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Wiltshire Council

Melksham Bypass

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Preliminary Environmental Assessment Report
Volume 1 Main Report

12/11/21

A1

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Document history

Revision	Suitability	Purpose description	Originated	Checked	Reviewed	Authorised	Date
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1. Introduction

1.1. Scheme overview

1.1.1. Wiltshire Council is promoting a scheme for the A350 at Melksham as part of an application to the Large Local Majors (LLM) fund administered by the Department for Transport (DfT).

1.1.2. The scheme was one of nine priority schemes identified by the Western Gateway Sub-national Transport Body (STB). In March 2020, the Government awarded funding to further develop the case for the project, having considered an initial Strategic Outline Business Case submission made in July 2019.

1.1.3. The scheme is intended to improve the current and future transport-related problems and issues relating the A350 at Melksham including journey times and delays, journey time reliability, collisions and severance.

1.1.4. An initial sifting process of options has been completed including two non-statutory consultations which has led to one route option alignment to be further considered as part of the preliminary environmental assessment in this report. Further information about the initial route options considered is provided in the Options Assessment Report (OAR)[1].

1.1.5. This Preliminary Environmental Assessment Report (PEAR) considers the potential environmental impacts of the emerging preferred route option (hereby referred to as 'the Scheme') taken forward that will also be presented in the Outline Business Case (OBC) to be submitted to DfT in November 2021.

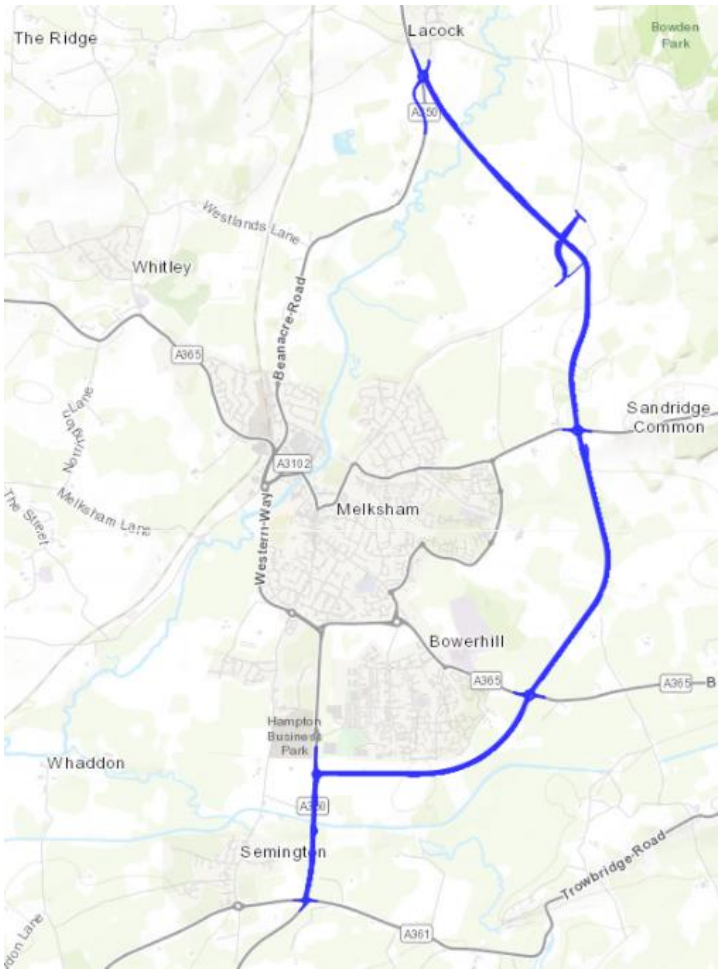
1.1.6. The Scheme is indicated in Figure 1-1 below. The development of this Scheme has been an iterative process between the design and environmental teams, ensuring that environmental feedback on the design is incorporated into the design or set out as mitigation measures. This had driven the intent of seeking to avoid or minimise potentially significant adverse environmental effects caused by the Scheme.

[1] Melksham Bypass Options Assessment Report (May 2021) online here: Part 1 - https://www.wiltshire.gov.uk/media/6753/Melksham-bypass-Options-Assessment-Report-OAR-Draft-May-2021-Part-1/pdf/Options_Assessment_Report_OAR_Draft_-_May_2021_-_Part_1.pdf?m=637600678372230000

Part 2 - https://www.wiltshire.gov.uk/media/6754/Melksham-bypass-Options-Assessment-Report-OAR-Draft-May-2021-Part-2/pdf/Options_Assessment_Report_OAR_Draft_-_May_2021_-_Part_2.pdf?m=637600678746730000

Appendices - https://www.wiltshire.gov.uk/media/6757/Options-Assessment-Report-OAR-Draft-May-2021-Appendices/pdf/Options_Assessment_Report_OAR_Draft_-_May_2021_-_Appendices.pdf?m=637601233876630000

Figure 1-1 - Melksham proposed Scheme layout



1.2. Purpose of this PEAR

1.2.1. This PEAR considers the potential environmental impacts and consequential effects of the Scheme. It is anticipated that the design will continue to be developed, in an iterative manner alongside the Environmental Impact Assessment (EIA) process, and that an Environmental Statement (ES) will be submitted as part of a planning application in 2024. Further information about the Scheme being considered at this stage can be found in Section 2.3.2.

1.2.2. To ensure a robust option selection process is completed, the Scheme has produced an OAR[1] which summarises the cost, buildability, engineering, traffic and environmental constraints of each of the options considered for this Scheme. The OAR aims to assist the selection of a preferred route alignment option to bring forward for preliminary and detailed design, and obtain any necessary planning consents.

1.2.3. The PEAR provides the design team and consultees with the information compiled, to date, about the predicted environmental impacts and effects of the Scheme. Where appropriate and necessary, the PEAR proposes mitigation to reduce the scale of adverse impacts where they have been identified. This has been done to provide detail for consultation and assist the development of a final preferred Scheme, for progression to the next stage of design.

1.2.4. For each environmental topic, this PEAR:

- Describes the environmental baseline data collection work undertaken to date;
- Describes the existing baseline environment, based on the primary and secondary data collection to date;

- Provides an assessment of the likely potential environmental impacts and effects of the Scheme based on the currently available information;
- Describes the range of mitigation measures that will be considered to avoid, reduce/mitigate or offset any identified adverse environmental effects likely to arise from the impacts, as appropriate; and
- Summarises the findings of the assessment.

1.2.5. This PEAR will be made available to prescribed consultees, so they can understand the environmental aspects and main environmental effects and implications of the Scheme considered at this stage.

1.2.6. Following the completion of the consultation on this document, Wiltshire Council will take account of comments and suggestions received from the consultees, to help develop the final Scheme design. The responses to the consultation will feed into the way the EIA work is undertaken and reported and help to finalise the ES.

1.3. Proposed Scheme programme

1.3.1. The proposed programme for the Scheme is as follows:

- PEAR – November 2021
- OBC submission to DfT – November 2021
- Environmental Scoping Report – March to June 2022
- Consultation on the preferred Scheme – June to July 2022
- EIA, preparation of the ES and planning application – July 2022 to February 2024

1.4. Need for EIA

1.4.1. The Scheme does not meet the screening criteria for it to be designated as a Nationally Significant Infrastructure Project (NSIP), and therefore, consent for the Scheme can be sought via a planning application under the Town and Country Planning Act 1990.

1.4.2. The requirement for certain projects to report their effects on the environment is derived from European Union (EU) legislation, initially in Council Directive 85/337/EEC, on the assessment of the effects of certain public and private projects on the environment. This legislation has been amended three times, in 1997, in 2003 and in 2009, with the amendments codified by Directive 2011/92/EU of 13 December 2011. The most recent changes have been adopted in UK legislation, for the purposes of planning applications, by the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the “EIA Regulations 2017”), which transposes changes made to EU Directive 2011/92/EU1 (“the EIA Directive 2011”) by EU Directive 2014/52/EU2.

1.4.3. The EIA Regulations 2017, in Schedule 1, sets out thresholds for certain types of projects that, by their scale or nature, require an EIA to be prepared. Where projects do not meet these thresholds, Schedule 2 of the Regulations lists projects (including highways projects) for which an EIA may still be required, if their effects on the environment are deemed to be significant. The process by which this decision is made is known as Screening.

1.4.4. The Scheme is within the definition of Schedule 2 projects and will undergo EIA screening and scoping; however, this process is expected to confirm that Wiltshire Council will consider the Scheme to be Schedule 2 EIA development and will require an EIA to be undertaken and reported in an ES to accompany a planning application, in line with the EIA Regulations 2017.

1.4.5. The aim of EIA is to protect the environment by ensuring that the local planning authority, granting planning permission, does so in the full knowledge of the likely significant environmental effects, and takes this into account in the decision-making process.

1.4.6. The EIA will be carried out by a team of specialists, working in close collaboration with the design engineers responsible for the preliminary design of the Scheme, as part of an iterative design,

consultation and assessment process. This will maximise the opportunity to avoid or reduce adverse environmental effects, at source, and to identify the most effective mitigation of those effects that cannot be avoided.

1.5. Overseeing organisation

1.5.1. The overseeing organisation for the Scheme is Wiltshire Council.

1.6. The designer

1.6.1. The designer is Atkins Ltd, a member of the SNC Lavalin Group. When the OBC is approved by DfT and budget is available for the Scheme preparation and development, Atkins would be appointed by Wiltshire Council to undertake the preliminary design of the Scheme, which includes EIA and the preparation of an ES.

1.7. Key legislation and policy

Overview

1.7.1. The Scheme would involve the construction of a new highway adjoining but outside the existing highway boundary of the A350. Given the highway authority is Wiltshire Council and not the Secretary of State or strategic highways company (Highways England), the Scheme does not meet the criteria of a Nationally Significant Infrastructure Project (NSIP) under the Planning Act 2008, and the preparation and submission of a Development Consent Order application will not be required. In its place, a planning application will be prepared by Atkins Ltd on behalf of the Wiltshire Council Highway Authority as the 'Applicant' and submitted to Wiltshire Council (as the local planning authority) for determination under Regulation 3 of the Town and Country Planning Act 1990 (the 'TCPA 1990').

1.7.2. Section 70(2) of the TCPA 1990 and Section 38(6) of the Planning and Compulsory Purchase Act 2004 require that applications for planning permission must be determined in accordance with the development plan unless there are material considerations that indicate otherwise.

1.7.3. The revised National Planning Policy Framework (NPPF), published in July 2021, represents up-to-date Government planning policy and is a material consideration that must be taken into account where it is relevant to a planning application or appeal. This includes the presumption in favour of development found at paragraph 11 of the NPPF. If decision makers choose not to follow the NPPF, where it is a material consideration, clear and convincing reasons for doing so are needed.

