.
- 5.9.2 The overall study area includes a 500 metres buffer surrounding the maximum Proposed Scheme area. This buffer is considered a suitable extent to assess direct potential impacts as well as encompassing indirect pathways, such as the migration of surface-borne pollutants, and the effects of any prolonged interception of groundwater flows. The study area encompasses surface water and groundwater features and associated uses, located up to a distance of approximately 1 kilometre from the site. This is considered to be in hydraulic connectivity with the Proposed Scheme, to assess potential indirect impacts (Figure 5-9-1).
- 5.9.3 During the EIA process, these potential impacts will be further assessed in more detail and reported on in the road drainage and water environment chapter of the Environmental Statement. Separate parallel assessments will be completed in the WFD, Flood, Groundwater and Piling Risk Assessments which will be appended to the Environmental Statement with the main findings summarised within the road drainage and water environment chapter. The WFD Assessment will determine compliance with the legislation, and the Flood Risk Assessment will seek to demonstrate compliance with the requirements of the NPPF (Ministry of Housing, Communities and Local Government, 2019). The Groundwater and Piling Risk Assessments will seek to demonstrate that the scheme has no significant impact to groundwater quality.
- 5.9.4 A summary of policies relevant to road drainage and the water environment is included in Part 9 of this PEIR. In addition, this PEIR has been informed by consultation and meetings with the Environment Agency on the 12 July 2018 and 16 July 2018. Consultations with the Environment Agency are ongoing, and the next proposed meeting is on 13th June 2019.

Existing and baseline knowledge

Surface water features

- 5.9.5 The study area for the Proposed Scheme crosses the River Itchen at three locations: along the A34, A33 and M3. It also crosses one of the River Itchen's tributaries, the Nun's Walk Stream along the A34.
- 5.9.6 The River Itchen and the Nun's Walk Stream are classified as 'Main Rivers' and therefore regulated by the Environment Agency. The River Itchen also has a separate arm called the Itchen Navigation. This arm has been heavily modified and forms part of the floodplain of the Itchen.
- 5.9.7 The River Itchen flows in a south-westerly direction and comprises several tributary channels and land drains. There are also numerous ditches, ponds, wetlands and ordinary watercourses associated with its floodplain. Figure 5-9-1 and Figure 5-9-2 provides a summary of the key water features.

- 5.9.8 The surface water bodies within the study area support several services, including biodiversity, recreation (including angling), abstraction and numerous discharges. The biodiversity attributes of the surface water environment are described in Section 5.4, recreation in Section 5.8, and abstraction and receipt of discharges in this section of the report. The River Itchen floodplain is anticipated to protect more than 100 properties in Winchester and Kings Worthy from flooding.
- 5.9.9 The River Itchen catchment area has European and National designations, namely the River Itchen SAC and the River Itchen SSSI, both of which are sited within the study area. The River Itchen floodplain forms part of the River Itchen SSSI. Much of the floodplain is designated as Lowland Fen wetland priority habitat.

Geomorphology and surface water WFD status

- 5.9.10 The River Itchen is a baseflow-dominated chalk stream, fed by three major tributaries in its upper reaches: the Candover Stream, River Alre and Cheriton Stream. The River Itchen catchment has undergone significant modification over centuries (including the construction of the Itchen Navigation which was completed in 1710), which has had a lasting impact on the fluvial geomorphology of the river. Modifications include re-alignment and/or deepening for land drainage and the construction of a variety of sluices and artificial channels for navigation, milling and to feed water meadows. Notwithstanding, the river mainly retains the chalk stream geomorphological characteristics (low energy, high width to depth ratio, gravel bed with abundant macrophyte growth) and water quality characteristics required to support the features for which it is designated.
- 5.9.11 The quality of the River Itchen and Nun's Walk Stream is monitored by the Environment Agency compared with the objectives of the WFD. The current WFD classifications for the 2016 Cycle 2 are Good for overall quality, ecological quality and chemical quality. The Itchen Navigation is heavily modified and is classed at Good Ecological Potential.

Surface water quality and pollution incidents

- 5.9.12 Surface water quality has, to date, been defined in this study using available records published by the Environment Agency in relation to WFD status of surface water bodies. Surface water monitoring will be carried out as part of further site investigations. The data on pollution will be obtained from the Environment Agency Pollution Incident Database.

Surface water abstractions and discharges

- 5.9.13 The Environment Agency have confirmed that there are no licensed surface water abstractions within 1 kilometre of the study area. Enquiries have been made to Winchester City Council to confirm the presence of unlicensed private supplies. Winchester City Council has confirmed that there are no registered private unlicensed surface water supplies within the study area. However, there is no obligation to register private water supplies with Winchester City Council and therefore, unregistered private surface water supplies may be present.

Groundwater units and groundwater WFD status

- 5.9.14 Superficial Deposits are associated with the River Itchen. The Alluvium and River Terrace Deposits are classified as a Secondary A aquifer by the Environment Agency. For further information, see Section 5.5. A Secondary A aquifer is defined as permeable layers of rock capable of supporting water supplies at a local rather than strategic scale, and in

some cases forming an important source of baseflow to rivers. Head Deposits are also present and are classified as a Secondary aquifer (undifferentiated). The Proposed Scheme is underlain by the Seaford and Lewes Chalk formations and classified as Principal aquifers. A Principal aquifer is defined by the British Geological Survey as:

“...layers of rock or drift deposits that have high intergranular and/or fracture permeability, meaning they usually provide a high level of water storage. These layers of rock or drift deposits could support water supply and/or river base flow on a strategic scale”.

5.9.15 Potential point sources of pollution including landfills are presented in Section 5.5.

5.9.16 The WFD groundwater body underlying the Proposed Scheme is the River Itchen Chalk (ID GB40701G505000). The current WFD classification for the 2016 Cycle 2 is Poor for overall quality, quantitative quality and chemical quality. The reasons for the River Itchen Chalk achieving a Poor status include local agriculture and rural land management practices, and local water industry practices.

Groundwater levels

5.9.17 Provisional results from the 2019 Ground Investigation (GI) indicates that groundwater is at some depth below the proposed cuttings and underground structures (up to 18 metres Below Ground Level in the vicinity of Junction 9 of the M3).

5.9.18 Long term regional groundwater water level monitoring information provided by the Environment Agency from October 1959 to October 2018 indicates seasonal groundwater water level fluctuations in the vicinity of the scheme are in the order of 2 to 3 metres. This has yet to be confirmed by long term groundwater monitoring to be undertaken as part of the 2019 GI.

5.9.19 Regional groundwater levels have been provided by the Environment Agency for 2014. These suggest a regional groundwater flow direction from the northeast to the southwest, falling from approximately 50 to 35 metres Above Ordnance Datum across the site. The groundwater contours indicate that the River Itchen is a gaining river, receiving inflows from groundwater. Groundwater levels immediately adjacent to the River Itchen are generally within 2 metres of the surface. Therefore, the local groundwater is likely to be connected (either directly or indirectly) to surface water courses within the River Itchen valley and changes to quality and level beneath the Proposed Scheme area could influence the surface water bodies.

Groundwater vulnerability and quality

5.9.20 The Proposed Scheme lies within a groundwater vulnerability classification zone of ‘High’. These areas are typically vulnerable and easily able to transmit pollution to groundwater. They are characterised by high leaching soils and the absence of low permeability superficial deposits.

5.9.21 Some background water quality has been provided by the Environment Agency for the Easton SPZ. For the period 25th October 2010 to 17th July 2018, average concentrations of copper (5.5µg/l), zinc (8.3µg/l), total hardness as CaCO₃ (312mg/l) and in-situ pH measurements (7.4) have been reported. There is no information on polyaromatic hydrocarbons (PAHs), a key contaminant from road drainage.

Groundwater utilisation

5.9.22 Groundwater users could be particularly vulnerable to any disruptions of groundwater flow, provision and quality, and therefore need to be considered in the assessment of impacts due to the Proposed Scheme. A summary of groundwater utilisation from the H5IT Itchen Chalk Unit is included in Table 5-33.

Table 5-33 Summary of groundwater utilisation

Groundwater Utilisation	Description
Public supply wells	There are three Southern Water Services Ltd public supply wells located at Easton adjacent to the M3 (water well locations marked on Figure 5-9-1 are approximate). These public supply wells are protected by an SPZ. SPZ 1 (inner zone) and SPZ 2 (outer zone) bisect the M3. SPZ 1 is the most sensitive of these protective areas and indicates the zone in which contamination released to the ground could reach the point of abstraction within 50 days. SPZ 2 similarly defines a travel time of 400 days. Typically discharges of road drainage should be outside SPZ 1 and should be avoided within SPZ 2. The SPZs are shown on Figure 5-9-2.
Licensed abstractions (excluding public supply wells)	There are four licensed groundwater abstractions near the Proposed Scheme including for: <ul style="list-style-type: none"> • Spray irrigation at Winnall Down Farm, approximately 800m to the east of the M3 • Aquaculture for watercress beds, six water wells located from 282m to 306m to the west of the A34. Since these abstraction wells are used for commercial food production (and not solely for the irrigation of crops), they are also protected by an SPZ. SPZ 1 (inner zone) bisects the A34. Typically, discharges of road drainage should be outside SPZ 1 • General farming and domestic use at Upper Farm, two water wells located 438m and 393m west of the A34 and one water well located 556m to the southeast of the satellite compound (but outside the 1 kilometre study area for the Proposed Scheme) • Fish aquaculture, approximately 1 kilometre to the southwest of the M3
Private unlicensed abstractions	Private unlicensed groundwater abstractions comprise those for quantities of less than 20m ³ per day. There is no obligation to register private water supplies, but available records have been obtained from Winchester City Council. There are three registered unlicensed private groundwater abstractions each of which is protected by SPZ1 and SPZ2 of 50m and 250m radius respectively within 1 kilometre of the study: <ul style="list-style-type: none"> • Mansard House which serves 14 people (2.8m³/d); This is located 114m east of the Junction 9 of the M3; • Lower Chilcomb Farm House which serves 2 people (0.4m³/d). This is located 643m east of Junction 10 of the M3; and • Burntwood Farm which serves 30 people (5m³/d). This is located 1050m north-west of the most northerly part of the red line boundary on the M3 (the SPZ falls within the 1 kilometre study area). <p>However, unregistered private groundwater supplies may also be present.</p>
Consented discharges to Ground	There are no consented discharges to groundwater in the study area.

Proposed works impacting SPZs and liaison with abstractors

5.9.23 The proposed works affecting the three SPZs impacted by the Proposed Scheme are summarised in Table 5-34. It should be noted that the Proposed Scheme design is still under development and so the summary below is reflective of the design at the time of writing the PEIR.

Table 5-34 Summary of works proposed in each SPZ

Groundwater SPZ	Summary of Proposed Works in Each SPZ
Easton public supply wells	<p>From southwest to northeast:</p> <ul style="list-style-type: none"> • 200m road construction (re-grading to meet levels) on the existing alignment, directional signs and signals. • re-surfacing, directional signs and signals for the remainder of the M3 bisecting the SPZ (i.e. most of its length). Signage will include two new gantry locations in SPZ1. It is anticipated that these structures will be piled (bored piles) to a depth of 10 to 12m with a small cut and fill to construct. • part of the access track to the proposed attenuation pond will fall within the SPZ. Construction would require an amount of excavation but as works will be minimal, there will not be a requirement for haul routes and site compound in the SPZ. Worst case, the track would comprise permeable paving to help drainage (it is too early in the design process to have fixed the design). <p>There are no new drainage works proposed in the SPZ. There are no construction compounds and material stockpiles in the SPZ. Also, with the current design it is not expected there will be a requirement to divert services in the SPZ.</p>
Watercress Company licensed abstractions for aquaculture (watercress production)	Re-surfacing and habitat enhancement along the road verges (environmental mitigation works).
Mansard House Private unlicensed groundwater abstraction	New road construction (on an embankment), directional signs and signals, and drainage provisions within SPZ2. Cuttings on boundary of SPZ2.

5.9.24 Liaison has commenced with Southern Water regarding the impacts of the scheme on the Easton Source Protection Zone (SPZ) where piling is currently proposed for new gantry locations. Liaison will also be commenced with the Watercress Company and the private unlicensed groundwater supply at Mansard House.

Fluvial flood risk

5.9.25 The northern and western parts of the study area, particularly the A34 Winchester Bypass and M3 north of Long Walk, extend into an area designated as Flood Zone 3 – an area with a 1% (1 in 100 year) Annual Exceedance Probability (AEP) risk or greater of fluvial flooding associated with the River Itchen and its tributaries, as given by the Environment Agency Flood Map for Planning (EA, 2019). There are designated Flood Zone 2 areas – risk between a 0.1% (1 in 1,000 year) and 1% (1 in 100 year) AEP of fluvial flooding – that extend beyond the Flood Zone 3 extent, mainly in areas along the A34 Winchester Bypass and M3 north of Long Walk and to the west of the Proposed Scheme (refer to Figure 5-9-1).

5.9.26 The remainder of the study area is situated within Flood Zone 1 – it has less than 0.1% (1 in 1,000 year) AEP risk of flooding.

5.9.27 It is anticipated that climate change would cause these flood zones to increase in area in the future. This will be further investigated as part of later assessment stages.

Surface water (pluvial) flood risk

- 5.9.28 The Risk of Flooding from Surface Water (RoFSW) map (EA, 2018a) details that the study area is mainly within an area at very low risk, less than 0.1% (1 in 1,000 year) AEP, of surface water flooding, as detailed in Figure 5-9-3.
- 5.9.29 The RoFSW map identifies those parts of the M3 and slip roads at Junction 9 that have a high, greater than 3.3% (1 in 30 year) AEP, surface water flood risk. The RoFSW mapping also identifies that there are several overland flow routes and isolated areas of ponding within the study area with a high to low risk of surface water flooding, i.e. between 0.1% (1 in 1,000 year) and 1% (1 in 100 year) AEP. These areas of flood risk are generally associated with topographic depressions within the fields to the east or where existing infrastructure (highways and residential development) causes an obstruction to natural overland flow paths.
- 5.9.30 There are several low-lying areas adjacent to watercourses to the west of the Proposed Scheme also shown to be at risk of surface water flooding. The risks associated with these areas are captured in the 'Fluvial Flood Risk' section above.