1.7.4. Paragraph 48 of the NPPF states that decision makers may give weight to relevant policies in emerging plans according to: (1) the stage of preparation of the emerging plan; (2) the extent to which there are unresolved objections to relevant policies in the emerging plan; and (3) the degree of consistency of relevant policies to the policies in the NPPF.

1.7.5. The development plan currently comprises the Wiltshire Core Strategy, adopted in January 2015, the saved policies of the adopted West Wiltshire District Plan, January 2004, the Wiltshire Housing Site Allocations Plan approved in February 2020, the West Wiltshire Leisure and Recreation Development Plan Document (DPD) approved in February 2009 and adopted Minerals and Waste Plans.

1.7.6. Planning applications are currently determined by Wiltshire Council in accordance with the above adopted development plan, with the policies of the NPPF taken into account as a material consideration. The emerging Wiltshire Local Plan Review is at an early stage of preparation. The current aim is to complete the Pre-Submission Draft Local Plan for public consultation at the end of 2022. The intention is that upon adoption of the Wiltshire Local Plan (potentially by late 2024), this will replace the Wiltshire Core Strategy (WCS) and the saved policies of the adopted West Wiltshire District Plan, to form part of the adopted development plan.

1.7.7. The current schedule for the submission of the planning application and ES for the Scheme is spring 2024. The application would therefore be determined in accordance with the Wiltshire Local Plan, assuming it has reached adoption by then. In the intervening period, the preparation of the environmental assessments would need to be based on the currently adopted development plan, with the policies of the emerging Local Plan afforded increasing weight as each successive stage of the Local Plan Review is reached.

1.7.8. It is intended that the principle of development for the Scheme will be supported by the proposed safeguarding of the preferred route option within the emerging Local Plan. A suitable evidence base will be provided in order to include the safeguarded route corridor within the Pre-Submission Draft Local Plan, for public consultation and stakeholder engagement at the end of 2022.

Planning policy review

1.7.9. The following policy documents contain the policies which will be used to assess the environmental impacts of the Scheme within this preliminary environmental assessment. Table 1-1 lists the policies and sections within each of the national and local planning documents which have relevance to the Scheme.

1.7.10. The NPPF and National Planning Practice Guidance (NPPG) are material considerations for all planning decisions. The NPPF sets out the Government's planning policies for England, based upon a presumption in favour of sustainable development. The NPPG was published in March 2014 and reviewed in 2019. The NPPG is a web-based resource which provides guidance on procedural matters and on numerous material considerations.

1.7.11. The WCS adopted on 20 January 2015, provides the overarching planning policy framework for Wiltshire for the period up to 2026. The plan sets out the Council's Spatial Vision, Key Objectives and Overall Principles of Development in the County.

1.7.12. The 'saved policies' of the West Wiltshire District Plan – First Alteration (June 2004) form part of the existing Development Plan and the policies of relevance are outlined in Table 1-1.

1.7.13. The Joint Melksham Neighbourhood Plan (2020-2026) prepared by Melksham Town Council and Melksham Without Parish Council was 'made' in July 2021. Wiltshire Council will now refer to the Joint Melksham Neighbourhood Plan in determining planning applications that are located within the neighbourhood area.

Table 1-1 – Policy documents and relevant policies

Policy document	Policy number	Policy name
National Planning Policy Framework (2021)	Chapter 9	Promoting Sustainable Transport
	Chapter 14	Meeting the challenges of climate change, flooding and coastal change
	Chapter 15	Natural Environment
	Chapter 16	Historic Environment
National Planning Practice Guidance (2019)		Consultation and Pre-decision Matters
		Climate Change
		Flood Risk and Coastal Change
		Natural Environment
		Health and Well-being
Wiltshire Core Strategy (2015 - 2026)	Core Policy 50	Biodiversity and Geodiversity
	Core Policy 51	Landscape
	Core Policy 52	Green Infrastructure

Policy document	Policy number	Policy name
	Core Policy 55	Air Quality
	Core Policy 56	Contaminated Land
	Core Policy 58	Ensuring the Conservation of the Historic Environment
	Core Policy 60	Sustainable Transport
	Core Policy 61	Transport and Development
	Core Policy 62	Development Impacts on the Transport Network
	Core Policy 64	Demand Management
	Core Policy 67	Flood Risk
	Core Policy 68	Water Resources
Saved Policies of the West Wiltshire District Plan – First Alteration (2004)	Policy C9	Rivers
	Policy C15	Archaeological Assessment
	Policy C35	Light Pollution
	Policy C37	Contaminated Land
	Policy T11	Cycleways
	Policy T12	Footpaths and Bridleways
	Policy U4	Groundwater Source Protection Areas
Joint Melksham Neighbourhood Plan (2020-2026)	Policy 1	Sustainable Design and Construction
	Policy 3	Flood Risk and Natural Flood Management
	Policy 5	Community Engagement
	Policy 11	Sustainable Transport and Active Travel
	Policy 12	Green Infrastructure
	Policy 13	Biodiversity
	Policy 16	Trees and Hedgerows
	Policy 17	Landscape Character
	Policy 19	Local Heritage

1.7.14. Other relevant policy documents include the Wiltshire Climate Strategy Discussion Document and the Wiltshire Local Transport Plan (2011-2026).

1.7.15. The Wiltshire Climate Strategy Consultation Draft September 2021, sets out the challenges and opportunities in relation to carbon reduction and climate resilience. The consultation period ends on 17 October 2021; the final Wiltshire Climate Strategy will be issued following any revisions made in response to comments received.

1.7.16. The Wiltshire Local Transport Plan (2011-2026) sets out a long-term transport strategy, a shorter-term implementation plan and a number of supporting strategies for Wiltshire. All supporting strategies are of relevance to the design development of the Melksham Bypass proposals and any associated active travel measures to be proposed within Melksham.

1.7.17. Relevant policies contained within the national and local planning documents identified above are set out in detail, on a topic by topic basis, in each relevant chapter of the PEAR.

1.8. Structure and contents of the PEAR

1.8.1. This PEAR is presented in three volumes, to allow for easier understanding of the content:

- Volume 1 contains the chapters describing the Scheme, followed by specific environmental topic chapters. These topic chapters are outline d in Table 1-2 below;
- Volume 2 comprises all appendices created in the production of PEAR Volume 1; and
- Volume 3 comprises all the figures created in the production of PEAR Volume 1.

Table 1-2 – Contents of the PEAR

Volume	Chapter	Content
Volume 1	Chapter 1	Introduction
	Chapter 2	The Scheme
	Chapter 3	Environmental Assessment Methodology
	Chapter 4	Air Quality
	Chapter 5	Noise and Vibration
	Chapter 6	Biodiversity
	Chapter 7	Road Drainage and the Water Environment
	Chapter 8	Landscape and Visual
	Chapter 9	Geology and soils
	Chapter 10	Cultural Heritage
	Chapter 11	Materials and Waste
	Chapter 12	Population and Human Health
	Chapter 13	Climate Change Effects
	Chapter 14	Vulnerability to Climate Change
	Chapter 15	Summary of all environmental effects
	Abbreviations and Glossary	
Volume 2	Appendices	
Volume 3	Figures	

1.8.2. This structure has been selected as it closely mirrors the expected structure of the ES. This will allow the development of the project and evolution of the Scheme, between the production of the PEAR and the completion of the ES, to be tracked effectively.

1.9. Consultation

1.9.1. Two non-statutory consultations have been undertaken for the Scheme which have included:

- Public consultation in November 2020 to January 2021 where an initial consultation exercise regarding the long list of options was undertaken including potential improvements.
- Public consultation in June 2021 to August 2021 where consultation on the emerging option was undertaken.

1.9.2. Comments from various environmental stakeholders including the Wiltshire's Wildlife Trust, Natural England and Historic England were received.

1.9.3. Other ad hoc consultation has also been undertaken with key environmental stakeholders as the option development has progressed to understand key concerns in the early stages of the design. The stakeholders that have been consulted so include:

- Wiltshire Council specialists:
  - Ecology
  - Landscape
  - Archaeology
  - Conservation
- Environment Agency
- Historic England
- National Trust

2. The Scheme

2.1. Need for the Scheme

2.1.1. The A350 in Wiltshire forms part of the Major Road Network (MRN). It connects the M4 corridor (at Junction 17) with the Dorset Coast and Poole port and is the main transport artery serving the A350 Growth Zone identified in the Swindon and Wiltshire Strategic Economic Plan (SEP)[2]. Improvement to the A350 route forms a key part of the Western Gateway Strategic Transport Plan 2020 – 2025[3], which identifies improved north / south connectivity between the Midlands and South Coast as a fundamental priority for the Western Gateway region.

2.1.2. Between Chippenham and Trowbridge the A350 passes through Melksham (a market town with a population of approximately 31,000) and the smaller village of Beanacre to the north. Here, the A350 also serves an important local function providing access to key commercial and retail sites, in addition to the town's railway station. Sections of the route are also fronted by residential properties, with the speed limit restricted to 30mph. The route suffers from delays and congestion, including at key junctions.

2.1.3. The A350 corridor has experienced significant growth over the last decade, and this trend is expected to continue. Key policy documents including the SEP and Wiltshire Core Strategy (WCS) 2006-2026[4] confirm that population, housing and economic growth in Wiltshire is expected to be concentrated in the A350 corridor, and this is supported by housing allocations and planning permissions that are now in place for the 2017-2026 period. Wiltshire Council is currently undertaking a Local Plan Review which extends the planning horizon to 2036 and establishes a continued high demand for new housing in the A350 corridor linked to economic growth.

2.1.4. The key transport problems with respect to the A350 at Melksham and Beanacre include:

- Journey times and delays;
- Poor journey time reliability;
- Collisions (road safety);
- Severance; and
- Localised noise, disturbance and emissions.

2.1.5. Collectively, these transport problems have the potential to create wider negative impacts on economic, environmental and social outcomes in Melksham and the wider A350 corridor.

2.1.6. Future traffic growth in the A350 corridor, linked to new housing and economic activity, is likely to exacerbate many of the issues identified. Traffic model forecast data predicts average peak period journey times on the A350 through Melksham to increase by approximately 10% to 13% between 2018 and 2036 (equating to approximately 1 to 2 minutes additional journey time per vehicle). Without intervention, this suggests that by 2036 all through-traffic on the A350 at Melksham would incur a total additional 55,000 vehicle hours of journey time on this section over the course of a year.

2.2. Scheme objectives

2.2.1. In response to the problems and issues, three strategic outcomes linked to five pairs of high-level objectives and transport objectives have been identified for the Scheme. The objectives and outcomes have a strong alignment with the MRN / LLM fund objectives. Further details regarding the objectives are provided in the OAR.

[2] https://www.lepnetwork.net/media/1128/swindon-wiltshire-sep.pdf

[3] https://westerngatewaystb.org.uk/strategy/2020-2025-western-gateway-strategic-transport-plan/

[4] https://pages.wiltshire.gov.uk/wiltshire-core-strategy-web-version-new-june.pdf

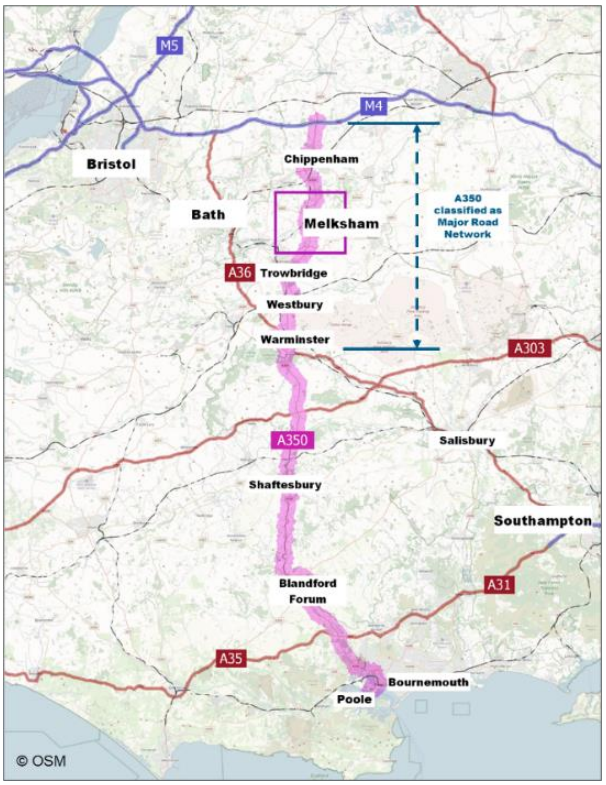
Table 2-1 – Strategic outcomes, high-level objectives, and transport objectives

Strategic outcomes	High-level objectives	Transport objectives
Sustainable population and economic growth in the A350 corridor, with positive impact on regional and national economic productivity. Sustainable population and economic growth around Melksham / Bowerhill, supporting a revitalised town centre. Improved physical and mental wellbeing for users of the A350 and residents of Melksham.	Improve north-south connectivity between the M4 and South Coast, and provide capacity for growth in the A350 corridor between Trowbridge / Westbury and Chippenham / M4	Reduce journey times and delays on the A350 through Melksham and Beanacre, allowing for future growth in demand
	Improve connectivity for other through journeys via Melksham (to/from Bath, Calne and Devizes)	Reduce journey times and delays on the following routes through Melksham, allowing for future growth in demand: - A350 South - A3102 - A365 West - A365 East - A350 South - A365 West
	Improve connectivity within Melksham / Bowerhill, particularly for walking and cycling journeys to Melksham town centre and along the existing A350 corridor through Melksham	Provide enhanced opportunities for walking and cycling between Melksham town centre and rail station / Bath Road, and along the existing A350 corridor within Melksham
	Reduce personal injury accidents on the road network	Reduce personal injury accident rates and severity for the A350 and Melksham as a whole
	Reduce severance impacts of traffic on communities in Melksham / Bowerhill and Beanacre	Reduce the volume of traffic including HGVs, passing along the current A350 route in northern Melksham and Beanacre, and avoid negative impacts on other existing or potential residential areas

2.3. Scheme location

2.3.1. The location of Melksham is presented In Figure 2-1 below.

Figure 2-1 – Location of Melksham along the A350



2.3.2. Melksham is one of Wiltshire's oldest towns, located between Chippenham (to the north) and Trowbridge (to the south). The Melksham Community Area has a population of approximately 31,0003. Melksham has a strong employment and manufacturing base (with its major employers including Cooper Avon Tires and Avon Technical Products) and there are business parks and industrial sites at Bowerhill, Avonside Enterprise Park and Challeymead. The market towns of Trowbridge, Chippenham and Devizes are within close proximity of Melksham and the city of Bath and Swindon are only 30 and 45 minutes away respectively. Inter-dependency between these centres generates regional economic advantage. Melksham town centre provides a range of local services and convenience shopping.

2.3.3. The section of the A350 through Melksham has been identified as a key remaining constraint on the route within Wiltshire, lying at the heart of the A350 corridor between Chippenham and Trowbridge. Issues include 30mph sections through residential areas of Beanacre and northern Melksham, and frequent peak period congestion throughout Melksham, including at the busy Bath Road, Farmers, Semington Road and Western Way junctions.

2.3.4. The A350 corridor, has a major role to play in meeting housing and employment needs in Wiltshire in a sustainable manner. Local economic and land use policy identifies the need for selective improvement to the A350 to maintain and enhance journey times and reliability, with the aim of aiding housing and employment growth at Chippenham, Melksham, Trowbridge, Westbury and Warminster.

2.3.5. The WCS established the need for delivery of approximately 41,000 dwellings across Wiltshire between 2006 and 2026. The Wiltshire Housing Site Allocations Plan (WHSAP), published in February 2020[5], reports housing completions between 2006 to 2017 along with developable commitments up to 2026, in order to assess progress towards achieving the housing requirements outlined in the WCS. The WHSAP indicates that in relation to Melksham, progress has been higher than expected (1,450 delivered by 2017, against a requirement of 2,250 by 2026). Several major

[5] https://www.wiltshire.gov.uk/media/4540/Wiltshire-Housing-Site-Allocations-Plan-Adopted-February-2020/pdf/Wiltshire_Housing_Site_Allocations_Plan_Adopted_February_2020.pdf?m=637347424921570000

planning permissions having been granted for new housing developments on the south and eastern edges of Melksham near Western Way, Spa Road and Eastern Way.

Environmental constraints

2.3.6. The majority of the Scheme area is in low-lying, open, mixed use farmland with isolated farmsteads. There is an old Roman Road crossing the A350 in the north of the Scheme approximately 800 m south of Lacock. There are several watercourses that run through the Scheme area including the River Avon in the north. High voltage pylons are located throughout the area and there are a combination of isolated farmsteads, and settlements across the Scheme area.

2.3.7. Environmental constraints in the Melksham area are shown on Figure 2.1 in Volume 3. The key constraints include:

- The existing settlements of Melksham, Beanacre, and Bowerhill, plus properties to the east of Melksham (e.g. along Woodrow Road and Sandridge Common), and the historic village of Lacock to the north and Semington to the south;
- The River Avon, Forest Brook, Clackers Brook, Semington Brook and their floodplains and various other small tributaries;
- The Kennet and Avon Canal;
- Grade I, II and II* Listed Buildings located in and around Melksham including a pocket to the south of Beanacre and Bowerhill and along Bath Road;
- Six noise important areas located along the A350 between Beanarce and where the A350 meets the A365 with one in Semington and one in the centre of Melksham;
- Pockets of ancient woodland located to the north of Melksham to the west of the A350, and in Sandridge Common to the east of Melksham;
- Four historic landfills; and
- Footway and bridleway paths as well as the National Cycle Route.

2.4. Scheme description

2.4.1. A plan of the Scheme is shown on Figure 2.2 in Volume 3. Details of the Scheme are provided below.

Emerging bypass

2.4.2. The Scheme will provide an approximately 9 km long full bypass to the east of Melksham. Key components include:

- A priority roundabout (Junction 1) is located at the existing A350, south of Melksham. The roundabout includes a signalised controlled crossing to accommodate walking/cycling communities that use MELW42;
- A priority roundabout (Junction 2) connects traffic to the A365. The mainline passes through open countryside and has aimed to reduce impacts as far as possible on known waterbodies, ancient woodland, priority roundabouts and archaeological monuments;
- The alignment runs parallel to Eastern Way and seeks to limit impact to a potential housing site allocation (Gleeson) as part of the emerging plan. A priority roundabout (Junction 3) is located at the A3102. The curvilinear alignment avoids established local businesses and committed planning proposals (agricultural dwellings);
- Significant alterations are required to the Lower Woodrow road; the existing road is diverted north and passes over the new bypass;
- The alignment crosses the Wilts and Berks canal and connectivity of MELW63 is maintained at this location;
- A viaduct will span the River Avon, associated flood zone and Roman Road asset;
- Four bridges are proposed over the Clackers and Forest brooks;
- The route ties into the existing A350 by a proposed priority roundabout (Junction 5) at the location of "Melksham Road". Significant alterations are required to the existing A350 alignment in this location;

- A series of drainage ponds are located along the east side of the route which are required to attenuate surface water from the new bypass; and
- The bypass design is based on a single carriageway (9.3m wide), with scope for future dualling, and is designed for national speed limit (60 mph).

Public Rights of Way

2.4.3. The Scheme takes account of existing Public Rights of Way (PRoW) and other facilities currently used by pedestrians, cyclists and horse-riders. At this stage, the design process has been informed by a Walking, Cycling and Horse-riding Assessment and Review (WCHAR), engagement with PRoW officers from Wiltshire Council and wider feedback obtained through public consultation.

2.4.4. The current Scheme route includes provision for potential sections of combined footway / cycleway parallel to the new road. These would be connected to existing footpaths and bridleways, creating more opportunities for residents to access and enjoy the local countryside.

2.4.5. Where direct impacts on existing PRoW are unavoidable, the general principle is to provide alternative facilities, with betterment where possible. The number of crossing points of the Scheme has been rationalised and some diversions to routes are proposed, and some routes are proposed to be stopped up (although with alternative connections being maintained where feasible). At this stage, all permanent PRoW connections across the bypass route will be designed with the bypass passing over the PRoW.

Supplementary highway improvement works

2.4.6. To ensure the introduction of the bypass is conducive with the surrounding network the potential need for limited additional highway improvements has been identified. These include:

- Capacity improvements to the Littleton Roundabout on the A350 near Semington, to the south of the bypass route. This is the junction between the A350 and the east-west A365 route;
- Upgrading the existing section of the A350 between the southern A350 / bypass junction and the Littleton Roundabout to dual carriageway. This section is approximately 1.2 km in length and was originally constructed with potential future dualling in mind; and
- Signalisation of the A3102 / A342 junction to the east of the bypass route.

2.4.7. These supplementary improvements are currently included within the Scheme scope but will be subject to review and further assessment as the project develops.