Groundwater flood risk

- 5.9.31 The SDNPA Water Cycle Study and Strategic Flood Risk Assessment Level 1 (Amec, 2015) Groundwater Flood Risk Map indicates a variable susceptibility to groundwater flooding within the study area. The level of risk ranges from high (>75%) based on a 1 kilometre square grid area to low (25–50%) flood risk from south (M3/A34 crossing) to the north of the Proposed Scheme. There are areas identified to be at high susceptibility to groundwater flooding to the southwest and northeast of the Proposed Scheme. The areas of greatest susceptibility are generally those near the River Itchen and its tributaries.
- 5.9.32 Winchester City Council's Strategic Flood Risk Assessment (Halcrow, 2007) indicates that the underlying chalk combined with a high-water table increases susceptibility to groundwater flooding. The Strategic Flood Risk Assessment details that flooding from a combination of sources including groundwater in Winchester. However, there are no records in the Strategic Flood Risk Assessment of flooding occurring from groundwater only.
- 5.9.33 The current data indicate a risk of groundwater flooding in the Winchester area. The Hampshire Groundwater Management Plan (HCC, 2013a) identified areas throughout the county at risk of groundwater flooding. Kings Worthy village, located north of the A34, showed a significant history of groundwater flooding (21 properties flooded in 2000/2001) and continued susceptibility to this flood risk.
- 5.9.34 HCC has provided groundwater level contours (HCC, 2015) taken during a period of high groundwater level during the Spring of 2014. The groundwater level contours cover the entire extent of the study area. The approximate depth to groundwater at the time was less than 5 metres below ground level. These areas are mainly located within designated Flood Zones 3 and 2.

Historic flood events

- 5.9.35 A review of the Environment Agency's Historic Flood Map (EA, 2018b) identifies the maximum extent of recorded flood outlines from the rivers, sea and groundwater springs. A review of the map identifies no recorded historic flood events within the study area.

5.9.36 Winchester City Council Strategic Flood Risk Assessment (Halcrow, 2007) identifies historic flood records dating from 1997 to 2006 within the area of Winchester. The source of flooding is identified to be a combination of groundwater, fluvial flooding and foul/combined systems. The nearest recorded flood report to the Proposed Scheme is approximately 750 metres southwest on Wales Street; flooding is reported to have occurred as a result of sewer flooding at this location.

Other flood sources

5.9.37 The Environment Agency's Risk of Flooding from Reservoirs (EA, 2017) mapping gives an indication of the areas at risk of flooding due to reservoir failure. The northern extent of the study area is identified to be at risk of flooding, likely to be in the event of failure of Old Alresford Pond. The mapped reservoir flood extents are shown to be similar to the fluvial flood extents associated with the River Itchen.

5.9.38 The Environment Agency's Flood Map for Planning (EA, 2019) highlights that there are no areas benefiting from flood defences near the Proposed Scheme. There could be informal flood defences nearby that will need to be further investigated as part of the later assessment stages. It is understood that as part of the second phase of the Winchester Flood Relief Scheme, a joint endeavour by Winchester City Council and the Environment Agency, there will be new flood defences around Durngate Bridge, the Trinity Centre and Durngate Terrace. The scheme will include three new sluice gates to enhance flood protection in the area and it is also understood that these will better enable the control of water levels on Winnall Moors. It is not anticipated that these works will affect the Proposed Scheme.

5.9.39 The Proposed Scheme is not located within an area at risk of tidal flooding.

Existing highways drainage

5.9.40 The Highways Agency Drainage Data Management System has Priority Asset Registers identifying existing outfalls, culverts and soakaways that potentially pose a risk of pollution or flooding. At the time of writing, there are 16 priority outfalls from the Highways England network to the River Itchen catchment within the Proposed Scheme area and numerous soakaway chambers and soakaway trenches. The database also identifies four surface water priority culverts. The risk posed by these existing drainage assets will be considered within the overall assessment. The assets that have been assessed in detail in the Highways Agency Drainage Data Management System are stated to pose an overall low to no risk, except one outfall along the M3 north of Long Walk that has a high overall status.

Value of receptors

5.9.41 An initial assessment of the importance (sensitivity) of the water environment including consideration of flood risk, geomorphology (and WFD), water quality and groundwater has been made using desk-based information. The receptors have been assigned a sensitivity attribute based on DMRB simple assessment guidelines and professional judgement (Table 5-35). Table A4.3 in Highways England (2009) defines the values and sensitivity classification used to assess importance of the receptors identified for the Proposed Scheme. It should be noted that the importance values of the receptors are subject to change following more detailed assessment and consultation with the relevant authorities.

Table 5-35 Importance of water environment attributes

Importance	Definition of importance from DMRB	Examples within the study area
Very high	Attribute has a high quality and rarity on regional or national scale	Flood Risk: None identified Geomorphology: None identified Surface water and groundwater quality: Principal aquifer sections with substantial contribution to the SAC
High	Attribute has a high quality and rarity on a local scale	Flood risk: River Itchen and Nun Walk's Stream floodplain – estimated as being between 1 and 100 properties within the floodplain. Geomorphology: River Itchen and Itchen Navigation – Good status under WFD Surface water and groundwater quality: Principal aquifers, providing locally important resource
Medium	Attribute has a medium quality and rarity on local scale	Flood risk: None identified Geomorphology: None identified Surface water and groundwater quality: Secondary aquifers
Low	Attribute has a low quality and rarity on local scale	Flood risk: Floodplain to the north of Proposed Scheme area within SDNP (floodplain with limited constraints and low probability of flooding property) Geomorphology: None identified Surface water and groundwater quality: None identified

Methodology

- 5.9.42 The road drainage and water environment impacts of the Proposed Scheme will be assessed using Highways England's DMRB Volume 11, Section 2, Part 5 Environmental Impact Assessment (HA208/08) and technical guidance provided in the DMRB Volume 11, Section 3, Part 10 (HD 45/09): Road Drainage and the Water Environment (Highways Agency, 2009) (hereafter referred to as HD 45/09). This will include the use of the Highways England (formerly Highways Agency) Water Risk Assessment Tool (HAWRAT) as one of the indicators of the likely impacts associated with routine runoff. The methodology for the Environmental Impact Assessment is set out in detail in the Scoping Report (Highways England, 2019).
- 5.9.43 The Flood Risk Assessment will be carried out in accordance with the requirements of the NPPF and its accompanying Technical Guidance, and the Environment Agency Climate change allowances for planners NPPF supporting guidance.
- 5.9.44 A preliminary WFD assessment will be carried out alongside the Environmental Statement, to establish the potential for effects on WFD status and the need for a full WFD assessment. The WFD assessment will be carried out in accordance with the Environment Agency (2010) documents 'Assessing modifications for compliance with WFD' and its accompanying Detailed Supplementary Guidance note (EA, 2011). The results of the HD 45/09 groundwater, surface water and spillage risk assessments will inform the WFD assessment.

Proposed site investigation

5.9.45 Further ground investigations and continuous groundwater level monitoring will be carried out in several borehole locations across the Proposed Scheme area to gain a clear understanding of baseline groundwater levels and fluctuations. The ground investigation will include:

- Groundwater levels and (where possible) seasonal variations along the route
- Predicted drawdown from the three proposed cuttings, underground and subway; groundwater flow into the River Itchen SSSI by examining groundwater levels in underlying strata
- Impacts of new soakaways and trenches on the existing groundwater regime
- Infiltration rates for proposed SuDS features using infiltration test results of soils

Constraints and limitations

5.9.46 No bespoke surveys have been carried out before this PEIR. The effectiveness of the drainage design will need to be informed by the outcome of further baseline surveys, information and assessments. This will include assessment of the risk associated with both construction and operation of the Proposed Scheme and will define baseline monitoring requirements during construction to determine efficacy of mitigation measures.

5.9.47 The assessment of potential impacts of the Proposed Scheme during construction and operation and potential mitigation measures has been based on currently available data and professional judgement. This assessment is ongoing and subject to change through ongoing development of the Proposed Scheme.

Potential impacts during construction

5.9.48 Hydraulic modelling of the River Itchen has been carried out by Peter Brett Associates in 2003, the extent of which is given as the 1% (1 in 100 year) AEP extent, as detailed in Figure 5-9-1. In 2018, the Environment Agency approved the model for use on the Proposed Scheme and confirmed no requirement for further modelling. However, it must be noted that the Hydraulic Modelling Report (Peter Brett Associates, 2003) details that *“the model may not be representative at an individual site location and if more detailed assessments are required it is recommended that additional calibration data be collected”*.

5.9.49 The proposed construction area and the works to be completed are detailed in Part 2. Without considering any form of mitigation, the construction of the Proposed Scheme would have the potential to impact on the water environment as follows:

- Mobilisation of sediments, particularly during earthworks and high rainfall events and inadvertent discharge to the River Itchen, Nun’s Walk Stream
- Disruption of groundwater or surface water flows in areas where excavations were proposed (e.g. road cuttings and attenuation pond) and new filter drains and soakaways to be installed
- The risk that construction works such as deep excavations and piling could create new pathways for contaminants to migrate into water receptors
- The potential for pollution in surface water runoff or from on-site spills by sediment and polluting substances. During the construction phase, the risks are primarily

posed by materials being stored on site, e.g. oils, fuels, lubricants, cement from construction plant

- Pollution of groundwater bodies could occur from polluted surface waters being discharged to ground. There is also the potential for pollutants to enter the watercourse through this pathway
- Impacting the SPZ surrounding the Easton public water supply (piling of new road gantries), Watercress Company which is used for aquaculture (watercress production), and the private unlicensed groundwater supply at Mansard House
- The integrity of the water-dependent nature conservation sites could be impacted. While the water balance would be likely to be dominated by fluvial flows supported by regional groundwater inputs, the importance of local groundwater inflow is not well understood. Therefore, local drawdown in the aquifer or changes to groundwater recharge could result in reduced baseflow, potentially affecting surface water characteristics
- Any construction activities taking place within the floodplain could result in a loss of floodplain storage
- Temporary introduction of impermeable surfaces due to haul routes and temporary construction compounds could result in increased runoff and increased risk of surface water flooding. Interception of overland flows through the introduction of impervious structures and the movement and storage of earth materials within the study area could potentially disrupt local flow routes and increase surface water flood risk
- Potential blockage of drainage systems with construction debris, potentially resulting in overflowing drains and increased surface water flood risk

Potential mitigation for construction impacts

- 5.9.50 A ground investigation, hydrogeological and piling risk assessment will be required to determine risk to water features. Construction groundwater control measures will be designed to reduce changes to the existing regime. It is likely that Natural England and Environment Agency will require approval of method statements before the works progress. The works could themselves be classed as a flood risk activity and require a flood risk permit under the Environmental Permitting (England and Wales) Regulations. Land drainage consents could also be required for works near ordinary watercourses and dewatering during construction could require an environmental permit.
- 5.9.51 During the construction process, best practice would be followed to address the potential construction phase impacts. Best practice guidance is set out in the now withdrawn Pollution Prevention Guidelines (2015) and replacement series, Guidance for Pollution Prevention (NetRegs, 2019). Mitigation will be clearly set out in a CoCP. These will include an array of techniques, including locating key pollution sources as far away as possible from receptors such as water bodies; providing spill kits; bunding and/or provision of storage facilities with impervious walls and floors installed around oil, fuel and chemical tanks at least 110% of the volume of the protected tank; implementing dust suppression measures; reducing exposed unvegetated surfaces; and providing wheel wash facilities.
- 5.9.52 Site work areas would be located outside of the floodplain where possible. Where this is not possible, temporary floodplain compensation could be required to offset storage losses. At the time of writing, no construction works are proposed within the floodplain. As

such, it is not expected that any mitigation addressing the loss of floodplain storage would be required.

- 5.9.53 Site drainage would be programmed early in the construction sequence, so that any runoff from the site could be intercepted and controlled. This would include early construction of the proposed mitigation measures determined in the next phases of work. Best practice construction measures would be adopted in line with the Considerate Contractors Scheme and the SuDS Manual (C753) (CIRIA, 2015) to reduce the risk of flooding during construction.
- 5.9.54 Most impacts during construction would be likely to be neutral with appropriate mitigation measures in place.

Potential impacts during operation

- 5.9.55 The Proposed Scheme is intended to improve traffic flow within the area and would result in a greater area of impermeable surfaces than presently exists. This could lead to an increase in the pollutant load and surface water runoff, which would ultimately be discharged either to groundwater or the River Itchen depending on the means of drainage.
- 5.9.56 Road drainage presents the risk of contaminated road runoff being discharged to the receiving water environment and causing long-term effects on groundwater levels and surface water discharged to the River Itchen. Groundwater pollution from highway drainage would also have potential to contaminate the chalk aquifer groundwater quality and water supply wells. Occurrence of effects depends on several contributory factors, such as the size of the area of paved surfaces in the highway, volume and composition of the traffic using the road and the amount of water in the receiving water body. These risks and any potential impacts will be confirmed in the ES.
- 5.9.57 Without mitigation, the introduction of permanent impermeable surfacing would have the potential to increase runoff rates, intercept existing flow paths and result in an increase in surface water flood risk.
- 5.9.58 Loss of floodplain storage due to infrastructure located within the floodplain of the River Itchen could result in increased flood risk. At the time of writing, there are no structures proposed within the floodplain.