Complementary measures

2.4.8. A potential package of walking and cycling improvements on and around the A350 and the town centre is proposed to complement the Scheme and create a better-connected walking and cycling network for Melksham. This would help to lock in the benefits from the bypass for traffic relief on the A350 and other routes through:

- Making use of existing walking and cycling connections in Melksham;
- Creating a cohesive walking and cycling network;
- Reducing pedestrian and cyclist casualties; and
- Creating more opportunities for active travel.

2.4.9. Three main components to the complementary measures have currently been identified which include:

- Pedestrian-Friendly Town Centre - Improve access for people to the Town Centre, through walking and cycling improvements on King Street / Bank Street;
- Better access to Melksham Rail Station - More direct links across the A350 between the Rail Station / employment areas and the rest of the town; and

- Northern / southern connections - Potential improved routes heading north towards Lacock and south towards Semington, Trowbridge and Bradford-on-Avon, via the National Cycle Network route 403.

Structures

2.4.10. Table 2-2 below describes the type and dimensions of the main structures required for the bypass. The Scheme will also provide two farm access overpasses and three pedestrian underpasses.

Table 2-2 – Structures required for the Scheme

Structure Name	Structure Type	Approximate Length (m)
River Avon Viaduct	Viaduct with clear span of watercourse channel	350
Canal Bridge	Clear Span	7
Clackers Brook South	Clear Span	20
Clackers Brook North	Clear Span	45
Forest Brook – South of Lower Woodrow Road	Clear Span	10
Forest Brook – North of Lower Woodrow Road	Clear Span	10
Semington Brook	Clear Span	70

Construction

2.4.11. Construction of the Scheme is assumed to start in 2025 with the Scheme open to traffic in 2028.

2.4.12. At this early stage of design development, much of the construction methodology of the Scheme is currently unknown and therefore assumptions are required for the assessment to understand the construction effects. The general assumptions are outlined below:

- Construction activities that affect the existing A350 will avoid peak times to minimise congestion and therefore disruption during construction;
- Where new junctions are proposed that effect other roads such as the A3102 Sandridge Hill and A365 Bath Road, temporary routes will be put in place for local residents and other users to continue to use the route. The duration of these temporary measures will be kept to a minimum to reduce disruption as far as possible. The duration of junction construction will depend on the construction stages of the whole project, but in isolation it may vary from 2 to 4 months.
- Access will be maintained to all properties for the duration of the Scheme;
- Night works will be limited as far as and possible and only used when the existing network requires closing for tie in works or road surfacing;
- PRoW will be kept open as long as it is safe to do so during construction, with closures forecasted and advertised in advance of works occurring, with suitable diversions put in place.
- Temporary light pollution is expected to be kept to minimum, only when required for safe working/operations;
- Modular construction methods are going to be incorporated in the design to optimise programme, reduce impact on the environment and reduce safety risks; and
- Noise levels are expected to be kept to minimal, especially in proximity to residential areas.

3. Environmental Assessment Methodology

3.1. Structure of PEAR

3.1.1. Each environmental topic will be considered in this PEAR as far as possible, on a consistent basis, with each chapter being structured as follows:

- Introduction
- Planning policy
- Study area and methodology
- Assumptions and limitations
- Consultation
- Baseline conditions
- Potential effects
- Potential mitigation measures
- Further work
- Summary

3.1.2. Some of the chapters contain accompanying Appendices to assist the understanding of the assessment undertaken. These are provided in Volume 2: Appendices.

3.1.3. Additionally, GIS figures accompany some chapters which are provided in Volume 3: Figures.

3.2. Study area and methodology

3.2.1. Study areas are defined individually for each environmental topic, according to the geographic scope of the potential impacts relevant to that topic or of the information required to assess those impacts. It draws on guidance in the Design Manual for Roads and Bridges (DMRB) where this specifies the extent of study areas. The study areas are defined within each relevant chapter of this report.

3.2.2. The methodology describes the guidance used for the assessment of each environmental topic, together with the criteria to determine the magnitude of effects and the sensitivity of receptors. For this Scheme, the assessment methodology has generally been adopted from DMRB LA Sustainability and Environment. Where there is no standard guidance this is stated, together with the methodology used to undertake the assessment.

3.3. Assumptions and limitations

3.3.1. Assumptions and limitations that have been identified in undertaking the assessment are listed. These can include limits on available design information at the time of writing the PEAR and assumptions on the type and methods of construction.

3.3.2. The assessments in the topic chapters have taken into account the full Scheme design extent boundary (referred to as the ‘Proposed Scheme Boundary’ on the figures in Volume 3). This boundary has been developed to include the area for the future dualling (west side of the route) and the area for proposed pond locations and maintenance tracks etc. This is an indicative boundary that will be developed further in the next design stage and in consultation with landowners.

3.3.3. The design extent boundary does not include the area required for environmental mitigation at this stage and this will be developed at the next stage of the design, following completion of the environmental surveys.

3.4. Baseline

3.4.1. The existing baseline conditions are defined to allow the assessment of changes that would be caused by the Scheme. The identification of the baseline requires the description of the existing situation and also a prediction of how it is likely to change in the absence of the Scheme.

3.4.2. The description of the baseline conditions identifies receptors that may be affected by the Scheme and also their 'value' or 'sensitivity' to potential change.

Do-Minimum and Do-Something Scenarios

3.4.3. The assessment of effects involves comparing a scenario with the Scheme against one without the Scheme over time. The absence and presence of the Scheme are referred to as the 'Do–Minimum' (DM) and 'Do–Something' (DS) scenarios, respectively. Dependent upon the environmental topic, the scenarios are assessed in the baseline year and a future assessment year or a series of future assessment years (for example, 15 years after opening, or the anticipated worst year in the first 15 years of operation).

3.4.4. The DM scenario is defined by DMRB as "the scenario that represents the situation that would occur without the project in operation, which includes permitted developments"[6]. Identification of the baseline therefore requires first the identification of the existing situation, and then the prediction of how it is likely to change between now and implementation of the Scheme, anticipated in 2028 (opening year).

Future Baseline

3.4.5. For the purposes of cumulative impact assessment, which will be included in the ES, consideration must be given to consented developments in the vicinity of the Scheme, as well as planned future housing and employment growth levels and general locations in order to develop a future baseline scenario.

3.4.6. The future baseline environment comprises the existing baseline, together with new or changed characteristics and conditions that can reasonably be predicted to be present during construction and/or operation of the Scheme. These characteristics are derived from the collation of a list of 'Reasonably Foreseeable Future Projects' (RFFPs) which will be developed and published within the ES. The ongoing production of the planning strategy for the project will finalise the future baseline scenarios required for the new road.

3.4.7. There are two main contributing elements in the definition of the future baseline that will be considered within the ES:

- RFFPs sourced from a search of relevant planning applications, development consent order (DCO) applications, Transport and Works Act Order (TWAO) applications and proposed development contained within relevant Development Plan documents.; and
- Forecast changes in traffic conditions projected within local authority traffic forecast models. Further details about this will be referenced in the air quality and noise and vibration topic chapters of the ES, which will draw on traffic modelling outputs.

3.5. Identification of potential effects

3.5.1. Schedule 4 of the EIA Regulations 2017 requires:

3.5.2. A description of the likely significant effects of the development on the environment resulting from, *inter alia*:

[6] https://www.standardsforhighways.co.uk/prod/attachments/10191621-07df-44a3-892e-c1d5c7a28d90?inline=true

A. *the construction and existence of the development, including, where relevant, demolition works;*
B. *the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources;*
C. *the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste;*
D. *the risks to human health, cultural heritage or the environment (for example due to accidents or disasters);*
E. *the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources;*
F. *the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change;*
G. *the technologies and the substances used.*

3.5.3. The description of the likely significant effects should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development.'

3.5.4. A range of environmental topics may be affected by the Scheme. Effects may be negative or positive, temporary or permanent. They may also be described as:

- Direct or Primary Effect: caused by activities which are an integral part of the proposals resulting in a change in environmental conditions, such as construction works causing an increase in dust concentrations in the air;
- Indirect or Secondary Effects: due to activities that affect environmental conditions or the receptors, which in turn affects other aspects of the environment or receptors;
- Cumulative: comprising multiple effects from different sources within the proposals (Inter), or cumulatively with other developments (Intra), on the same receptors; and
- Residual: effects that remain after the positive influence of mitigation measures are considered.

3.5.5. Each of these effects can persist over a period of time and can be considered as:

- Short term: effects that would last for a limited duration, for example, noise generated during construction of the Scheme; and
- Long term: permanent effects from the operational activities of the Scheme.

Assessment of significance

3.5.6. The proposed general approach will be adopted in accordance with relevant guidance and best practice. Methods and requirements specific to each environmental topic are set out in the relevant chapters (Chapters 4 to 14).

3.5.7. With the receptors identified and their sensitivity classified, the potential effects of construction and operation, where appropriate, will be established and the magnitude of the impact determined.

3.5.8. In accordance with guidance in DMRB LA104[7], for each environmental topic the assessment will combine the magnitude of the impacts and the sensitivity of the resources/receptors that could be affected in order to classify the effect (see Table 3-1) and to establish their significance (from very large to neutral). It is generally accepted that effects which are moderate or higher are deemed significant in assessments.

[7] https://www.standardsforhighways.co.uk/prod/attachments/0f6e0b6a-d08e-4673-8691-cab564d4a60a?inline=true

Table 3-1 - Significance of effects

Environmental Value (Sensitivity)	Magnitude of impact (degree of change)				
	Major	**Moderate**	**Minor**	**Negligible**	**No change**
Very high	Very large	Large or very larger	Moderate or large	Slight	Neutral
High	Large or very large	Moderate or large	Slight or moderate	Slight	Neutral
Medium	Moderate or large	Moderate	Slight	Neutral or slight	Neutral
Low	Slight or moderate	Slight	Neutral or slight	Neutral or slight	Neutral
Negligible	Slight	Neutral or slight	Neutral or slight	Neutral	Neutral

Table Source: DMRB LA 104, Chapter 3, Table 3.8.1

3.5.9. General descriptors for the significance of effect are provided in Table 3-2.

Table 3-2 - Descriptors of the Significance of Effect Categories

Significance Category	Typical descriptors of effect
Very Large	Effects at this level are material in the decision-making process.
Large	Effects at this level are likely to be material in the decision-making process.
Moderate	Effects at this level can be considered to be material decision-making factors.
Slight	Effects at this level are not material in the decision-making process.
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

Table Source: DMRB LA104, Chapter 3, Table 3.7

3.5.10. The classification of effects also considers the following descriptors:

- Adverse, neutral or beneficial;
- Permanent or temporary;
- Duration/frequency or likelihood;
- Direct or indirect;
- Secondary; or
- Cumulative.

3.5.11. The duration of the effect will be assessed to be either temporary or permanent on the following basis:

- Temporary (e.g. demolition and construction phase);
- Short term (< 5 years);
- Medium term (5-10 years); or
- Long term (> 10 years); and
- Permanent (e.g. once the proposed works are completed and operational).

3.5.12. Whilst the criteria derived vary between environmental topics (from a very formal set of criteria based on nationally recognised standards for air quality, to more qualitative criteria derived to assess landscape impact or heritage) each specialist will have used the common terminology set

out above alongside their topic-specific guidance and their professional judgement to assess the significance of effects. Where alternative basis of assessment applies, this is explained in the appropriate chapter.

3.6. Design and mitigation

3.6.1. Proposals for mitigation follow the hierarchy of avoid, reduce, remedy and compensate. This reflects the DMRB LA 104[8] definitions of embedded mitigation as “measures which are integrated into a project for the purpose of minimising environmental effects” and essential mitigation as “Mitigation critical for the delivery of a project which can be acquired through statutory powers”. Enhancement measures are defined as “measures over and above normal mitigation” (Interim Advice Note (IAN) 125/15).

3.6.2. Incorporated mitigation includes Best Practicable Measures (BPM) and construction environmental management procedures that all development projects are required to adopt in order to meet minimum legislative requirements. The PEAR also identifies generic mitigation on a topic by topic basis and specifies whether this is considered either in the initial assessment, or the residual effects assessment.

3.6.3. Consideration has been given to opportunities available to avoid or reduce adverse environmental impacts. These opportunities are described within each relevant chapter of this PEAR, supported by the identification of specific measures where appropriate, proposed as mitigation considered necessary to reduce adverse effects to an acceptable level, noting the preliminary design stage. Such mitigation measures have been considered within the assessment, informing the conclusions regarding the assessment of residual effects.

3.6.4. It is envisaged that mitigation measures may be advanced further during the Scheme development, as an iterative design and assessment process. Mitigation measures will also be informed by survey data being collected for the purposes of the Preliminary Design Stage and developed in consultation with statutory bodies. The Scheme has highlighted mitigation considered necessary to reduce effects to an acceptable level noting the preliminary design stage, and the assessment reports on this basis within the Potential Effects sections of each topic assessment.

3.6.5. During construction, the responsibility for further environmental mitigation and the adherence to environmentally responsible working practices will fall to the Principal Contractor. A Construction Environmental Management Plan (CEMP)will be prepared by the designer (Atkins) during the Preliminary Environmental Design Phase and refined as the Scheme progresses to construction and handover. The CEMP will detail practices identified by the ES that the Principal Contractor is to apply on site that will demonstrate commitments to environmental management. It will detail both generic and specifically targeted practices to enable construction to be undertaken with minimal impact on the environment and will also enable monitoring requirements to be set up. This PEAR as a pre-cursor document to the ES does not have an accompanying CEMP document or similar but provides an early steer for the measures that will be required as part of this document prior to the completion of the ES.

3.7. Cumulative effects

3.7.1. Cumulative effects are the result of multiple actions on environmental receptors. There are principally two types of cumulative impact:

- The combined action of a number of different environmental topic specific impacts upon a single resource/receptor (synergistic or interrelationships); and
- The combined action of a number of different projects, in combination with the project being assessed, on a single resource/receptor (additive).

3.7.2. Schedule 4 paragraph 5 of the EIA Regulations requires *‘A description of the likely significant effects*

[8] https://www.standardsforhighways.co.uk/prod/attachments/0f6e0b6a-d08e-4673-8691-cab564d4a60a?inline=true

of the development on the environment resulting from, inter alia: (e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources ….'

3.7.3. Therefore, the environmental effects of the Scheme will also be assessed in combination with the effects of other projects as part of the EIA process, where relevant information is available. The projects that should be considered as part of a 'cumulative' assessment for these purposes is not defined in the EIA Directive or Regulations and there is no standard approach to the assessment of cumulative effects, with different projects adopting different approaches. However, potential cumulative impacts with other major developments need to be identified, as required by the Directive. To aid in this, Planning Inspectorate's Advice Note 17 (Planning Inspectorate, 2015) suggests the categories of developments that should be included in such cumulative assessments. The following categories will be used in the ES assessment:

- Projects on the Infrastructure Planning Inspectorate's Programme of Projects;
- Trunk road and motorway projects which have completed the statutory planning processes, including those under construction;
- Other development projects under construction or with valid planning permissions, and for which formal EIA is a requirement or for which non– statutory EIA has been undertaken;
- Applications for consent which have been made, but which have not yet been determined;
- Projects identified in the relevant emerging or adopted Development Plans, with appropriate weight given as they move closer to adoption, recognising that information on these proposals may be limited at present; and
- Projects identified in other plans and programmes which set the framework for future development consents/approvals, where such development is reasonably likely to come forward.

3.7.4. Using these categories, developments will be identified with reference to local knowledge, published information and consultation with local planning authorities in the area.

3.7.5. It is anticipated that within the ES, topic chapters will report on individual receptors/resources predicted to experience multiple topic-specific effects and comment on their likely significance (i.e. intra-Scheme cumulative effects within a specialist topic). A separate cumulative assessment would then be produced to report on intra-Scheme cumulative effects that have been identified for receptors/resources predicted to experience significant effects either within an environmental topic, and/ or in relation to more than one environmental topic (referred to as 'cross-topic').

3.8. Dealing with uncertainty

3.8.1. EIA is an iterative process, and the Scheme may include somewhat uncertain aspects. At the time that the EIA is submitted, it is proposed that no aspects of design would vary so much as to represent effectively different Schemes. The EIA would ensure it addresses the potential for effects to arise from a range of impacts resulting from any undecided parameters.

3.8.2. The Rochdale Envelope principle would be applied in accordance with the Planning Inspectorate Advice Note 9 using the 'Rochdale Envelope' which despite being written by the Planning Inspectorate to clarify its use in DCO applications, provides useful guidance in respect of the Town and Country Planning Act planning process. The ES will explain clearly any elements of the Scheme yet to be finalised, with justification. Where flexibility is sought in the Scheme design, the maximum potential adverse impacts of the Scheme will be assessed. The ES will confirm maximum and other dimensions of the Scheme, and that any changes to the development within such parameters would not result in significant effects not previously identified and assessed.

3.9. HRA

3.9.1. A Habitat Regulations Assessment Stage 1 Screening has been undertaken in accordance with DMRB guidance (Appendix D, Volume 3). The screening has concluded that there are potential

significant effects on European sites (Bath and Bradford on Avon Bats SAC, Severn Estuary SAC and Severn Estuary Ramsar) and so Stage 2 Appropriate Assessment will be undertaken.

4. Air Quality

4.1. Introduction

4.1.1. This chapter provides the preliminary environmental assessment for air quality. It outlines the air quality study area, methodology for assessment, baseline conditions, and the potential impacts associated with the Scheme during construction and operation. Where relevant, it identifies mitigation measures recommended to mitigate any potentially significant adverse effects.

4.2. Planning policy

National planning policy

National Planning Policy Framework

4.2.1. The Government's planning guidance of general relevance to air quality is found within the National Planning Policy Framework (NPPF)[9]. It provides guidance for local authorities on incorporating air quality considerations into planning decisions and aims to protect the environment and to promote sustainable growth.

4.2.2. Paragraph 105 refers to sustainable transport:

"The planning system should actively manage patterns of growth in support of these [transport] objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making."

4.2.3. Paragraph 186 considers impacts on local air quality:

"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."

Planning Practice Guidance

4.2.4. Planning practice guidance for air quality[10] is intended to support the NPPF and provide further detail on its policies. Paragraph 005 of this guidance provides information relating to air quality that could be important to decision makers, and when there are concerns about air quality, the local planning authority may want to know about:

- "the 'baseline' local air quality;

[9] Ministry of Housing, Communities & Local Government (2021) National Planning Policy Framework (NPPF). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf

[10] Ministry of Housing, Communities & Local Government (2019) Planning Practice Guidance - Air Quality. Available at: http://planningguidance.planningportal.gov.uk/blog/guidance/air-quality/#

- whether the proposed development could significantly change air quality during the construction and operational phases; and
- whether occupiers or users of the development could experience poor living conditions or users of the development could experience poor living conditions or health due to poor air quality

4.2.5. Paragraph 005 of this guidance also provides information on early engagement with the local planning and environmental health departments to establish the scope of any assessment. Guidance is also given on the level of detail required in an air quality assessment, and measures which could be employed to mitigate adverse effects.

Local planning policy

Wiltshire Core Strategy

4.2.6. The Wiltshire Core Strategy[11] was adopted on 20 January 2015, which sets out the strategic vision for delivering sustainable growth over the period up to 2026. In relation to air quality and development, Core Policy 55 – Air Quality states:

"Development proposals, which by virtue of their scale, nature or location are likely to exacerbate existing areas of poor air quality, will need to demonstrate that measures can be taken to effectively mitigate emission levels in order to protect public health, environmental quality and amenity. Mitigation measures should demonstrate how they will make a positive contribution to the aims of the Air Quality Strategy for Wiltshire and where relevant, the Wiltshire Air Quality Action Plan.

Mitigation may include:

- *i. landscaping, bunding or separation to increase distance from highways and junctions*
- *ii. possible traffic management or highway improvements to be agreed with the local authority*
- *iii. abatement technology and incorporating site layout/separation and other conditions in site planning*
- *iv. traffic routing, site management, site layout and phasing*
- *v. where appropriate, contributions will be sought toward the mitigation of the impact a development may have on levels of air pollutants"*

Wiltshire Local Transport Plan

4.2.7. Local Transport Plans (LTPs) steer the implementation of national transport policies at the local level, setting out a long-term transport strategy, a shorter-term implementation plan and a number of supporting strategies. The Wiltshire Local Transport Plan 3 (LTP3 2011-2026) [12] contains a number of strategic objectives which have strong links to improving air quality and climate change:

- SO2 To provide, support and promote a choice of sustainable transport alternatives.
- SO11 To reduce the level of air pollutant and climate change emissions from transport.
- SO13 To reduce the need to travel, particularly by private car.
- SO14 To promote travel modes that are beneficial to health.
- SO3 To reduce the impact of traffic on people's quality of life and Wiltshire's built and natural environment.