Potential mitigation for operational impacts

- 5.9.59 Discharge to groundwater is expected to be the main potential drainage mechanism. A mixture of concrete surface water channels, gullies and combined kerb drainage units would be used for edge-of-carriageway surface water collection. The surface water would then be directed to a mixture of infiltration trenches and catchpits and soakaways. Any discharge to surface water bodies would ultimately be received by the River Itchen.
- 5.9.60 The Proposed Scheme would discharge some of the runoff generated via a new attenuation pond (i.e. a pond used for the collection of runoff water). Flows would be attenuated to not exceed rates equivalent to runoff from greenfield areas.
- 5.9.61 Sediment and pollutants associated with highway runoff will be assessed via water quality and spillage risk assessments in line with the latest Highways England guidance set out in HD 45/09. With respect to routine road runoff discharging to the river, preliminary analysis using Method A, and the analysis carried out under the priority outfalls programme,

suggests that even under conditions of low flow the dilution effects of the River Itchen are such that any impacts on surface water quality would be likely to be negligible. Method C will be used to help identify the likely scale of the risks to groundwater and to identify the need for a more detailed groundwater risk assessment. Initial groundwater risk assessments would suggest that the risk to groundwater from highway runoff is low. Method D of HD 45/09 will be used to undertake assessments for spillages (both for outfalls and discharges to ground). Again, preliminary analysis suggests there is a low risk of spillage to the drainage network and receiving waters. Following these assessments, appropriate risk-based mitigation measures would be implemented to meet environmental and WFD requirements. At this stage, it is too early to state what mitigation measures would need to be implemented. The mitigation would be reviewed as part of the EIA. The drainage design would be developed in line with current DMRB guidance and agreement would be sought with the Environment Agency and Natural England at the time.

- 5.9.62 Structures will be designed to be outside the floodplain where possible. Where this is not possible, open span structures will be considered to reduce effects. Floodplain compensation could be required to offset floodplain losses. However, it is not expected that this would be necessary as, at the time of writing, no structures are proposed within the floodplain.
- 5.9.63 Mitigation for the effects of increased surface water flood risk will be managed by implementing a robust Surface Water Drainage Strategy. The strategy will be designed to make sure that discharge from the Proposed Scheme does not increase flood risk elsewhere up to and including the 1% AEP rainfall event. This will include allowances for climate change as detailed in the Environment Agency's Flood risk assessments: climate change allowances (EA, 2018c). Surface water from the new high catchment area will be designed in accordance with the drainage hierarchy to make sure that surface water is managed as close to its source as possible.
- 5.9.64 The Proposed Scheme could provide an opportunity to improve the existing system and reduce existing flood risk. Multi-stage proposals that maximise passive treatment through the use of SuDS will be considered.
- 5.9.65 As discussed previously, groundwater contours and groundwater investigation will inform the assessment of groundwater flood risk during both construction and operation phases of the Proposed Scheme, and this will be a focus within the Flood Risk Assessment. To improve, or at least maintain, the current flood risk, the Surface Water Drainage Strategy will attempt to maintain the current groundwater levels by replicating the current location and discharge rates into existing soakaways.
- 5.9.66 Most operational impacts would be neutral or beneficial, for example through improvements in existing drainage.

Summary

- 5.9.67 Based on current information, it is anticipated that the Proposed Scheme will be designed to avoid any increase in flood risk, avoid a change in the quality of water being discharged, reduce any impact to water-dependent nature conservation sites and reduce the risk from pollution incidents.

5.10 Climate

- 5.10.1 Climate is a consideration in any development proposal involving significant changes in GHG emissions. The Proposed Scheme aims to develop a comprehensive package of improvements, including the introduction of free-flow movements between the M3 and A34 at Junction 9. These improvements would cause changes to GHGs emitted as a result of the alteration in vehicle traffic emissions and the constructions activities related with the Proposed Scheme. Climate is also a consideration in any development proposal because of the vulnerability imposed by the climate change (ASC, 2016).
- 5.10.2 A 'simple' climate assessment has been carried out at the option selection stage to establish the potential effects of the Proposed Scheme on GHG emissions and assess its vulnerability to climate change, with regard to several different design options. The preliminary design assessment will include the updated GHG emissions, as a result of new traffic data incorporated into the regional air quality section and updated information regarding the construction and materials to be used. A more detailed assessment of the vulnerability of the Proposed Scheme to climate change will also be included within the preliminary design assessment as more detailed design information will be available by this time.
- 5.10.3 While the updated traffic and construction data (on which the preliminary design air quality and materials assessments will be based to provide input for the climate assessment) are not yet available, this section summarizes the available information regarding current climate (baseline) and future climate (projections) at the location of the Proposed Scheme. Additionally, the outcomes of the option selection assessment are referenced regarding the GHG emissions from the Proposed Scheme and its vulnerability to climate change.

Existing and baseline knowledge

- 5.10.4 The Climate Change Risk Assessment Evidence Report (ASC, 2016) identifies that future changes in climate in the UK will likely include the following:
- Increases in average temperature
 - Increases in average rainfall
 - Increases in the frequency of hot periods
 - Increases in the frequency of periods of heavy rainfall
- 5.10.5 The UK Climate Projections (UKCP) is a climate analysis tool that forms part of the Met Office Hadley Centre Climate Programme which is supported by the Department of Business, Energy and Industrial Strategy and Defra. The aim of the UKCP is to provide information across the UK about possible climate changes that could be expected in the future. The UKCP18, which is the most recent version of the climate projections, is used here.
- 5.10.6 Due to uncertainties in predicting exactly how much GHG emissions will be generated in the future, four future GHG emission scenarios have been developed. The scenarios are based on different assumptions relating to socio-economic development and technological change, developed by the Intergovernmental Panel on Climate Change. The four

scenarios are named Representative Concentration Pathway (RCP) 2.5, 4.5, 6.5 and 8.5.³ RCP 2.5 represents the future scenario under which lowest GHG emissions occur and RCP 8.5 the highest, with RCP 4.5 and RCP 6.5 intermediate between these two scenarios.

5.10.7 Table 5-36 presents the baseline temperature and precipitation metrics for the location of the Proposed Scheme, based on the most recent complete climatological normal (i.e. 1960–1990). The same metrics are presented for the future climate (UKCP18 – 50% probability) for each emission scenario, for each 30-year period (i.e. 2020s (2010 – 2039), 2050s (2040 – 2069) and 2080s (2070 – 2099)), for a 25km² gridded area centred on the Proposed Scheme, in line with the latest Highways England guidance.

³ RCP is an abbreviation for Representative Concentration Pathway, and the number following the letters RCP corresponds to a total radiative forcing value in the year 2100 (i.e. 2.6, 4.5, 6.0 or 8.5 Watts/m²).

Table 5-36 Current and future climate data for the study area

Climate metrics	Current Climate (1961–1990) ¹ (°C for temperature data, mm/day for precipitation data)	UKCP18 projected future climate change (°C for temperature data, % change for precipitation data)											
		2020s (2010–2039)				2050s (2040–2069)				2080s (2070–2099)			
		RCP 2.6	RCP 4.5	RCP 6.5	RCP 8.5	RCP 2.6	RCP 4.5	RCP 6.5	RCP 8.5	RCP 2.6	RCP 4.5	RCP 6.5	RCP 8.5
Winter													
Mean temperature change	4.1	0.9	0.9	0.9	1	1.3	1.6	1.5	2	1.4	2.2	2.5	3.4
Minimum temperature change	-	1	0.9	0.9	1	1.4	1.6	1.6	2.1	1.5	2.3	2.6	3.5
Maximum temperature change	-	0.9	0.9	0.9	1	1.2	1.5	1.4	1.9	1.4	2.1	2.4	3.3
Mean precipitation change	2.6	7	7	7	7	9	10	9	13	10	16	17	24
Summer													
Mean temperature change	15.6	1.5	1.3	1.2	1.4	2.1	2.2	2.1	3	2.3	3.6	4	5.6
Minimum temperature change	-	1.4	1.2	1.1	1.3	1.9	2.1	2	2.8	2.1	3.3	3.7	5.1

Climate metrics	Current Climate (1961–1990) ¹ (°C for temperature data, mm/day for precipitation data)	UKCP18 projected future climate change (°C for temperature data, % change for precipitation data)											
		2020s (2010–2039)				2050s (2040–2069)				2080s (2070–2099)			
		RCP 2.6	RCP 4.5	RCP 6.5	RCP 8.5	RCP 2.6	RCP 4.5	RCP 6.5	RCP 8.5	RCP 2.6	RCP 4.5	RCP 6.5	RCP 8.5
Maximum temperature change	-	1.8	1.4	1.4	1.6	2.4	2.5	2.3	3.4	2.9	4	4.6	6.3
Maximum precipitation change	1.7	-6	-4	-3	-5	-15	-17	-16	-21	-19	-24	-27	-36

Note: RCP refers to Representative Concentration Pathways. These represent four different GHG emission scenarios developed by the IPCC, with RCP 2.5 being the future scenario under which lowest GHG emissions occur and RCP 8.5 the highest

¹ Baseline data taken from the UK Climate Data 2009 (UKCP9) datasets as presented in the Environmental Assessment Report for the Proposed Scheme (WSP, 2018d)

5.10.8 Projections indicate that, during the lifespan of the Proposed Scheme (i.e. 60 years, in line with the latest Highways England guidance), the seasonal average temperatures could increase by up to 3.4°C during the winter and 5.6°C during the summer. Trends in change in precipitation shows marked seasonal differences, with a decrease of average precipitation rate of up to 36% anticipated during summer, and an increase of up to 24% during the winter season.

Methodology

Impacts on climate (GHG emissions)

5.10.9 The assessment of the effects of the Proposed Scheme on climate will include the identification and assessment of GHGs (as CO₂ equivalent) occur throughout the construction and operation of the project (i.e. 60 years, as per the latest Highways England guidance), in comparison to the UK Government carbon budget targets. Carbon is considered as:

- Construction carbon, associated with project activities and transport, calculated in line with Highways England guidance; using the Highways England carbon calculator and following the IAN 114/08
- Road user carbon, including emissions associated with maintenance and refurbishment requirements, as set out in the regional assessment methodology presented in the DMRB (Highways Agency, 2007), described as the 'Affected Road Network'

5.10.10 The assessment will be based on the following guidance:

- Latest Highways England guidance
- IEMA's Environmental Impact Assessment guide to assessing greenhouse gas emissions and evaluating their significance (IEMA, 2017)
- Transport Analysis Guidance (TAG) Unit A3 Environmental Impact Appraisal Chapter 4 Greenhouse gases (Department for Transport, 2015)
- DMRB, Volume 11, Section 3, Part 1 Air Quality HA207/07 (Highways Agency, 2007)

5.10.11 The assessment and reporting of GHGs associated with the Proposed Scheme will consider the following project stages:

- Construction (of the Proposed Scheme) – including the material supply (embodied carbon) and recycling, transport, manufacturing and construction processes
- Operation – considering the road users carbon, and emissions associated with the maintenance/refurbishment requirements and lighting

5.10.12 In line with the latest Highways England guidance, significance will be defined based on the Proposed Scheme's contribution to GHG emissions in hindering the UK Government from meeting carbon budget emission reduction targets. There are currently no agreed thresholds for the determination of significance in the context of GHG contribution to climate change in an EIA context. Therefore, this assessment considers that a significant effect would occur when the increase in carbon emissions resulting from the Proposed Scheme have been large enough to have a material impact on the ability of UK Government to meet its carbon reduction targets in accordance with guidance provided in the NPS NN (Department for Transport, 2014).

- 5.10.13 Emissions associated with the decommissioning of the Proposed Scheme have not been considered. This is because the long design life of the Proposed Scheme (more than 60 years) means there isn't enough certainty about the likelihood, type or scale of emissions activities that could occur.
- 5.10.14 Information regarding the carbon emissions caused by the construction, maintenance, refurbishment activities and by lighting during the operation phase, will be retrieved from the materials chapter, where the methodology and the calculation will be detailed. In line with Scoping Opinion for the Proposed Scheme, carbon emission related with raw material supply, transport and manufacture is scoped in and will be assessed.
- 5.10.15 Information regarding the carbon emissions caused during the operation phase of the Proposed Scheme (i.e. road user carbon) will be obtained from the air quality chapter, where the methodology and the calculations will be detailed. The climate assessment, following the relevant latest Highways England guidance and Scoping Opinion for the Proposed Scheme, will include a comparison of the GHG emissions for the do-minimum and do-something scenarios for the opening and design (future) years in line with HA207/07.

Vulnerability of the Proposed Scheme to climate change

- 5.10.16 The assessment of the vulnerability of the Proposed Scheme to climate change will consider future climate projections and the Proposed Scheme receptors which could be vulnerable to climate changes.
- 5.10.17 Although certain receptors have been identified during the option selection stage, a reassessment of the vulnerable receptors will be carried out to include any potential design and construction updates.
- 5.10.18 Future climate projections, as presented in the 'existing and baseline knowledge' section, consider the lifespan of the project (including timescales for construction and operations) to be 60 years, in line with the latest Highways England guidance requirements, and in line with the TAG Unit A3 Environmental Impact Appraisal (Department for Transport, 2015). Lifecycle stages can then be assessed in the short, medium and long term (i.e. 2030, 2050 and 2080). The climate trends associated with the UKCP high emissions scenario (RCP 8.5 – 50% probability) projections will be considered in this assessment, in line with the latest Highways England guidance requirements, as a conservative approach due to the uncertainties that exist around climate projections.
- 5.10.19 The Proposed Scheme receptors vulnerable to climate change will be identified based on the construction process, assets and their operation, maintenance and refurbishment, and end users, including the public and commercial operators. Impacts will be described in terms of hazards and opportunities using the climate projection data, together with the vulnerability of the Proposed Scheme to both normal and extreme weather-related scenarios.
- 5.10.20 In line with the latest Highways England guidance requirements and with the Scoping Opinion for the Proposed Scheme, the likelihood and consequence of the impact occurring at receptors will be assessed, and an evaluation of the significance of effects will be presented based on the latest Highways England's guidance significance matrix.