[11]Wiltshire.gov.uk, "Wiltshire Core Strategy, Adopted Jan 2015," [Online]. Available at: https://www.wiltshire.gov.uk/planning-policy-core-strategy
[12]Wiltshire.gov.uk, "Local Transport Plan 2011-2026, Adopted March 2011," [Online]. Available at: https://www.wiltshire.gov.uk/media/3028/Local-Transport-Plan-3/pdf/Ltp3-strategy.pdf?m=637152104238670000

Air Quality Strategy for Wiltshire

4.2.8. The Air Quality Strategy for Wilshire (2019 to 2024)[13] seeks to maintain progress with the improvement of air quality across all communities in Wiltshire and reflects the national Clean Air Quality Strategy 2019. This strategy details the four strategic priorities for the area:

- Secure air quality objectives in the eight AQMA;
- Maintain good air quality across the county;
- Wiltshire Council's own actions; and
- Communication and information dissemination.

Air Quality Action Plan for Wiltshire

4.2.9. The air quality action plan[14] for Wiltshire was published in June 2015. The purpose of the air quality action plan is to set out the strategic and locally generated actions that will be implemented to improve air quality and work towards meeting air quality objectives. The plan details 17 strategic actions to work towards achieving the air quality objectives for nitrogen dioxide and particulates. These actions share synergies with many other council policies and strategies, notably the Local Transport plan and Climate Change Strategy.

Air quality supplementary planning document

4.2.10. The draft air quality supplementary planning document[15] was published in September 2012. This guidance is aimed at developers, their consultants and officers within the Council. It provides technical advice on how to deal with planning applications that may have an impact on air quality with a view to ensuring consistency in the approach to proposed new development.

Air quality legislation

4.2.11. Legislation relevant to air quality including the objectives within the Air Quality Strategy (AQS) are presented in Appendix A.1, Volume 2.

Guidance/ Best practice

Non-statutory guidance

Design Manual for Roads and Bridges (DMRB) LA 105 Air Quality

4.2.12. National Highways DMRB LA 105 Air Quality[16] (DMRB LA 105) sets out the requirements for assessing and reporting the effects of highway projects on air quality from the delivery of motorway and all-purpose trunk road projects. The guidance covers both construction and operational effects and provides a detailed assessment methodology, reporting requirements and mitigation measures

[13] Wiltshire Council (2020) Air Quality Strategy for Wiltshire. Available at: https://www.wiltshireairquality.org.uk/assets/documents/council-reports/Air%20Quality%20Strategy%20Online%20Version.pdf
[14] Wiltshire Council (2015) Air Quality Action Plan for Wiltshire. Available at: https://www.wiltshireairquality.org.uk/assets/documents/action-plans/Final%20Air%20Quality%20Action%20Plan%20D16140.pdf
[15] Wiltshire Council (2012) Air Quality Supplementary Planning Document. Available at: https://www.wiltshire.gov.uk/media/3367/Air-quality-supplementary-planning-guidance/pdf/Air-quality-supplementary-planning-document.pdf?m=637159007891400000
[16] Highways England (2019). Design Manual for Roads and Bridges (DMRB) 'LA 105 Air Quality', November 2019. Available at: https://www.standardsforhighways.co.uk/prod/attachments/10191621-07df-44a3-892e-c1d5c7a28d90

suitable for such schemes

LAQM technical guidance

4.2.13. Guidance concerning local air quality management is given in DEFRA's technical guidance LAQM.TG(16)[17]. The guidance provides relevant methods concerning treatment and interpretation of data for local authorities in relation to the LAQM regime but is frequently applied when undertaking assessments for planning applications.

4.3. Study area and PEAR methodology

Study area

4.3.1. The air quality study area has been defined in accordance with DMRB LA 105.

4.3.2. For the potential effects of construction dust, the study area was defined as the area within 200 m of construction activity.

4.3.3. For the potential effects of traffic emissions during the operational phase the study area was determined in accordance with DMRB LA 105. The study area includes the area within 200 m of the Affected Road Network (ARN), which is defined as roads meeting the traffic scoping criteria (see A.2) and adjoining roads within 200 m. The traffic scoping criteria are:

- Road alignment will change by 5 m or more;
- Daily traffic flows (two way) will change by 1,000 annual average daily traffic (AADT) or more;
- Heavy Duty Vehicle (HDV) flows (two way) will change by 200 AADT or more; or
- A change in speed band.

4.3.4. An assessment is required for air quality where there are receptors identified within 200 m of the roads that trigger the traffic screening criteria. The ARN is located wholly within the administrative boundary of Wiltshire Council and shown on Figure 4-1, Volume 3.

PEAR methodology

4.3.5. The air quality assessment for the PEAR has been undertaken in accordance with DMRB LA 105 and consists of the following:

- Collation of air quality monitoring data and discussion of existing baseline conditions.
- Identification of sensitive receptors and Air Quality Management Areas (AQMA), and production of constraints maps.
- Qualitative assessment of the likely effect on air quality during construction.
- Assessment of the likely changes in air pollutant concentrations during operation of the Scheme. The assessment follows the 'detailed' assessment methodology, and a dispersion model has been used to estimate NO_2 (nitrogen dioxide) and particulate matter (PM_{10} and $PM_{2.5}$) concentrations at selected human health receptors in the Scheme opening year (2028).
- Assessment of the likely changes in nitrogen deposition during operation of the Scheme have been estimated at selected ecological receptors in the Scheme opening year (2028).
- Assessment of significance of the air quality effects in the Scheme opening year (2028), including an assessment of compliance with air quality limit values set within the EU Air Quality Directive, and now implemented through the EU (Withdrawal Agreement) Act 2020.
- Identification of the need for mitigation measures where appropriate.

[17] Department for Environment Food & Rural Affairs, Local Air Quality Management, Technical Guidance (TG16), April 2021. Available at: https://laqm.defra.gov.uk/documents/LAQM-TG16-April-21-v1.pdf

4.3.6. Further detail on the methodology used in this report is detailed in Appendix A.2, Volume 2.

Constraints map

4.3.7. A constraints map has been produced based on the latest available information and is shown in Figure 4-1, Volume 3. The constraints map includes the following:

- Roads meeting the traffic screening criteria and adjoining roads included in the air quality modelling;
- A 200 m buffer of the roads meeting the traffic screening criteria (ARN);
- Designated ecological site boundaries;
- AQMA boundaries;
- Pollution Climate Mapping (PCM) model roadside annual mean NO_2 data showing whether the air quality limit value is exceeded or not; and
- Locations of air quality monitoring sites colour coded by pollutant concentration.

4.4. Assumptions and limitations

4.4.1. This is a preliminary assessment for the purposes of consultation based on data collated from existing data sets as noted under the baseline conditions section. No scheme specific data has been collated or is planned to be collated.

4.4.2. The final assessment will be reported within the ES taking into account consultation comments, further design details and the further assessments detailed in section 4-9.

4.4.3. Any air quality model has inherent areas of uncertainty, including:

- The traffic data used in the air quality model;
- The suitability of emissions data;
- Simplifications in model algorithms and empirical relationships that are used to simulate complex physical and chemical processes in the atmosphere;
- The suitability of background concentrations; and
- The suitability of meteorological data.

4.4.4. Uncertainty associated with traffic data has been minimised by using a validated traffic model with data only used from within the defined traffic reliability area (TRA, all links which meet the DMRB LA 105 traffic change screening criteria are located within the TRA).

4.4.5. Uncertainties associated with emissions data have been minimised by using the most up to date emission factors available at the time the air quality modelling was undertaken (Emission Factor Toolkit v10.1), and by using Highways England LTTE6 projection factors as referenced in DMRB LA 105.

4.4.6. A further uncertainty is using historical meteorological data to estimate future concentrations. The key limiting assumption is that conditions in the future will be the same as in the past. In line with best practice, the base year meteorology (as used in the model verification and adjustment process) has been used in future year modelling to allow any adjustments to be applied in future cases.

4.4.7. Any air quality model has inherent areas of uncertainty, including: the traffic data used in the air quality model, the suitability of emissions data, background concentrations, and meteorological data and simplifications in model algorithms and empirical relationships used to simulate complex physical and chemical processes in the atmosphere. Uncertainty associated with these parameters has been minimised by using validated models and data and following best practice. The air quality model used in the assessment does not include terrain, however specific conditions have been addressed through localised model validation zones.

4.4.8. Cumulative effects on air quality could occur as a result of cumulative traffic changes caused by the Scheme combined with other schemes and as a result of new developments. The consideration of cumulative effects for the Scheme is driven by the traffic modelling and its assumptions regarding other schemes and developments. It is assumed that all relevant committed developments are included in the traffic model and so inherent in the data provided for the air quality assessment.

4.5. Consultation

4.5.1. Wilshire Council were consulted on the air quality approach for the PEAR in September 2021 and requested that $PM_{2.5}$ also be considered in the assessment. This is a different approach from the DMRB LA 105 methodology which requires NO_2 and PM_{10} only to be assessed.

4.5.2. Further consultation will be conducted at subsequent stages as required.

4.6. Baseline conditions

4.6.1. Baseline data has been collated from the following data sets:

- AQMA mapping[18];
- PCM model data (based on a 2018 reference year)[19];
- Local authority Local Air Quality Management (LAQM) reports including local monitoring data;
- Mapped background pollutant concentrations for the UK available from Defra UK-Air website[20];
- Natural England (NE) Multi-Agency Geographic Information for the Countryside (MAGIC) website[21], to identify boundaries of national and internationally designated ecological sites;
- Woodland Trust Ancient Tree Inventory[22] to identify veteran trees;
- Local wildlife site held by Melksham Bypass Outline Business Case project team to identify boundaries of locally designated ecological sites;
- Critical loads obtained from the Air Pollution Information System (APIS) website[23] where available; and
- Ordnance Survey mapping to identify locations of sensitive receptors (residential properties, schools and hospitals).

Local air quality management

4.6.2. Wiltshire Council has declared eight AQMAs for exceedances of the annual mean Air Quality Standard (AQS) objective for NO_2[24]. The Scheme is not located within an AQMA.

4.6.3. The closest AQMA is the Devizes Shanes Castle AQMA, declared in 2009. This AQMA is located within the study area, approximately 8 km to the south east of the Scheme. There are no other AQMA designations within the study area.