- 5.10.21 In considering the elements of climate, professional judgements, following a proportionate approach, will be used in providing a qualitative description of the nature of the impacts.
- 5.10.22 The study area for the assessment of vulnerability of the Proposed Scheme to climate change is its footprint.

Constraints and limitations

- 5.10.23 A quantitative information assessment of GHG emissions associated with the construction and operation of the Proposed Scheme presented in this report was carried out at an earlier stage of the design and based on limited design information. It is anticipated that a revised quantitative assessment will be carried out once the Proposed Scheme design has been finalised and traffic data and materials quantities become available.
- 5.10.24 Due to the uncertainties that exist around the subject of climate, there are limitations associated with predicting the impacts of climate change into the future, which could result in this assessment either over or under estimating the impacts of the Proposed Scheme on climate, and of climate on the Proposed Scheme. These limitations include:
- Uncertainty around climate change projections
 - Limited methodological guidance on how a climate change assessment should be carried out
 - Limited literature describing climate change impacts on infrastructure and assets
- 5.10.25 Although uncertainties and limitations exist around predicting climate change into the future, the NPS NN (Department for Transport, 2014) states that *“it is very unlikely that the impact of a road project will, in isolation, affect the ability of the government to meet its carbon reduction plan targets”*. Therefore, based on the size of the Proposed Scheme in relation to the area and background emissions, the confidence in this assessment is increased.

Potential impacts of the Proposed Scheme on climate (GHG emissions)

Construction

- 5.10.26 As the design of the Proposed Scheme is still under development, this assessment presents the results of a simple assessment of GHG emissions carried out during the option selection stage. The assessment carried out at this stage considered GHG emissions associated with the transport of materials for the carriageway and of fill to and from the works site and movement of earth on site, which was calculated using the Highways England carbon calculator (Highways England, 2016).
- 5.10.27 The Highways England carbon calculator multiplies emissions activity by the relevant emissions factors reported in tonnes of carbon dioxide equivalents (tCO_{2e}). Although CO₂ has a relatively low global warming potential compared to other GHGs, it is the most abundant contributor. Therefore, the global warming potential of GHG emissions is measured in terms of the equivalent amount of CO₂ (referred as CO_{2e}) that would give rise to global warming.
- 5.10.28 No quantitative assessment of the GHG emissions associated with delivery of the materials for the new roundabout, bridges or ancillary works (for example drainage, barriers, signs and lighting) or construction and installation processes was carried out at

the option selection stage as the Proposed Scheme design was not developed enough to support such an assessment.

5.10.29 A revised assessment of GHG emissions carried out using the same method as used for the option selection stage but including GHG emissions associated with the transport of materials to and from site and construction and installation processes, will be presented in the Environmental Statement for the Proposed Scheme.

5.10.30 The following activities associated with the transport of materials to and from the working site and construction activities carried out on site are anticipated to result in GHG emissions:

- Delivery of carriageway materials
- Import of earth fill, and onsite earth movement
- Delivery and installation of drainage, barriers, signs and lighting
- Delivery of materials for new roundabout and bridges
- Installation of major structures
- Activities for organisations carrying out construction works (fuel and electricity consumption)

5.10.31 Table 5-37 shows total GHG emissions associated with those activities listed above for which it has been possible to make a preliminary assessment of emissions using the design information currently available. As shown in Table 5-37, total emissions associated with those construction activities would be approximately 1,179 tCO₂.

Table 5-37 GHG emissions associated with construction of the Proposed Scheme (taken from option selection assessment, reported in the Environmental Assessment Report (WSP, 2018d))

Activity	tCO ₂ e
Delivery of materials for carriageway	499
Import of fill	490
On site earth movements	190
Total	1,179

Operation

Use of the Proposed Scheme by traffic

5.10.32 An assessment of the total GHG emissions associated with use of the Proposed Scheme by traffic was modelled in accordance with DMRB guidance (Highways Agency, 2007) during the option selection stage. The study area for the assessment of GHG emissions associated with end users (motor vehicles) included the strategic and local road network within the area covered by the traffic model.

5.10.33 A revised assessment of the total GHG emissions associated with use of the Proposed Scheme by traffic will be presented in the Environmental Statement following completion of updates to the traffic model. However, again, the information provided in this preliminary assessment is considered sufficient to determine the likely significance of the impact of the Proposed Scheme on climate as it provides a good indication of the degree of magnitude

of GHG emissions associated with the Proposed Scheme relative to the UK Government carbon budget.

5.10.34 The main source of GHG emissions during the operation phase of the Proposed Scheme would come from changes in traffic patterns on the highway network in the surrounding area. Table 5-38 shows that the Proposed Scheme would result in an average annual increase in GHG emissions of 8.9 ktCO₂ from 2023 to 2082. This is assumed to be the lifetime of the Proposed Scheme for the purposes of this assessment, relative to the do-minimum scenario (if the Proposed Scheme was not taken forward). Total GHG emissions over this period would be 35,797 ktCO₂, which would be 535 ktCO₂ higher than if the Proposed Scheme does not get constructed.

Table 5-38 GHG emissions associated with use of the Proposed Scheme by traffic (taken from option selection assessment, reported in the Environmental Assessment Report (WSP, 2018d))

Scenario	GHG emissions (ktCO ₂ e)	
	Annual average (2023-2082)	Total (2023-2082)
Do-something (with the Proposed Scheme in place)	596.6	35,797
Do-minimum (in the absence of the Proposed Scheme)	587.7	35,262
Difference between do-something and do-minimum (impact of the Proposed Scheme)	8.9	535

Operation, maintenance, repair and refurbishment of the Proposed Scheme

5.10.35 Other sources of emissions associated with the operation of the Proposed Scheme would principally be associated with the operational energy requirements of electrical components such as lighting and signal gantries and with the maintenance, repair and refurbishment of elements of the Proposed Scheme.

5.10.36 The Proposed Scheme includes new road relative to the existing highway design, which will in the main form part of the UK trunk road network. Due to the relatively high volume of traffic using these roads, it is anticipated that they would require regular resurfacing. The renewal of road surfacing is likely to be the main contributor to GHG emissions associated with the maintenance, repair and refurbishment of the Proposed Scheme.

5.10.37 The Proposed Scheme also includes a number of large structures, including four overbridges, and several small structures, including four subways and two retaining walls (as described in Part 2). These elements of the Proposed Scheme all have a relatively long design life compared to road surfacing, so their contribution to GHG emission during the operational phase would be relatively small. Similarly, GHG emissions associated with the repair or replacement of ancillaries, such as lighting and gantries, and the repainting or surfacing of structures would be insignificant relative to that associated with resurfacing works.

Contribution of the Proposed Scheme to the UK carbon budget

5.10.38 At this stage of Proposed Scheme’s design, it has not been possible to quantify GHG emissions associated with the operation, maintenance, repair and refurbishment of the Proposed Scheme. However, as stated above, the dominant source of GHG emissions would be associated with traffic using the Proposed Scheme.

5.10.39 As shown in Table 5-38, the contribution of the Proposed Scheme to regional GHG emissions is anticipated to be approximately 8.9 ktCO₂ per year. The contribution of the Proposed Scheme to the UK carbon budget for the periods 2023–2027 and 2028–2032 is anticipated to be less than 0.163% (see Table 5-39), and therefore it is anticipated that the Proposed Scheme would not have a significant effect on climate change.

Table 5-39 Contribution of the Proposed Scheme to the UK carbon budget (taken from option selection assessment (WSP, 2018d))

Carbon budget period	Carbon budget (ktCO ₂)	Contribution of the Proposed Scheme
		%
Three (2018–2022)	2,544,000	0.001%
Four (2023–2027)	1,950,000	0.136%
Five (2028–2032)	1,725,000	0.163%

Potential mitigation for the Proposed Scheme on climate (GHG emissions)

Construction

5.10.40 Detailed construction proposals have not yet been developed for the Proposed Scheme as the design is still being finalised. However, opportunities to reduce the magnitude of GHG emissions associated with construction activities would include:

- Mitigation measures listed in the assessment of impacts of waste and materials provided in the Material Assets and Waste Section of this report, including:
 - Reducing the use of resources and use of renewable resources or resources with recycled or secondary content
 - Reducing import and export of fill and materials
- Use of more efficient construction plant and delivery and/or those powered by electricity from alternative/lower carbon fuels

Operation, maintenance, repair and refurbishment

5.10.41 Opportunities to reduce the magnitude of GHG emissions associated with the operation, maintenance, repair and refurbishment of the Proposed Scheme would include:

- Designing, specifying and constructing the Proposed Scheme with a view to maximising the operational lifespan of surfaces and structures and minimising the need for maintenance and refurbishment
- Designing, specifying and constructing the Proposed Scheme with a view to maximising the potential for reuse and recycling of materials/elements at the end-of-life stage
- Making adequate provision to support up and coming new clean vehicle technologies where appropriate
- Specifying high efficiency mechanical and electrical equipment such as LED lighting and signal gantries

- Maintaining, refurbishing and repairing equipment using current best practice techniques

Potential impacts for vulnerability of the Proposed Scheme to climate change

5.10.42 Table 5-40 below sets out how aspects of the Proposed Scheme, including end users, could be vulnerable to future climate change.

Table 5-40 Potential impacts of future climate change on the Proposed Scheme

Climate variable	Potential impact
Increases in precipitation	Flooding Water scour causing structural damage Weakening or washout of structural soils Change in groundwater levels and soil moisture
Temperature extremes	Stress on structures Stress on surfaces Challenges for maintenance regimes
High winds	Damage to road restraints, signs, signals and gantries Risks to stability of high sided vehicles

5.10.43 At this stage of design, there isn't enough information available to assess the vulnerability of the Proposed Scheme to future changes in climate beyond identification of potential receptors as set out above.

5.10.44 It is anticipated that all elements of the Proposed Scheme will be designed and specified in accordance with current best practice guidance helping to reduce the risks to the integrity of surfaces and structures and therefore disruption to end users. However, it is likely that future changes in climate would increase maintenance, repair and refurbishment requirements for the Proposed Scheme.

5.10.45 Further information regarding the vulnerability of the Proposed Scheme to climate change will be provided in the climate assessment in the Environmental Statement for the Proposed Scheme.

Potential mitigation for vulnerability of the Proposed Scheme to climate change

5.10.46 Potential mitigation for the potential impacts of climate change on the Proposed Scheme include:

- Making sure that the Proposed Scheme design (in particular the drainage system) complies with Environment Agency guidance regarding peak rainfall
- Designing and specifying pavement construction, expansion joints and other elements that would be resilient to anticipated increases in peak summer temperatures and increased UV exposure
- Designing and specifying pavement construction, drainage systems, embankments and other elements with a view to anticipated increases in peak rainfall as well as increased variability of ground conditions (wetting and drying)

Summary

- 5.10.47 In this section, the available baseline information was reviewed and the new UKCP dataset, UKCP18, was included. At the time of writing, there were no construction and air quality updates, because the designs were in progress and there was no updated traffic data. The outcomes of the option selection climate assessment were summarized. The methodology to be followed at the next stage was also presented.
- 5.10.48 As stated in the option selection assessment, reported in the Environmental Assessment Report (WSP, 2018d), while the Proposed Scheme would result in increased GHG emissions, these would not be significant in the context of the UK's carbon budget commitments. Opportunities to further reduce emissions associated with the construction and operation phases of the Proposed Scheme were identified. Elements of the Proposed Scheme are considered vulnerable to future changes in climate, including road surfacing and structures. There is currently insufficient design information available to make an informed assessment of the risks to the Proposed Scheme from future climate change. The design of the Proposed Scheme will be informed by current best practice minimising risks to vulnerable elements of the Proposed Scheme and end users.

6. Part 6 – Cumulative Effects

6.1 Introduction

6.1.1 This Part outlines potential likely significant cumulative effects associated with the Proposed Scheme, both when a single receptor is affected by combined aspects of the Proposed Scheme (intra-project effects) or where the effects of the Proposed Scheme are increased due to interactions with the effects of other proposed/committed developments (inter-project effects).

6.1.2 Intra-project and inter-project effects result from multiple actions on receptors over time and are generally additive or interactive (synergistic) in nature. For two impacts to have a cumulative effect, the impacts would 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). They could also be considered as effects resulting from incremental changes caused by other past, present or reasonably foreseeable actions together with the project, produced as a result of:

- The interrelationship between different environmental factors of the same project
- Cumulative effects from different projects (with the project being assessed)

6.1.3 This Part has been prepared with reference to the Planning Inspectorate's Advice Note 17: Cumulative Effects Assessment (Planning Inspectorate, 2015) and guidance on cumulative effects contained in DMRB Volume 11, Section 2, Part 5 (HA 205/08) (Highways Agency, 2008). This assessment is also informed by the NPS NN (Department for Transport, 2014), the findings of the assessment carried out at the option selection stage of the Proposed Scheme and Scoping Report for which a Scoping Opinion was received in March 2019. Additionally, reference has also been made to the guidelines set by the IEMA in its Special Report (IEMA, 2011).

6.2 Approach to assessment

6.2.1 The cumulative effects assessment for the Proposed Scheme follows the guidelines as set by IEMA as mentioned above as well as advice from the Planning Inspectorate.

6.2.2 IEMA's guidelines recognise two major sources of cumulative effects:

- Intra-project effects (also referred as 'interrelationships between topics' (Planning Inspectorate, 2015)) – These occur where a single receptor is affected by more than one source of effect arising from different aspects of the Proposed Scheme. An example of an intra-project effect would be where local residents are affected by dust, noise and traffic disruption during the construction of the Proposed Scheme, with the result being a greater nuisance than each individual effect alone
- Inter-project effects (also referred to as 'Cumulative Effects' (Planning Inspectorate, 2015)) – These effects occur as a result of a number of past, present or reasonably foreseeable proposed developments, which individually might not be significant, but when considered together could create a significant cumulative effect on a shared receptor and could include developments separate from and related to the Proposed Scheme

Intra-project assessment approach

- 6.2.3 Due to the nature of the proposal, impact interaction from the Proposed Scheme has been considered for both construction as well as operational phases. It is to be noted that these phases occur at different times, hence impacts do not act cumulatively with each other across phases.
- 6.2.4 Rather than carrying out an assessment of each possible receptor identified by the technical sections, representative groups and/or individual receptors (where appropriate) potentially most sensitive to impact interactions have been chosen. These include existing and future landowners, communities near the construction works, sensitive habitats and species.
- 6.2.5 Receptors and the potential impacts on them will be presented in a matrix format in the Environmental Statement. Where it is identified that more than one environmental topic has identified an impact on a particular receptor or a group of receptors in the same temporal and spatial scope, that receptor will be assessed for intra-project cumulative effects. The assessment will be carried out with the relevant specialists who will describe the potential intra-project effect and whether it would be likely to be significant or not.
- 6.2.6 The combined effects assessment considers the residual effects identified for each individual environmental topic, and the potential combined effects on single receptors/resources. Table 5-2 in the Scoping Report gives the significance categories to be used by each topic, and based on this information, only those effects that are slight or more will be considered for assessment. This is because multiple slight effects have the potential to lead to a significant (i.e. moderate or above) cumulative effect. The key is to focus on the receptor and consider its capacity to accommodate changes likely to occur because of the Proposed Scheme. Sensitive receptors have been identified in the individual environmental topic sections.
- 6.2.7 Potential impacts on a receptor due to the Proposed Scheme could be both beneficial and adverse. Additionally, there is no guidance for assessing the significance of intra-project effects, hence assessing the significance of combined effects is necessarily a qualitative process, based on professional judgement implemented by the topic specialists.
- 6.2.8 It should be noted that, in some cases, multiple effects on a single receptor are already considered within the topic sections. These links will be recorded in the intra-project effects assessment matrix but to avoid duplication will not be reassessed. For example, the biodiversity section evaluates impacts on ecological components due to various aspects like changes in air quality, noise, vibration, groundwater flow, land use, habitat fragmentation and vegetation clearance. So, although the matrix will depict these linkages, there will be no discussion of such impacts in this chapter.

Inter-project assessment approach

- 6.2.9 The EIA will consider other schemes proposed to be developed at the same time as the Proposed Scheme that are consented and subject to a high degree of certainty of being delivered (ideally with signed legal agreements). Inter-project cumulative effects have been considered in line with the assessment methodology provided in Part 4 for the construction stage and the operational stage within each of the technical sections. Section 6.3 provides the approach and methodology followed to identify a long list and short list of other developments.

6.3 Preliminary identification of key developments

- 6.3.1 Seventy other developments have been identified for inclusion in the long list of developments during the option selection stage of the project (WSP, 2018e). They comprise six agricultural schemes, 13 commercial and industrial schemes, four power generation schemes, seven allocated sites, eight infrastructure schemes, including a pipeline project and a road scheme. The remainder are residential developments.
- 6.3.2 The search area used for the creation of the long list of developments was 30 kilometres. This is considered to be the maximum study area over which the Proposed Scheme could exert impacts. This distance was identified as the search radius for SACs designated for bats covered in the biodiversity section. However, this is a disproportionately large search area considering the scale of the Proposed Scheme, so it has been modified for the current assessment, as explained below.
- 6.3.3 Based on the Zones of Influence of the various topics and using professional judgement, a smaller search area has been established allowing for a realistic assessment of cumulative effects between the Proposed Scheme and other developments. The long list will be based on the following search criteria:
- Major infrastructure projects, including Nationally Significant Infrastructure Projects identified on the Planning Inspectorate's programme of projects, within 2 kilometres of the proposed Order Limits. The search area reflects the Zone of Influence with potential impacts on all topics, including traffic and biodiversity
 - Major developments as defined under the Development Management Procedure (England) Order 2010, such as housing developments of 10 or more dwellings. These sites have been identified by searching the local planning authorities' planning portals. The search area was set at 2 kilometres from the proposed Order Limits due to the Zone of Influence of possible construction traffic effects
 - Minor planning applications, for example a housing development of less than 10 dwellings. These sites have been identified from the local planning authorities' planning portals. The search area was set at 200 metres to reflect the Zone of Influence of possible air quality, noise and vibration effects
 - A review of other developments will be carried out on the following planning portals:
 - Winchester City Council
 - Hampshire County Council
 - South Downs National Park Authority
- 6.3.4 As per Planning Inspectorate Advice Note 17, developments falling in the following stages of implementation will be considered for inclusion on the long list.
- Under construction
 - Permitted application(s), but not yet implemented
 - Submitted applications(s) not yet determined
 - Projects on the Planning Inspectorate's programme of projects or on the Local Planning Authorities' portal
 - Identified projects in the relevant Development Plan

- Identified projects 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

- 6.3.5 Applications registered (currently approved or not decided) five years before the start of the construction of the Proposed Scheme have been considered for assessment. Although planning applications typically have three years to start of construction once permission is granted, some of them may not yet be fully implemented and so could have a construction timescale that coincides with that of the Proposed Scheme. Taking 2021–2023 to be the construction period of the Proposed Scheme, applications registered as far back as January 2016 will be considered. However, if any other ongoing construction works corresponding to an application from before January 2016 are known, then such applications will also be included.
- 6.3.6 In the next stage, the long list will be filtered to create a short list of those proposed developments whose construction programmes would be likely to overlap with the construction programme for the Proposed Scheme (i.e. within temporal scope) and which are considered would generate potential likely significant effects (i.e. within spatial scope).
- 6.3.7 Where significant cumulative effects are identified, beyond those identified as residual effects from the Proposed Scheme in isolation, additional mitigation measures would be recommended. It should be noted that such mitigation measures proposed at this stage may be beyond the control of Highways England but will provide useful guidance to relevant planning authorities when considering other applications.
- 6.3.8 Five developments from the long list developed at the previous stage of assessment were carried forward for further assessment in the subsequent stages. This was further reviewed in March 2019 and the draft short list of developments are shown in Table 6-1. The short list of proposed developments will be reviewed during the Environmental Statement phase as further applications for development consent or planning permission are made and added in the long list.
- 6.3.9 In the next stage of assessment, information will be gathered about these developments from publicly available sources. An assessment of likely significant impacts arising from the Proposed Scheme cumulatively with the short-listed developments will be carried out involving each topic specialist.
- 6.3.10 It is not always easy to assess potential cumulative effects due to the lack of information available, so a pragmatic approach will be taken when determining what is feasible and reasonable.
- 6.3.11 During the EIA stage, Local Planning Authorities and any other relevant stakeholders will be contacted to determine whether any additional large-scale planning applications have been submitted for determination or granted, which could lead to potential cumulative impacts. The long and the short list of developments will be agreed with them.
- 6.3.12 As per the Scoping Report, the long list and the short list will continue to be reviewed throughout the EIA process as appropriate when new developments are proposed to make sure that all potentially relevant developments are included in the cumulative assessment.

Table 6-1 Draft short list of other developments

Development Name	Description of Proposed Development	Distance from the Project	Current Status
Winchester City Council 09/02412/OUT (under construction)	Development of approximately 93.1 hectares of land at Barton Farm to the east of Andover Road, Winchester, to provide 2,000 dwellings (to include 40% affordable housing) and a local centre including a new primary school, a children's pre-school nursery, a retail food store up to 2,000 sq. m, a community building, a health centre, a district energy centre, car parking and other commercial, leisure and community floor space.	2km northwest	Approved
Winchester City Council 17/02147/FUL	Demolish existing garage and storage buildings that are beyond serviceable repair and replace with newly purpose-built garaging bays for three winter service vehicles and welfare facilities to accommodate operational staff. The new facility will be erected on the existing footprint of the obsolete asset but will incorporate existing drainage and other services already installed.	Within the proposed Order Limits	Approved
Highways England (M3 J9-14 Upgrade to Smart Motorway)	Upgrading the M3 between Junction 9 (Winchester/A34 interchange) and Junction 14 (M27 Southampton interchange) to an all-lane running smart motorway. The scheme was announced in 2015 by the government and will link to the smart motorway scheme on the M27.	Within the proposed Order Limits	N/A
Policy MTRA 2 – Market Towns and Larger Villages	In Bishop Waltham and New Alresford, provision for about 500 new homes in each settlement and provision for about 250 new homes in each of the following settlements: Colden Common, Denmead, Kings Worthy, Swanmore, Waltham Close and Wickham.	Various	N/A
Hampshire County Council 17/01714/HCS	Retrospective application for the development of Highways Waste Management Facility at land off Spitfire Link (A272) Winchester.	Within proposed Order Limits	Approved

6.3.13 Following finalisation of the other developments to be included in this assessment, a map showing the location of these proposed major developments will be produced for the Environmental Statement.

6.4 Potential cumulative impacts

6.4.1 The Environmental Statement will assess the potential combined effects based on the results of baseline surveys and data collection for each environmental discipline assessed and any key developments identified. At this stage, assessment is ongoing to identify potential impacts for each topic on receptors during both construction and operation phases.

6.4.2 Since there is no fixed guidance in determining significance of cumulative effects, the impacts identified will be reported as 'significant' or 'not significant', 'permanent' or 'temporary' and 'beneficial' or 'adverse'.

Intra-project effects

6.4.3 The intra-project effects of different types of impact, or 'impact interactions', from the Proposed Scheme on certain receptors have been considered for both construction as well as operational phases.

6.4.4 Potential effects of the project on receptors are discussed in the Sections 5.1 to 5.11, although at this stage the assessment is not yet complete and still ongoing. Potentially, local communities (including schools), biodiversity, tourists, historic landscapes and heritage assets could be affected by multiple environmental effects during the construction of the project. Further assessment is ongoing to establish cumulative effects on specific receptors.

6.4.5 Tables 6-2A and 6-2B, based on the draft assessment carried out at this stage, show the linkages between various receptors and impacts affecting them at construction phase and operational phase respectively. The information presented in these tables has been obtained from the following PEIR sections:

- Section 5.1 Air Quality
- Section 5.2 Cultural Heritage
- Section 5.3 Landscape and Visual
- Section 5.4 Biodiversity
- Section 5.5 Geology and Soils
- Section 5.6 Material Assets and Waste
- Section 5.7 Noise and Vibration
- Section 5.8 Population and Health
- Section 5.9 Road Drainage and the Water Environment
- Section 5.10 Climate

Table 6-2A Matrix to show receptors vs impact linkages for intra-project assessment: construction phase

Receptors / Impacts	Local Residents	Local Community	Species	River Itchen SAC/SSSI	Aquatic Habitats	Terrestrial Habitats	Archaeological remain	Historic Building and Conservation Area	Heritage Assets	Easton Down	Construction workers, off-site workers, future site users	Minerals resources	Groundwater – Aquifers and SPZ	Surface water - River Itchen	Existing & future infrastructure	Sensitive sites	Adjacent land and soil	PRoW Users	Road Vehicle Users	Local SDNP	Trees	Night Skies	Local Landscape	Flood Risk	Surface water	Land Use	Driver Stress
Traffic	X	X																	X								X
Disruption of flow					X								X														
Land take																	X			X							
Disruption/damage caused by construction activities			X		X	X	X		X	X		X					X	X						X			
Contamination (through air-borne and water-borne pollutants, hazardous material, etc.); runoff			X		X	X					X		X	X		X	X								X		



Receptors	Local Residents	Local Community	Species	River Itchen SAC/SSSI	Aquatic Habitats	Terrestrial Habitats	Archaeological remain	Historic Building and Conservation Area	Heritage Assets	Easton Down	Construction workers, off-site workers, future site users	Minerals resources	Groundwater – Aquifers and SPZ	Surface water - River Itchen	Existing & future infrastructure	Sensitive sites	Adjacent land and soil	PRoW Users	Road Vehicle Users	Local SDNP	Trees	Night Skies	Local Landscape	Flood Risk	Surface water	Land Use	Driver Stress
Habitat loss				X	X																						
Noise & vibration	X	X	X					X	X									X		X							
Visual	X		X															X									
Lighting			X																			X					
Dewatering													X														
Introduction of contamination pathways													X	X	X	X									X		
Resource loss												X												X			
Landscape impacts				X																X			X				
Quality																											
Severance		X																									

Table 6-2B Matrix to show receptors vs impact linkages for intra-project assessment: operation phase

Receptors \ Impacts	Local Residents	Local Community	River Itchen SAC	St Catherine's Hill	Species	Aquatic Habitats	Historic Building and Conservation Area	Historic Landscape	Easton Down	Minerals resources	Groundwater – Aquifers and SPZ	Sensitive sites	PRoW Users	Road Users	Local SDNP	Trees	Night Skies	Local Landscape	Flood Risk	Surface water	Land Use	Driver Stress	
Air quality			x ¹	x ¹																			
Traffic	y	y																					
Disruption of Groundwater flow						x																	
Direct mortality					x																		
Habitat fragmentation					x											x			x				
Operational disturbances (noise, vibration, visual and lighting)			x		x																		
Contamination											x									x			

Receptors	Local Residents	Local Community	River Itchen SAC	St Catherine's Hill	Species	Aquatic Habitats	Historic Building and Conservation Area	Historic Landscape	Easton Down	Minerals resources	Groundwater – Aquifers and SPZ	Sensitive sites	PRoW Users	Road Users	Local SDNP	Trees	Night Skies	Local Landscape	Flood Risk	Surface water	Land Use	Driver Stress
Lighting			x														x					
Visual								x	x													
Loss/damage of resource										x		x						x				
Landscape impact															x							
Amenity and facility													y									y

Legend:

x¹ – only in very few selected locations

x – Potential adverse impacts

y – Potential beneficial impacts

6.4.6 In summary, based on the linkages demonstrated in Tables 6-2A and 6-2B, the most sensitive receptors in the surrounding area that could potentially experience impact interactions are:

During construction:

- Residents and community receptors as well as Public Rights of Way users (closest residential properties being on Longfield Road, approximately 100 metres west of the M3) which could potentially be impacted by a combination of dust, noise, vibration, visual, lighting and severance effects
- The immediate area of South Downs National Park would potentially be impacted by a combination of minor land take, damage or disruption due to construction activities, landscape change and effects on the tranquillity due to noise, vibration and visual intrusion
- Ecological receptors comprising both terrestrial and aquatic habitats could potentially be impacted by a combined effect of pollution to surface and groundwater bodies and noise disturbance, damage to habitats.
- Groundwater and surface water courses which could be potentially impacted from mobilisation of sediments, disruption to flows, runoff and on-site spills and creation of new pollutant pathways.