[18] Defra AQMA interactive map [Online]. Available at: http://uk-air.DEFRA.gov.uk/aqma/maps
[19] Defra UK Ambient Air Quality Interactive Map. [Online]. Available at: http://uk-air.DEFRA.gov.uk/data/gis-mapping
[20] Defra background maps [Online]. Available at: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018
[21] Defra Magic [Online]. Available at: http://magic.DEFRA.gov.uk/
[22] Woodland Trust Tree Search [Online]. Available at: https://ati.woodlandtrust.org.uk/tree-search/?v=1739585&ml=map&z=13&nwLat=53.10951817906596&nwLng=-0.9179754249781213&seLat=53.07240556032497&seLng=-0.7011671058863245
[23] UK Air Pollution Information System. Available at: http://www.apis.ac.uk/
[24] Uk-air.defra.gov.uk. Local Authority Details –Wiltshire Council. [online] Available at: https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=443

Local air quality monitoring

4.6.4. Air quality monitoring is undertaken by national and local authorities and is a key component of local air quality management. Measurements of pollutant concentrations include analytical instruments that measure continuously, and passive sampling devices such as diffusion tubes which give longer period results (typically monthly), to calculate an annual mean concentration.

Continuous monitoring data

4.6.5. Wiltshire Council undertake monitoring at four automatic (continuous) monitoring sites[25]. The nearest continuous monitoring station (CMS) is AM3 (Sidmouth St Devizes), approximately 8 km to the southeast of the Scheme within the Devizes Shanes Castle AQMA. This CMS monitors NO_2, PM_{10} and $PM_{2.5}$ (particles less than 10 micrometres and 2.5 micrometres in diameter respectively) concentrations. Measured concentrations for the site between 2016 to 2020 are presented in Table 4-1.

Table 4-1 - Local Authority measured concentrations (µg/m^3) at CMS site AM3

Site ID	Site name	Site type	X	Y	Pollutant	2016	2017	2018	2019	2020
AM3	Sidmouth St Devizes	Roadside	400765	161458	NO_2	31 (1)	**42 (7)**	**41 (2)**	37 (1)	29 (0)
					PM_{10}	20 (1)	20 (1)	20 (0)	21 (8)	19 (3)
					$PM_{2.5}$	14	14	14	15	13

Bold indicates concentrations above AQS objectives and brackets indicate the number of exceedances of the hourly annual mean NO_2 objective of 200 µg/m^3 and daily mean PM_{10} objective of 50 µg/m^3.

4.6.6. Monitoring data at this location demonstrates NO_2 concentrations were in excess of the air quality objective in 2017 and 2018 but were below the objective in 2019. 2020 results are not considered representative due to the COVID-19 pandemic affecting normal traffic levels. PM_{10} and $PM_{2.5}$ concentrations are shown to be below the air quality objective in all years considered. This CMS location is representative of receptors at roadside locations within the Devizes Shane Castle AQMA but not for the majority of receptors in the study area which would be expected to have lower pollutant concentrations.

Passive monitoring data

4.6.7. Wiltshire Council carry out non-automatic (i.e. passive) monitoring of NO_2 at 72 sites. Measured annual mean concentrations for the diffusion tube sites within the study area for the period 2016 to 2020 are summarised in Table 4-2 and shown on Figure 4-1, Volume 3.

4.6.8. The diffusion tube measurements indicate that the AQS annual mean NO_2 objective (40 µg/m^3) was exceeded at locations within the Devizes Shanes Castle AQMA (DT2, DT3 and DT42 in 2016, and DT2 and DT3 in 2018). There were no exceedances in 2019 or 2020 at any site in the study area.

4.6.9. The impact of the COVID-19 pandemic resulted in a clear reduction in NO_2 concentrations at all diffusion monitoring sites and real time analysers in 2020 relative to 2019, so analysis of these data should be treated with caution. Diffusion tube monitoring is representative of receptors located at the roadside within the study area. Further away from the roadside, concentrations would be lower.

[25] Wiltshireairquality.org.uk. Air quality reports - Wiltshire. [online] Available at: https://www.wiltshireairquality.org.uk/reports

Table 4-2 – Local Authority measured annual mean nitrogen dioxide concentrations (µg/m^3) at diffusion tube sites 2016-2020 within the study area

Site ID	Site name	Site type	X	Y	2016	2017	2018	2019	2020
DT2	The Nursery, Devizes	Roadside	399924	161729	**44.1**	39.3	**41.7**	38.2	31.6
DT3	Shanes Castle, Devizes	Kerbside	399763	161717	**45.4**	38.9	**43.7**	38.3	31.6
DT42	Melksham N	Roadside	390118	164878	**41.8**	38.6	37.4	32.9	27.0
DT43	Melksham Weavers Croft	Roadside	390136	164277	-	-	-	16.0	13.7
DT44	Melksham Market Place	Roadside	390471	163657	-	-	-	19.8	16.3
DT48a	Beanacre	Roadside	390387	166196	-	-	-	-	14.7

Bold indicates concentrations above AQS objectives

Mapped background data

4.6.10. Estimates of current and future year background pollutant concentrations in the UK are available on the DEFRA UK-AIR website[26]. The background estimates, which are a combination of measured and modelled data, are available for each one-kilometre grid square throughout the UK for the years 2018 to 2030. These background estimates include contributions from all source sectors, e.g. road transport, industry and domestic and commercial heating systems.

4.6.11. The estimated ranges in annual mean background concentrations for the 85 one-kilometre grid squares in which the Scheme lies, are presented in Table 4-3 for the pollutants NOx (oxides of nitrogen), NO_2, PM_{10} and $PM_{2.5}$. Background concentrations of these pollutants are shown to be well below relevant AQS objectives within the study area for the model base year 2018. Concentrations are expected to reduce in future years.

Table 4-3 - DEFRA mapped background concentrations within the study area (µg/m^3)

Grid square co-ordinates	Mapped concentrations (µg/m^3)			
	NOx	NO_2	PM_{10}	$PM_{2.5}$
Study area	8.5 - 16.1	6.6 - 12.1	12.5 - 14.7	8.2 - 9.6

Pollution Climate Mapping (PCM)

4.6.12. DEFRA's PCM model provides estimates of roadside concentrations of annual mean NO_2 and PM_{10}, which are used in reporting compliance with the air quality limit values. The model provides projected roadside concentrations of pollutants, for the years 2018-2030 inclusive, based on a 2018 reference year.

4.6.13. There are total of eleven PCM model links within the study area. The projected roadside NO_2 and PM_{10} concentrations for the PCM base year 2018 at PCM model links in the study area are all well below the relevant annual mean limit values and are expected to reduce in future years.

Sensitive receptors

4.6.14. The Scheme is located in a rural area with few human health receptors, however the study area extends into Melksham town where there are many high sensitivity human health receptors located

[26] Uk-air.defra.gov.uk. Home - Defra, UK. [online] Available at: https://uk-air.defra.gov.uk/

in the study area.

4.6.15. The nearest statutory designated ecological sites, Bristol Avon River Local Wildlife Site (LWS) and Kennet & Avon Canal LWS are located adjacent to the Scheme. There are also a number of other statutory and non-statutory designated ecological sites within the study area detailed in Table 4-4 and shown on Figure 4-1, Volume 3.

Air Pollution Information System (APIS) background mapping

4.6.16. The background nitrogen deposition rate and habitat critical loads for the relevant sensitive habitats have been obtained from the APIS website. The 2016-2018 background nitrogen deposition rate has been used unadjusted, as a conservative approach, for the Scheme opening year of 2028. Given the limited information available on designated features with non-statutory sites (LWS, LNR, AW and veteran trees), where habitat type were not available on the APIS website, this information has been conservatively assumed to be broadleaved woodland and the relevant critical load selected from the APIS website.

Table 4-4 - Designated ecological sites within the study area

Designation	Name / description	Habitat type*	Background nitrogen deposition (kgN/ha/yr)	Critical load (kgN/ha/yr)*
Site of Special Scientific Interest (SSSI)	Spye Park	Acid grassland	22.0	10
Local Wildlife Site (LWS)	Bristol Avon River	Broadleaved woodland	35.8	10
	Inwood, Lacock	Broadleaved woodland	35.8	10
	Kennet & Avon Canal	Broadleaved woodland	36.7 – 38.6	10
	Morass Wood	Broadleaved woodland	36.7	10
Local Nature Reserve (LNR)	Green Lane Wood	Broadleaved woodland	36.5	10
Ancient Woodland (AW)	11 stands of Ancient Woodland	Broadleaved woodland	35.8 – 37.8	10
Veteran Tree	3 No.	Broadleaved woodland	36.7	10

* As the conversion rate of NO_2 to nitrogen deposition is higher for woodland habitats the habitat type for LWS, LNR, AW and veteran trees have been assumed conservatively to contain broadleaved woodland as habitat information is not available on APIS for these site classifications. Where relevant, habitat types will be confirmed by the project ecologist at the next stage.

Summary of existing conditions

4.6.17. A review of baseline air quality information indicates that air quality in the study area is relatively good. The Scheme is not within an AQMA although the study area does extend to Devizes Shanes Castle AQMA. Monitoring data for 2018 shows exceedances of the annual mean NO_2 AQS objective within the AQMA, however subsequent 2019 concentrations were below the annual mean

NO_2 AQS objective at all monitoring locations within the study area. There are no exceedances of particulate matter (PM_{10} or $PM_{2.5}$) AQS objectives within the study area. All background concentrations for 2018 are below AQS objectives, and all DEFRA PCM links within the study area are compliant with relevant air quality limit values.

4.7. Potential effects

4.7.1. Table 4-7 and Table 4-9 below present the potential effects, mitigation measures and residual effects on air quality during construction and operation respectively.

4.7.2. Potential mitigation measures are summarised in the tables and more details are provided in Section 4-8 below.

Construction dust

4.7.3. There is the potential for elevated dust deposition and soiling at properties within 200 m of the design extent boundary as a consequence of the construction works, if dust raising activities are not effectively controlled and mitigated. The level and distribution of dust emissions would vary according to the duration and location of activity, weather conditions, and the effectiveness of suppression measures.

4.7.4. The approximate number of properties which could be affected by construction dust, located within 200 m of the construction site boundary for the Scheme has been assessed. The Scheme has the potential for construction dust to affect approximately 335 human health receptors. There are no internationally designated ecological sites within 200 m of the construction site boundary although there are 3 LWS, 2 stands of AW and a veteran tree within 200 m as detailed in Table 4-5.

Table 4-5 - Ecological designations within 200 m of Scheme design extent boundary

Designation	Name	Distance and direction to construction site boundary
Local Wildlife Site (LWS)	Bristol Avon River	Intersects construction site boundary
	Kennet & Avon Canal	Intersects construction site boundary
	Inwood, Lacock	10 m to the east
Ancient Woodland (AW)	Unnamed woodland at Inwood 1	80 m to the east
	Unnamed woodland at Inwood 2	190 m to the east
Veteran Tree	N/A	20 m to the north east

4.7.5. Receptors within 200 m of the design extent boundary for the Scheme within the respective distance bands (0-50 m, 50-100 m and 100-200 m) from construction activities have been identified as per DMRB LA 105 are shown in Figure 4-2, Volume 3. Table 4-6 summarises the number of properties likely to be affected by construction dust.