During operation:

- Residential and community receptors which could experience a reduction in traffic flow in the local road network as well as a reduction in air pollutant concentrations but could experience an increase in operational noise and visual impacts
- Ecological receptors could be affected by impacts from direct mortality and other operational disruption such as noise, vibration and visual effects
- With the improvements planned as part of the Proposed Scheme, there would be greater opportunity for pedestrians and cyclists as well as improved driver stress

6.4.7 The potential impacts reported herein are based on the information provided in Sections 5.1 to 5.11 of this PEIR. It is assumed that any design features and any mitigation measures to avoid, reduce or compensate any adverse impacts identified for the Proposed Scheme would be implemented in full.

Inter-project effects

6.4.8 Where other major improvement and construction projects are delivered at the same time as, and near, the Proposed Scheme, a potential for cumulative adverse impacts would exist. Conversely, beneficial opportunities to maximise synergies between major projects (for example, balancing cut and fill across different schemes) could also be considered.

6.4.9 Cumulative impacts are only likely to occur when construction phases or operational phases overlap.

6.4.10 It is anticipated that due to the nature of the Proposed Scheme, significant cumulative impacts could occur during both the construction and operational phases. Potential cumulative impacts with other developments could include:

- Incremental noise increases

- Incremental loss of agricultural land
- Fragmentation of wildlife corridors
- Incremental air quality/dust increases
- Incremental impact on visual and landscape including increased effects of lightings
- Increased demand for use of public rights of way (requiring suitable provision with the proposed scheme)

- 6.4.11 It is expected that when all the identified developments, including the Proposed Scheme, are in operation, there is a potential that the socio-economic aspect of the local region will be beneficially impacted. Planning applications 09/02412/OUT and Policy MTRA/2 are expected to provide more than 2,500 homes and other essential community facilities in the area, while applications 17/01714/HCS and 17/02147/FUL are expected to provide supporting infrastructure in the form of waste management and vehicle service centres. All of these developments would generate additional traffic on the local road network, for example as identified in the Traffic Assessment of 09/02412/OUT (CALA homes, 2009), where approximately 278 and 328 new vehicular trips per hour will be undertaken through the Proposed Scheme junction in the peak AM and PM. Therefore, it is imperative for improvements to be made to the existing transport infrastructure, which both the Proposed Scheme along with the M3 Junction 9 to Junction 14 Smart Motorways Project are expected to provide.
- 6.4.12 The housing developments in conjunction with the road schemes, including the Proposed Scheme, are expected to encourage future residents to participate in walking or cycling to their work-place or for outdoor recreational purposes. This would be beneficial for human health, especially for the population surrounding the Proposed Scheme.
- 6.4.13 As identified in paragraph 6.4.10, there is the potential for a number of adverse effects due to the cumulative impact from the different developments. However, collectively they are expected to provide a wider benefit to the area. This would be in terms of additional housing provision and improvements to traffic infrastructure required to support the additional population growth and provide congestion free travelling opportunities. This in turn would potentially support sub-regional economic growth, unlocking the capacity for jobs, businesses and new homes in this area.
- 6.4.14 It should be noted that the traffic modelling used to inform the EIA, particularly for the assessment of air quality and noise, will take into account projected traffic growth from other planned developments. Other topics using the traffic modelling for their assessment include road drainage and the water environment (i.e. calculations of risk to water quality from runoff and calculations of accidental spillage risk respectively) and population and human health (community severance).
- 6.4.15 Therefore, the cumulative effect of other planned developments is likely to be taken into account in those topic assessments within the EIA. This means that inter-project cumulative effects are already built into assessments carried out in those topics and will not need to be covered again in the cumulative effects chapter of the Environmental Statement.
- 6.4.16 An initial assessment of the potential inter-project cumulative effects that could arise due to interaction between each of the developments identified in Table 6-1 and the Proposed Scheme is given in Table 6-3 below.

Table 6-3 Potential cumulative effects with of other developments – initial assessment

Development Name	Initial assessment of potential Cumulative Effect
Winchester City Council 09/02412/OUT (under construction)	Biodiversity: There is a potential for cumulative effects on biodiversity, including on the River Itchen which flows between the development and the Proposed Scheme. For example, pollution to surface and groundwater bodies, noise disturbance, habitat loss and interruption of groundwater flows could adversely impact the shared ecological receptors.
Winchester City Council 17/02147/FUL	<p>Given that this development and the Proposed Scheme would intersect, there is potential for the following cumulative effects to occur:</p> <ul style="list-style-type: none"> • Noise and air quality (construction dust) effects for the local community, especially to the west of the junction 9 of M3 • Changes in level and quality of groundwater and surface water effects during dewatering • Landscape and visual amenity effects near construction sites especially for walkers, cyclists and horse-riders and visitors to the South Downs National Park • Additional disturbance of protected species within 2km of construction sites • Traffic effects in the shared access routes as well as in the local road network
M3 J9-J14 Upgrade to Smart Motorway	Considering the Smart Motorway development would remain within the current motorway boundaries, there could be cumulative impacts on the surrounding environment due to an increased traffic flow in the highway network as well as the local roads. This could increase noise, pollution, vibration effects on the surrounding human receptors as well as ecological receptors such as habitats and species in the nearby River Itchen.
Policy MTRA 2 – Market Towns and Larger Villages	The development of various residential schemes could potentially have cumulative effects on biodiversity, local community and traffic, but further investigation is required to understand the location and nature of these schemes in relation to the Proposed Scheme.
Hampshire County Council 17/01714/HCS	The development of the waste management scheme could potentially have cumulative effects on biodiversity, traffic, and soils and geology. Additionally, as both the schemes are adjacent to South Downs National Park, there could be impacts on landscape and visual amenity.

6.5 Summary

6.5.1 This chapter of the Environmental Statement will bring together the principal findings of each of the topic chapters to identify and assess the combined effects of the Proposed Scheme and its cumulative effects with other existing or future major developments in the study area.

6.5.2 For the inter-project effects assessment, the long list and the short list will be further reviewed and any suitable new schemes will be added to the assessment. The list will also be agreed with the Local Planning Authorities and other stakeholders. Thereafter the

Proposed Scheme will be assessed for cumulative effects with these developments and propose any additional mitigation measures if needed.

- 6.5.3 For the intra-project assessment, once the various topic assessments are completed, a receptor-vs-impact matrix will be produced to identify and assess the impacts on those receptors that have the potential to experience multiple effects from different sources.

7. Part 7 – Summary

7.1 Conclusions

- 7.1.1 The scale and location of the Proposed Scheme would mean that several different aspects of the environment would potentially be affected, some adversely and some beneficially. Some of these impacts would occur during construction, such as loss of vegetation and wildlife habitat, the generation of dust and disruption for travellers. Other impacts would occur during operation, such as noise from traffic, new travel conditions and development of new habitats from the landscape and ecological mitigation proposals.
- 7.1.2 The ongoing EIA work will assess how significant the adverse and beneficial effects could be, taking into account proposed mitigation measures.
- 7.1.3 The current environmental mitigation proposals are outlined in paragraphs 2.3.46 to 2.3.51 of this document.

7.2 Next steps

Consultation

- 7.2.1 We would like to obtain the views of the public on the draft proposals for the Proposed Scheme design, taking into account the potential environmental effects of the Proposed Scheme. Those views would then be considered in finalising the design and refining the EIA and Environmental Statement.
- 7.2.2 Consultation at this stage follows the previous options consultation held on the Proposed Scheme in January and February 2018. This options consultation presented information about the Proposed Scheme objectives and the proposed option (Option 14), as well as the rationale for excluding other options. The forthcoming pre-design public consultation in summer 2019 will present more detailed proposals for the Proposed Scheme that are being developed.
- 7.2.3 The pre-design public consultation will run for an eight-week period, from 2 July to 27 August 2019. During this period, six public consultation events will be held near the Proposed Scheme, further details about the events can be found within the Statement of Community Consultation. In the first week of the consultation, four targeted briefings will be held for key stakeholder audiences, including statutory environmental bodies and local authorities.
- 7.2.4 Information related to the Proposed Scheme, including the preliminary environmental information set out in this report, will be available to access on the consultation web page.
- 7.2.5 Members of the public and the wider community will be able to respond to the consultation using the online questionnaire, by email, or via a dedicated freepost address, enclosing a completed consultation questionnaire or letter. Respondents will have the opportunity to comment on all aspects of the Proposed Scheme, including the environmental information.
- 7.2.6 Further details of the pre-design public consultation, including events, response channels and deposit locations will be set out in the Statement of Community Consultation, to be published in advance of the consultation.

After the pre-design public consultation

- 7.2.7 After the consultation period, all responses will be analysed and considered in finalising the Proposed Scheme design and the Environmental Statement. To comply with the government's Consultation Principles 2018, results of the public consultation (in a Consultation Report) will be published within 12 weeks of the end of the pre-design public consultation process. The Consultation Report will detail the consultation process and responses received and how they have been taken into account, including any changes to the Proposed Scheme.
- 7.2.8 We must submit an application for development consent to the Secretary of State for authorisation to construct the Proposed Scheme. The Environmental Statement will be submitted with the DCO application. Once the DCO application has been submitted and accepted, the public and wider community will have further opportunity to comment on the application.
- 7.2.9 Details of how the DCO process works can be found on the Planning Inspectorate's National Infrastructure Planning website
<https://infrastructure.planninginspectorate.gov.uk/application-process/>.
- 7.2.10 Highways England's information leaflet on development consent will be among the information available online during the consultation period. You can view all the consultation materials on our webpage at:
<https://highwaysengland.citizenspace.com/he/m3-junction-9-improvements-statutory-consultation>.

8. Part 8 – References

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9. Part 9 - Planning Policy

9.1 Introduction

9.1.1 This section lists sources of planning policy and legislation that have been used to inform the Environmental Impact Assessment (EIA) process. For more information about the legislative guidance and approaches to EIA, readers should refer to the M3 J9 Improvements EIA Scoping Report (Highways England, 2019) available on the National Infrastructure Planning website:

<https://bit.ly/2KyzqQN>

9.2 List of National and Local Planning Policy Documents

National

National Policy Statement for National Networks (NPS NN) (Department for Transport, 2014)

National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2019)

Planning Practice Guidance documents

Local

Winchester District Local Plan Review - Saved Policies (Winchester City Council, 2006)

Winchester District Local Plan Part 1 - Joint Core Strategy (Winchester City Council, 2013)

Winchester District Local Plan Part 2 - Development Management and Site Allocations (Winchester City Council, 2017)

South Downs National Park Emerging Local Plan (South Downs National Park Authority, 2017)

Hampshire Minerals and Waste Plan (Hampshire County Council, 2013)

9.3 Planning Policy Used for Each Environmental Topic

Air Quality

NPS NN: Paragraphs 3.8 (Emissions); 5.3-5.15 (Air Quality); and 5.81-5.89 (Dust)

NPPF: Paragraph 8 (Achieving sustainable development), Paragraphs 102 (Promoting sustainable transport), 170, 180 and 181 (Conserving and enhancing the natural environment); and associated Planning Practice Guidance: Air Quality (2014)

Winchester District Local Plan Review – Saved Policies: Policies DP.3 (General design criteria); and DP.10 (Pollution generating development)

Winchester District Local Plan Part 1: Policies CP13 (High Quality Design); CP16 (Biodiversity); and DS1 (Development Strategy and Principles)

Winchester District Local Plan Part 2: Policies WIN2 (Winchester Town); DM17 (Site Development Principles); and DM19 (Development and Pollution)

South Downs National Park Emerging Local Plan: Policies SD1 (Sustainable Development); SD2 (Ecosystems Services); SD3 (Major Development); SD9 (Biodiversity and Geodiversity); and SD54 (Pollution and Air Quality)

Cultural Heritage

NPS NN: Paragraphs 5.120 to 5.142 (Historic Environment)

NPPF: Paragraphs 8 (Achieving sustainable development); 189, 193, 194, 195, 196, 197, 199, 200 and 201 (Conserving and enhancing the historic environment); and associated Planning Practice Guidance: 'Conserving and Enhancing the Historic Environment'

Winchester District Local Plan Review – Saved Policies: Policies DP.3 (General Design Criteria); DP.4 (Landscape and the Built Environment); HE.1 (Archaeological Site Preservation); HE.2 (Archaeological Site Assessment); HE.4 (Conservation Areas – Landscape Setting); and HE.5 (Conservation Areas – Development Criteria)

Winchester District Local Plan Part 1: Policies DS1 (Development Strategy and Principles); CP13 (High Quality Design); CP19 (South Downs National Park); and CP20 (Heritage and Landscape Character)

Winchester District Local Plan Part 2: Policies WIN1 (Winchester Town); WIN2 (Winchester Town – Views & Roofscape); DM15 (Local Distinctiveness); DM16 (Site Design Criteria); DM17 (Site Development Principles); DM25 (Historic Parks and Gardens); DM26 (Archaeology); DM27 (Development in Conservation Areas); DM29 (Heritage Assets); and DM31 (Locally Listed Heritage Assets)

South Downs National Park Emerging Local Plan – Policies SD1 (Sustainable Development); SD3 (Major Development); SD4 (Landscape Character); SD5 (Design); SD6 (Safeguarding Views); SD12 (Historic Environment); SD13 (Listed Buildings); SD15 (Conservation Area); SD16 (Archaeology); SD42 (Infrastructure).

Ancient Monuments and Archaeological Areas Act 1979 (amended by the National Heritage Act 1983 and 2002)

Planning (Listed Buildings and Conservation Areas) Act 1990

Landscape and Visual

NPS NN: Paragraphs 5.81-5.89 (Dust, odour, artificial light, smoke, steam); 5.143 to 5.161 (Landscape and Visual Impacts including Tranquillity); and 5.188 (Tranquillity)

NPPF: Paragraph 8 (Achieving sustainable development), 124, 127, 130 (Achieving well-designed places), 170, 172 and 180 (Conserving and enhancing the natural environment); and the associated Planning Practice Guidance: Natural Environment (2016), Noise (2014) and Light pollution (2014)

Winchester District Local Plan Review – Saved Policies: Policies DP.3 (General Design Criteria); DP.4 (Landscape and The Built Environment); DP.10 (Pollution Generating Development); and DP.11 (Unneighbourly uses)

Winchester District Local Plan Part 1: Policies DS1 (Development Strategy and Principles); MTRA4 (Development in the Countryside); CP13 (High Quality Design); CP15 (Green Infrastructure); CP19 (South Downs National Park); and, CP20 (Heritage and Landscape Character).

Winchester District Local Plan Part 2: Policies WIN1 (Winchester Town); WIN3 (Winchester Town – Views & Roofscape); DM10 (Essential Facilities & Services in the Countryside); DM15 (Local Distinctiveness); DM16 (Site Design Criteria); DM17 (Site Development Principles); DM19 (Development and Pollution); DM23 (Rural Character); DM24 (Special Trees, Important Hedgerows and Ancient Woodlands); DM25 (Historic Parks and Gardens); and, DM29 Heritage Assets.

South Downs National Park Emerging Local Plan: Policies SD1 (Sustainable Development); SD3 (Major Development); SD4 (Landscape Character); SD5 (Design); SD6 (Safeguarding Views); SD7 (Relative Tranquillity); SD8 (Dark Night Skies); SD11 (Trees, Woodland and Hedgerows); SD21

(Public Realm, Highway Design and Public Art); SD42 (Infrastructure); SD45 (Green Infrastructure); and SD54 (Pollution and Air Quality).

Biodiversity

NPS NN: Paragraphs 5.20 to 5.38 (Biodiversity and Ecological Conservation); Paragraphs 5.81-5.89 (Dust, odour, artificial light, smoke and steam); and, 5.192 (Noise and vibration)

NPPF: Paragraphs 8 (Achieving sustainable development); 91 (Promoting health and safe communities); 102 (Promoting sustainable transport); 170, 172, 175, 176, 177 and 180 (Conserving and enhancing the natural environment); and, associated Planning Practice Guidance: Natural Environment (2016), Noise (2014) Light pollution (2014)

Winchester District Local Plan Review – Saved Policies: Policies DP.3 (General Design Criteria) and DP.4 (Landscape and the built environment)

Winchester District Local Plan Part 1: Policies DS1 (Development Strategy and Principles); CP13 (High Quality Design); CP15 (Green Infrastructure); CP16 (Biodiversity); and, CP17 (Flooding, Flood Risk and the Water Environment)

Winchester District Local Plan Part 2: Policies WIN1 (Winchester Town); DM16 (Site Design Criteria); DM17 (Site Development Principles); DM19 (Development and Pollution); DM21 (Contaminated Land); and, DM24 (Special Trees, Important Hedgerows and Ancient Woodlands)

South Downs National Park Emerging Local Plan: Policies SD1 (Sustainable Development); SD2 (Ecosystems Services); SD3 (Major Development); SD4 (Landscape Character); SD5 (Design); SD9 (Biodiversity and Geodiversity); SD11 (Trees, Woodland and Hedgerows); SD42 (Infrastructure); SD45 (Green Infrastructure); and SD54 (Pollution and Air Quality)

Geology and Soils

NPS NN: Paragraphs 5.116 to 5.119 (Land Stability) and 5.168 (Agricultural Land, and Contamination)

NPPF: Paragraphs 8 (Achieving sustainable development); 170, 178 and 179 (Conserving and enhancing the natural environment); and the associated Planning Practice Guidance for NPPF, Land Affected by Contamination, June 2014; Land Stability, March 2014; Natural Environment, January 2016

Winchester District Local Plan Review - Saved Policies: Policies DP.3 (General Design Criteria); DP.10 (Pollution Generating Development); and DP.13 (Contaminated Land)

Winchester District Local Plan Part 1: Policy DS1 (Development Strategy and Principles)

Winchester District Local Plan Part 2: Policies DM.17 (Site Development Principles); DM19 (Development and Pollution); and, DM21 (Contaminated Land)

South Downs National Park Emerging Local Plan: Policies SD2 (Ecosystems Services); SD9 (Biodiversity and Geodiversity); SD54 (Pollution and Air Quality); and SD55 (Contaminated Land)

Material Resources and Waste

NPS NN: Paragraphs 5.39-5.45 (Waste); 5.169 (Mineral Resources); and 5.182 (Mineral Safeguarding Areas)

NPPF: Paragraphs 8 (Achieving sustainable development); 203, 205 and 206 (Facilitating the sustainable use of minerals); and the associated Planning Practice Guidance: Waste (2015)

National Planning Policy for Waste (2014): Paragraph 8 (non-waste development)

Winchester District Local Plan Part 1: Policy DS1 (Development Strategy and Principles)

Hampshire Minerals and Waste Plan: Policies 1 (Sustainable mineral and waste development); 15 (Safeguarding – mineral resources); and 18 (Recycled and secondary aggregates development)

South Downs National Park Emerging Local Plan: Policy SD2 (Ecosystems Services)

Waste Management Plan for England (2013)

National Policy Statement for Hazardous Waste (2013)

Noise and Vibration

NPS NN: Paragraphs 5.186 to 5.200 (Noise and Vibration)

NPPF: Paragraphs: 170, 180 and 182 (Conserving and enhancing the natural environment); and associated Planning Practice Guidance for 'Noise' (2014)

Noise Policy Statement for England (2010)

Noise Action Plan: Roads (Including Major Roads) - Environmental Noise (England) Regulations 2006, as amended (2014)

Winchester Local Plan Review - Saved Policies: Policies DP.3 (General design criteria); and DP.11 (Unneighbourly uses)

Winchester District Local Plan Part 1: Policies DS1 (Development Strategy and Principles); and MTRA4 (Development in the Countryside)

Winchester District Local Plan Part 2: Policies DM17 (Site Development Principles); DM19 (Development and Pollution); DM20 (Development and Noise); and, DM23 (Rural Character).

South Downs National Park Emerging Local Plan: Policies SD1 (Sustainable Development); SD3 (Major Development); SD5 (Design); SD7 (Relative Tranquillity); and, SD54 (Pollution and Air Quality).

Population and Health

NPS NN: Paragraphs 3.2-3.5 (Environmental and Social Impacts); 3.10 (Safety); 3.15-3.17 (Sustainable Transport); 3.19-3.22 (Accessibility); 4.81-4.82 (Health); 5.162, 5.175, 5.180, 5.184 (Land Use Including Open Space, Green Infrastructure and Green Belt); and, 5.202-5.214 (Impacts on Transport Networks)

NPPF: Paragraphs 91 (Promoting healthy and safe communities); 98 (Open space and recreation); 102, 110 (Promoting sustainable transport); 124, 127, 130 (Achieving well-designed places); 172 (Conserving and enhancing the natural environment); and the associated Planning Practice Guidance: Natural Environment (2016) and Open space, sports and recreation facilities, public rights of way and local green space (2014)

Winchester District Local Plan Review - Saved Policies: Policy DP.3 (General Design Criteria)

Winchester District Local Plan Part 1: Policies MTRA4 (Development in the Countryside); CP13 (High Quality Design), CP15 (Green Infrastructure); CP19 (National Park); and CP20 (Heritage and Landscape Character)

Winchester District Local Plan Part 2: Policies WIN1 (Winchester Town); DM16 (Site Design Criteria); DM17 (Site Development Principles); DM18 (Access and Parking); DM20 (Development and Noise); and, DM23 Rural Character

South Downs National Park Emerging Local Plan: Policies SD1 (Sustainable Development); SD2 (Ecosystem Services); SD3 (Major Development); SD5 (Design); SD6 (Safeguarding Views); SD7 (Relative Tranquillity); SD8 (Dark Night Skies); SD19 (Transport and Accessibility); SD20 (Walking,

Cycling and Equestrian Routes); SD21 (Public Realm, Highway Design and Public Art); SD42 (Infrastructure); and SD45 (Green Infrastructure)

Road Drainage and the Water Environment

NPS NN: Paragraphs 4.36-4.47 (Climate Change adaptation), paragraphs 4.48 to 4.56 (Pollution Control and other environmental protection regimes); 5.90-5.115 (Flood Risk); and, 5.219-5.231 (Water quality and resources).

NPPF: Paragraphs 8 (Achieving Sustainable Development); 148, 150, 155, 158-161, 163 and 165 (Meeting the challenge of climate change, flooding and coastal change), and the associated Planning Practice Guidance: Flood risk and coastal change (2014), climate change (2014), land affected by contamination (DCLG, 2014a), natural environment (2016), and Water supply, wastewater and water quality (2016).

Winchester District Local Plan Review – Saved Policies: Policy DP.3 (General design criteria).

Winchester District Local Plan Part 1: Policies DS1 (Development Strategy and Principles) and CP17 (Flooding).

Winchester District Local Plan Part 2: Policies DM17 (Site Development Principles) and DM19 (Development and Pollution).

South Downs National Park Emerging Local Plan: Policies SD17 (Protection of the water environment); SD49 (Flood risk management); and SD50 (Sustainable drainage systems).

Environment Agency (EA, 2018d) –The Environment Agency’s approach to groundwater protection.

Climate

NPS NN: Paragraphs 5.16 to 5.19 (Carbon emissions).

NPPF: Paragraphs 8 (Achieving sustainable development); 148 and 150 (Meeting the challenge of climate change, flooding and coastal change), and the associated Planning Practice Guidance: Climate change (2014) and Renewable and low carbon energy (2015).

Winchester District Local Plan Part 1: Policies DS1 (Development Strategy and Principles) and CP13 (High Quality Design).

Winchester District Local Plan Part 2: Policy WIN1 (Winchester Town).

South Downs National Park Emerging Local Plan: Policies SD2 (Ecosystem Services); SD45 (Green Infrastructure); and, SD48 (Climate Change and Sustainable Use of Resources).

Cumulative Effects

NPS NN: Paragraph 4.16 states that when considering significant cumulative effects, the Environmental Statement should provide information on how the effects of the proposal would combine and interact with the effects of other development (including projects for which consent has been granted, as well as those already in existence). Paragraphs 5.16 to 5.19 (Carbon emissions).

NPPF: Paragraphs 8 (Achieving sustainable development); 148 and 150 (Meeting the challenge of climate change, flooding and coastal change); 180 (Ground conditions and pollution) and the associated Planning Practice Guidance: Climate change (2014) and Renewable and low carbon energy (2015).

Winchester District Local Plan Part 1: Policies DS1 (Development Strategy and Principles) and CP13 (High Quality Design).

Winchester District Local Plan Part 2: Policy WIN1 (Winchester Town).

South Downs National Park Emerging Local Plan: Policies SD2 (Ecosystem Services); SD3 (Major Development), SD6 (Safeguarding Views), SD45 (Green Infrastructure); and, SD48 (Climate Change and Sustainable Use of Resources).

10. Abbreviations

Acronyms / abbreviations	Definition
AADT	Average Annual Daily Traffic
AEP	Annual Exceedance Probability
ALC	Agricultural Land Classification
AONB	Area of Outstanding Natural Beauty
AQMA	Air Quality Management Area
AQS	Air Quality Strategy
ARN	Affected Road Network
BAP	Biodiversity Action Plan
BCR	Benefit Cost Rating
BGS	British Geological Society
BSI	British Standards Institute
C4SL	Category 4 Screening Levels
CCTV	Closed-circuit television
CDE	Construction, demolition and excavation
CEMP	Construction Environmental Management Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
CL:AIRE	Contaminated Land: Applications in Real Environments
CoCP	Code of Construction Practice
CPRE	Campaign to Protect Rural England
CRTN	Calculation of Road Traffic Noise
CSM	Conceptual site model
DCO	Development Consent Order
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges
EA	Environment Agency
EAR	Environmental Assessment Report
EHO	Environmental Health Officer
EIA	Environmental Impact Assessment
EqIA	Equality Impact Assessment
ES	Environmental Statement
GHG	Greenhouse gas
HABAP	Highways Agency Biodiversity Action Plan
HADDMS	Highways Agency Drainage Data Management System
HAGDMS	Highways Agency Geotechnical Data Management System
HCC	Hampshire County Council

Acronyms / abbreviations	Definition
HE MPI	Highways England Major Project Instruction
HIA	Hydrogeological Impact Appraisal
HLT	Historic Landscape Type
HPI	Habitats of Principal Importance
HRA	Hot rolled asphalt
IAN	Interim Advice Note
IAQM	Institute of Air Quality Management
IEMA	Institute of Environmental Management and Assessment
LAQM	Local Air Quality Management
LiDAR	Light Detection and Ranging
LNRS	Low noise road surface
LOAEL	Lowest Observable Adverse Effect Level
MAGIC	Multi Agency Geographic Information for the Countryside
NERC (Act)	Natural Environment and Rural Communities
NEWP	Natural Environment White Paper
NOEL	No Observed Effect Level
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NPS NN	National Policy Statement for National Networks
NPSE	Noise Policy Statement for England
NVC	National Vegetation Classification
ONS	Office for National Statistics
OS	Ordnance Survey
PA 2008	Planning Act 2008
PCF	Project Control Framework
PCM	Pollution Climate Mapping
PCSM	Preliminary conceptual site model
PM	Particulate matter
PPG	Planning Practice Guidance
PPV	Peak particle velocity
PRoW	Public Rights of Way
RBMP	River Basin Management Plan
RCP	Representative Concentration Pathway
RIGS	Regionally Important Geological Sites
RIS	Road Investment Strategy
RoFSW	Risk of Flooding from Surface Water

Acronyms / abbreviations	Definition
RVEI	Road Verge of Ecological Importance
S4UL	Suitable 4 Use Levels
SAC	Special Area of Conservation
SDILCA	South Downs Integrated Landscape Character Assessment
SDNP	South Downs National Park
SDNPA	South Downs National Park Authority
SFRA	Strategic Flood Risk Assessment
SINC	Site of Importance for Nature Conservation
SOAEL	Significant Observed Adverse Effect Level
SPA	Special Protection Area
SPI	A Species of Principal Importance
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage System
tCO _{2e}	Tonnes of carbon dioxide equivalents
TRL	Transport Research Laboratory
UKCP	UK Climate Projections
VMS	Variable message signs
WFD	Water Framework Directive
ZTV	Zone of Theoretical Visibility

11. Glossary

Term	Definition
Agricultural Land Classification	A system used to grade agricultural land according to versatility, quality and suitability for growing crops, as set out in the Agricultural Land Classification for England and Wales issued by the Department for Environment, Food and Rural Affairs (Defra). The top three grades, Grades 1, 2 and Subgrade 3a, are referred to as “Best and Most Versatile” land.
Air Quality Management Area	Areas within a local authority's boundary that are identified as areas where Air Quality Objectives are not likely to be achieved.
Air Quality Objective	Defined levels of air quality and maximum pollution limits as specified in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland, 2007.
Annual average daily traffic	Total volume of vehicle traffic on a road flowing past a certain point over a year divided by 365 days.
Annual Average Weekday Traffic	The average 24-hour traffic volume occurring on weekdays throughout a full year.
Annual Exceedance Probability	The likelihood that a particular flood discharge or stage is exceeded annually
Area of Outstanding Natural Beauty	Areas of countryside in England, Wales and Northern Ireland which have been designated under the Countryside and Rights of Way Act 2000 for the purpose of conserving and enhancing the natural beauty of the designated area.
Attenuation pond	A pond designed to slow the passage of water from surface runoff to the ground/drainage system.
Best Practicable Means	A term meaning all reasonably practicable measures operators need to take in the design and management of their facilities to reduce charges and disposals of radioactive waste to achieve a high standard of protection of the environment and the public.
Biodiversity Action Plan	An agreed plan for a habitat or species.
Calculation area	For road noise assessments, this term is defined in the Design Manual for Roads and Bridges (DMRB) (Highways Agency, 2011) as a zone extending 600m from the road scheme, and 600m from any existing roads within 2km of the road scheme which are subject to a change in basic noise levels greater than 1dB. Within the calculation area, noise levels are calculated at sensitive receptors.
Contaminated Land: Applications	An independent not-for-profit organisation established in 1999 to stimulate the regeneration of contaminated land in the UK. It

Term	Definition
in Real Environments	aims to raise awareness of, and confidence in, practical and sustainable remediation technologies.
Competent Authority	In relation to Habitats Regulations Assessment, the Competent Authority is the body that determines if there are likely significant effects and carries out the Appropriate Assessment, if required, before a decision is made. The Competent Authority also has to consult with the relevant statutory nature conservation bodies (and the public, if considered appropriate) before deciding to grant a consent. For the purposes of DCO applications, the Secretary of State is the Competent Authority.
Conceptual site model	A tool which sets out the information gathered through a site investigation and is used to characterise the physical, biological, and chemical systems existing at a site.
Conservation Area	An area designated under Section 69 of the Planning (Listed Buildings and Conservation Areas) Act 1990 as being an area of “ <i>special architectural or historic interest, the character or appearance of which it is desirable to preserve or enhance</i> ”.
Conservation Objectives	The overall target for the species and/or habitat types for which a European Designated Site is designated in order for it to contribute to maintaining or reaching favourable conservation status of the habitats and species concerned at the national, biogeographical or European level, and site-specific objectives to enable it to achieve conservation status at the appropriate level.
Critical level	An air quality standard or guideline for ambient concentrations of a pollutant which applies at ecological receptors.
Critical load	A quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge.
Cumulative effects assessment	An assessment to identify the potential significant effects caused by the interactions of the effects on the environment from different aspects of the same project and from other projects.
Design Manual for Roads and Bridges (DMRB)	A comprehensive manual, prepared by the Highways Agency (now Highways England) that sets out all current standards, advice notes and other published documents relating to the design, assessment and operation of road schemes. Volume 11 of the DMRB sets out the criteria for the environmental assessment of road schemes.
Design Site Waste Management Plan	A plan describing how materials will be managed efficiently and disposed of legally during the construction of the works,

Term	Definition
	explaining how the re-use and recycling of materials will be maximised.
Development Consent Order	The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008.
Dispersion modelling (air quality)	The mathematical simulation of how air pollutants disperse in the ambient atmosphere. A dispersion model is used to estimate or predict the downwind concentration of air pollutants emitted from sources such as industrial facilities or road traffic.
Ecological quality ratio	A ratio which incorporates the key WFD requirements for ecological classification: typology, reference conditions and class boundary settings.
Ecological status	From the Water Framework Directive, ecological status is classified in all water bodies and expressed in terms of five classes (high, good, moderate, poor or bad). These classes are established on the basis of specific criteria and boundaries defined against biological, physico-chemical and hydromorphological elements.
Embedded mitigation	Measures to avoid or reduce environmental effects that are directly incorporated into the design of the development.
Energy average sound level (or equivalent continuous sound level)	The sound level of a steady sound having the same energy as a fluctuating sound over the same period. It is possible to consider this level as the ambient noise encompassing all noise at a given time. L_{Aeq} is considered the best general purpose index for environmental noise.
Equality Impact Assessment	The assessment of the impact of new or revised policies, practices or services against a framework based on the public sector equality duty under the Equality Act 2010.
Free-field (noise)	An environment in which there are no reflective surfaces within the frequency region of interest.
Ground investigation	An intrusive investigation carried out to collect information relating to the ground conditions, normally for geotechnical or land contamination purposes.
Hampshire Biodiversity Information Centre (HBIC)	HBIC provides an independent and impartial data service. Data maintained by HBIC is comprehensive and covers designated sites, habitats and species.
Heavy duty vehicle	Heavy duty vehicles are those with a gross weight of more than 3.5 tonnes and buses.
Heavy goods vehicle	A goods vehicle with a gross weight of more than 3.5 tonnes.

Term	Definition
Heritage asset	A building, monument, site, place, area or landscape identified as having a degree of significance meriting consideration in planning decisions because of its heritage interest. Heritage assets include designated heritage assets and assets identified by the local planning authority (including local listing).
Historic Environment Record	The record of heritage assets which provides information to members of the public, statutory bodies and developers about the archaeological resource in an area.
Hollow way	A way, path or road through a cutting.
Imperative Reasons of Over-riding Public Interest (IROPI)	Known as Stage 4 of the Habitats Regulations Assessment process, IROPI ensures compensatory measures are implemented to maintain the coherence of the European designated site network in the face of adverse effects to site integrity.
Key characteristics (landscape)	The combination of elements that are particularly important to the current character of the landscape and help to give an area its particularly distinctive sense of place.
LA ₁₀	The level exceeded for 10% of the measurement time. This has been shown to correlate well with human responses to road traffic noise.
L _{AeqT}	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level. The suffix "T" represents the time period to which the noise level relates. For example, L _{Aeq 1 hr} is the L _{Aeq} level determined over a period of one hour.
Land Drainage Act	The Land Drainage Act requires that a watercourse be maintained by its riparian owner in such a condition that the free flow of water is not impeded. The county and district councils have powers of enforcement.
Landscape and Visual Impact Assessment	An assessment to identify and assess the significance of change on the landscape including specific views and general visual amenity resulting from a proposed development.
Landscape character area	A discrete geographical area of a particular landscape type.
Landscape character assessment	The process of identifying and describing variation in the character of the landscape, and using this information to assist in managing change in the landscape. It seeks to identify and explain the unique combination of elements and features that make landscapes distinctive.

Term	Definition
Landscape element	Landscape features found within the highway estate, which can encompass both hard landscape features and elements of the soft estate.
Lead Local Flood Authorities (LLFA)	Unitary authorities or county councils who are responsible for developing, maintaining and applying a strategy for local flood risk management in their areas and for maintaining a register of flood risk assets.
Listed Building	A building or structure designated under the Planning (Listed Buildings and Conservation Areas) Act 1990 as being of 'special architectural or historic interest'.
Lowest Observable Adverse Effect Level (noise) (LOAEL)	This is the level above which adverse effects on health and quality of life can be detected.
Local Air Quality Management (LAQM)	A process that requires local authorities across the UK to review, assess and manage the air quality within their geographical areas.
Local Nature Reserves	Sites that are designated by the local authority under Section 21 of the National Parks and Access to the Countryside Act 1949 for nature conservation which have wildlife or geological features that are of special interest locally.
National Cycle Network (NCN)	A series of traffic-free paths and quiet, on-road cycling and walking routes that connect to every major town and city. These routes are promoted for both recreational and active travel purposes.
National Nature Reserve	Sites that are dedicated by the statutory country conservation agencies, under the National Parks and Access to the Countryside Act 1949 and the Wildlife and Countryside Act 1981, for nature conservation and which have wildlife or geological features that are of special interest nationally.
National Trails	Long distance footpaths and bridleways in England and Wales. In Scotland, the equivalent trails are called 'long distance routes'.
National Vegetation Classification	A system of classifying natural habitat types in Great Britain according to the vegetation they contain.
No Observed Effect Level (NOEL)	This is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise

Term	Definition
Open space	Land where the public have access either by legal right or by informal agreement.
Particulate matter	Airborne particulate matter is made up of a collection of solid and/or liquid materials of various sizes that range from a few nanometres in diameter (about the size of a virus) to around 100 micrometres (about the thickness of a human hair).
Phase 1 habitat survey	A rapid system for the recording of semi-natural vegetation and other wildlife habitats.
Point source	A specific location where pollutants are discharged into a receptor.
Preservation in situ	Conservation of an archaeological asset in its original location and condition.
Protected Species Mitigation Licence	The licence issued to permit an activity affecting protected species that would otherwise be an offence.
Public Right of Way	Highways such as footpaths, cycle ways and National Trails that allow the public a legal right of passage.
Ramsar Site	Wetlands of international importance designated under the Ramsar Convention 1971.
Regionally Important Geological Sites (RIGS)	Locally designated sites of importance for geodiversity.
Reptile Receptor Site	Area of land which has been enhanced to provide alternative habitats for reptiles which have been displaced and translocated during works.
Residual effect	Residual effects are those effects that remain after all three forms of mitigation (embedded, good practice and additional) have been factored into the assessment of effects.
River Basin District	The area of land and sea made up of one or more adjacent river basins together with their associated groundwaters and coastal waters.
Road Verge of Ecological Importance (RVEI)	A road verge that supports either a notable species and/or a species rich habitat. Selection of Road Verge of Ecological Importance sites is carried out by the Hampshire Biodiversity Information Centre. The county council is responsible for the management of the verges on all roads in the county, except motorways, major trunk roads and urban areas.
Runoff	Precipitation that flows as surface water from a site, catchment or region.

Term	Definition
Scheduled Ancient Monument	Scheduled Monument within the meaning of the Ancient Monuments and Archaeological Areas Act 1979.
Scheduled Monument	A heritage asset designated and protected under the Ancient Monuments and Archaeological Areas Act 1979.
Setting	The surroundings in which a place is experienced, while embracing an understanding of perceptible evidence of the past in the present landscape.
Site of Special Scientific Interest (SSSI)	Site designated as being of special interest for its flora, fauna or geological or physiographical features and protected under the Wildlife and Countryside Act 1981.
Significant Observed Adverse Effect Level (noise) (SOAEL)	This is the level above which significant adverse effects on health and quality of life occur.
Special Area of Conservation (SAC)	An area which has been identified as being important for a range of vulnerable habitats, plant and animal species within the EU and is designated under the Habitats Directive.
Special Protection Area (SPA)	A site designated under the Birds Directive due to its international importance for the breeding, feeding, wintering or the migration of rare and vulnerable species of birds.
Source Protection Zone (groundwater) (SPZ)	Zones that show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk
Study area	The spatial area within which environmental effects are assessed (i.e. extending a distance from the development footprint in which significant environmental effects are anticipated to occur). This area varies between different environmental topic areas.
Sustainable Drainage Systems (SuDS)	A collective approach to manage surface water as close to source as possible and mimic natural drainage by taking into account water quantity (flooding), water quality (pollution), biodiversity (wildlife and plants) and amenity.
Sustrans	Registered British charity whose aim is to promote sustainable transport, i.e. walking, cycling and public transport.
Temporary traffic management	Measures, including directive barriers and signs, taken to ensure that road users can travel safely through or around the work site.
UK Biodiversity Action Plan	UK list of priority species and habitats compiled in response to Article 6 of the Biodiversity Convention. Forms part of the UK's commitment to biodiversity.

Term	Definition
Water Framework Directive	Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for community action in the field of water policy.
Zone of Influence	The area(s) over which environmental features may be affected by the biophysical changes caused by the Proposed Scheme.
Zone of Theoretical Visibility	A map, usually digitally produced, showing areas of land within which a development is theoretically visible.

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