Table 4-6 - Approximate number of sensitive receptors likely to be affected by construction dust

Total number of receptors	Approximate receptor count in distance bands		
	0 - 50 m	50 - 100 m	100 - 200 m
335	44	63	228

4.7.6. The Scheme comprises the construction of a bypass around Melksham and therefore is considered to have a “large” dust risk potential as defined in DMRB LA 105. Given that there are sensitive human and ecological receptors within 50 m of construction activities, and in consultation with the

project ecologist, the receiving environment is considered to be “high sensitivity”. The overall construction dust risk potential for the Scheme is therefore classed as “high”.

Construction traffic

4.7.7. An increase in vehicle movements is expected to occur during the construction period, associated with the transport of materials, plant, and labour to and from site. The number of Heavy Duty Vehicles (HDV) movements is not anticipated to exceed the DMRB LA 105 traffic screening criteria for quantitative assessment of 200 HDV per day, nor are total vehicle movements anticipated to increase more than 1000 Annual Average Daily Traffic (AADT).

4.7.8. Substantial traffic management or the need to divert existing traffic during the construction phase is not expected to be required. It is anticipated that the duration of the construction phase will be less than two years, consequently further quantitative assessment has not been undertaken, in line with DMRB LA 105.

4.7.9. Any impact during construction would be expected to be less than that during operation and would be temporary.

Table 4-7 - Potential effects during construction

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
Area sensitivity for human health receptors within 200 m of the site boundary	High	Construction dust - Dust deposition / increase in PM_{10} concentrations	n/a*	Best practice construction working practices	Negligible (Not significant)
Area sensitivity for ecological receptors within 200 m of the site boundary	High	Construction dust - Dust deposition	n/a*	Best practice construction working practices	Negligible (Not significant)
Human health receptors within 200 m of links exceeding the traffic scoping criteria	High	Construction traffic – Increase in air pollutant concentrations of NO_2, PM_{10} and $PM_{2.5}$	Negligible (Not significant)	None required	Negligible (Not significant)
Ecological receptors within 200 m of links exceeding the traffic scoping criteria	High	Construction traffic – Increase in nitrogen deposition	Negligible (Not significant)	None required	Negligible (Not significant)

*it is not considered appropriate to provide the magnitude of effect without mitigation, as it is assumed that mitigation secured by a CEMP will ensure that a potential significant effect will not occur.

Operational traffic

Human health impacts

4.7.10. Pollutant concentrations were estimated for the Scheme opening year of 2028 at 108 human health receptors. Receptors were selected to be representative of sensitive locations within the study area. Modelled NO_2, PM_{10} and $PM_{2.5}$ concentrations were adjusted following verification, details of which are provided in A.3.

4.7.11. Modelling has been undertaken in accordance with DMRB LA 105 using LTTE6 projection factors to determine the future year NO_2 concentrations. Annual mean NO_2, PM_{10} and $PM_{2.5}$ results for all receptors considered are provided in A.4 and annual mean NO_2 concentrations are shown on Figure 4-3, Volume 3. Concentrations were compared with relevant AQS objectives to determine whether there were likely to be any exceedances.

4.7.12. The majority of receptors in the study area are expected to have annual mean NO_2 concentrations below the AQS objective in the opening year (2028) both with and without the Scheme. The only receptors with an exceedance of the annual mean NO_2 AQS objective are located within the Devizes Shanes Castle AQMA and include receptors R2 and R4, both with and without the Scheme, and receptor R3 without the Scheme only. At all three of these receptors, NO_2 concentrations are expected to decrease with the Scheme, indicating an improvement in air quality with the Scheme at these locations. This is due to a redistribution of traffic data causing a reduction in two-way traffic of -1,851 AADT on Dunkirk Hill and a reduction in HGVs of -48 AADT on the A361 The Nursery.

4.7.13. The air dispersion model verification for Devizes Shanes Castle AQMA is based on only two monitoring locations, resulting in a high model adjustment factor and highly conservative modelled annual mean concentrations. Given monitored concentrations within the AQMA were below the AQS objectives in 2019, national NO_2 concentrations are projected to reduce in the future, it is considered unlikely that the modelled exceedances of the AQS objectives or large decreases in concentrations with the Scheme in Devizes Shanes Castle AQMA would occur in the Scheme opening year 2028. Further information on the model verification is provided in Appendix A.3, Volume 2.

4.7.14. In other parts of the air quality study area, annual mean concentrations are below the relevant AQS objectives both with and without the Scheme, but will experience increases and decreases in concentrations as a result of changes to traffic. The Scheme is expected to result in a decrease in pollutant concentrations at receptors in Melksham, with a redistribution of traffic emissions away from the existing A350 corridor in Melksham and Beanacre to the areas on the eastern and southern fringes of Melksham and Bowerhill, near to the new bypass. The highest increase at a receptor is 2.6µg/m^3 at receptor R36 located in close proximity to the Scheme at the southern extent of Melksham, near the route of the proposed bypass. However, there are no exceedances of the AQS objective at any of these locations. No adverse impacts are expected on the AQMAs in Calne or Devizes.

4.7.15. In line with Defra's LAQM.TG(16) there are not expected to be exceedances of the NO_2 1-hour mean AQS objective as there are no annual mean NO_2 concentrations estimated to be more than 60 µg/m^3. There are no exceedances of PM_{10} or $PM_{2.5}$ AQS objectives at any of the selected receptors.

4.7.16. A summary of the human health receptors to inform the significance of effect on air quality are presented in

4.7.17. Table 4-8. Despite the large decrease in NO_2 concentrations at receptor R3 in Devizes Shanes Castle AQMA, there is not considered to be an overall significant beneficial effect on human health with the Scheme, as this decrease is just at one receptor, and is largely as a result of the high verification factor used in the assessment.

Table 4-8 – Human health receptors informing Scheme significance

Magnitude of change in annual vverage NO_2 ($\mu g/m^3$)	Total receptors with:	
	Worsening of air quality objective already above objective or creation of new exceedance	Improvement of air quality objective already above objective or the removal of an existing exceedance
Large (>4)	0	1
Medium (>2)	0	0
Small (>0.4)	0	1
Total Change	0	2

Compliance risk assessment

4.7.18. The compliance risk assessment follows a pragmatic approach, using professional judgement to assess the potential for the Scheme to affect the UK's ability to comply with the Air Quality Directive.

4.7.19. There are no PCM links with an exceedance of the air quality limit value within the study area. The Scheme air quality assessment has shown that the Scheme would not result in an increase in concentrations of annual mean NO_2 where there are modelled exceedances of the annual mean NO_2 limit value in the Scheme opening year (2028), nor would any new exceedances of the annual mean NO_2 limit value be introduced by the Scheme. Further, the maximum PCM roadside NO_2 concentration in the study area for the Scheme opening year (2028) is 17.6 $\mu g/m^3$, less than half the annual mean NO_2 limit value of 40 $\mu g/m^3$ and the maximum increase at a human health receptor included in the air quality assessment located adjacent to any PCM link in the study area is 0.5 $\mu g/m^3$.

4.7.20. There is therefore considered to be no compliance risk and it is unlikely the Scheme will affect the UK's ability to comply with the Air Quality Directive in the shortest timescales possible.

Ecological impacts

4.7.21. Total nitrogen deposition has been estimated at 31 ecological receptors. DMRB LA 105 provides designated habitat screening criteria for determining the need for further consideration of the impacts of nitrogen deposition. The designated habitat screening criteria are considered to be exceeded where total nitrogen deposition is greater than the relevant critical load, and the change in nitrogen deposition is greater than 1% of the relevant critical load and is greater than 0.4 kg N/ha/yr. Results for all ecological receptors considered are provided in A.4.

4.7.22. Given the limited information available on the designated features within non-statutory designated ecological sites, detailed habitat identification was not undertaken at this stage. Nitrogen deposition rates were therefore calculated for all non-statutory designated ecological site receptors as both “woodland” and “grassland” habitat types (for which there are different NO_2 to nitrogen deposition conversion factors).

4.7.23. The change in nitrogen deposition rate with the Scheme is expected to be less than the DMRB LA 105 designated habitat screening criteria at all relevant statutory designated sites (SSSI and LNR) and the majority of the non-statutory designated sites (LWS, AW and veteran trees). The Scheme is therefore not expected to have a significant adverse effect on the designated habitats within these sites.

4.7.24. There are however changes to nitrogen deposition expected at the Kennet & Avon Canal non-statutory designated LWS (at receptor points ECO5, ECO6, ECO22, and ECO23) that exceed the DMRB LA 105 designated habitat screening criteria, based on the conservative assumption that “woodland” habitat is present within the LWS. Receptor point ECO23 (located adjacent to the A350 south of Melksham) exceeds the DMRB LA 105 designated habitat screening criteria, for both “woodland” and “grassland” habitats. This should be reviewed in further detail with the competent biodiversity specialist to ensure these are representative of each site and to determine whether

there are species that could be adversely affected by increased nitrogen deposition within this site.

Table 4-9 - Potential effects during operation

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
Human health receptors within 200 m of links exceeding the traffic scoping criteria	High	Operational traffic - Change in air quality pollutant concentrations	Improvement to annual mean NO_2 concentrations within Devizes AQMA (No significant beneficial effect)	None required	Improvement to annual mean NO_2 concentrations within Devizes AQMA (No significant beneficial effect)
Ecological receptors within 200 m of links exceeding the traffic scoping criteria	High	Operational traffic - Change in nitrogen deposition	To be confirmed with competent biodiversity specialist at the next stage following further investigation of air quality impacts within Kennet & Avon Canal LWS (Potentially significant adverse)	To be confirmed with competent biodiversity specialist at the next stage if required	To be confirmed with competent biodiversity expert at the next stage (Potentially significant)

4.8. Potential mitigation measures

Construction phase

4.8.1. Construction activities for the Scheme represent a 'high' construction dust risk potential. Mitigation measures to control dust during construction would be specified within contract documentation and incorporated into a Construction Environmental Management Plan (CEMP) prior to construction of the Scheme. The precise measures, suitable for a 'high' construction dust risk site would depend on the intended construction methods and the degree of dust generation of construction activities. If necessary, monitoring parameters and a programme will be established, and the effectiveness of mitigation will be evaluated in line with DMRB LA 105. It is expected that the use of standard industry best practice would mitigate the risk of construction dust impacts in the majority of cases.

4.8.2. Such measures may include but not necessarily be limited to:

- Regular water-spraying and sweeping of unpaved and paved roads to minimise dust and remove mud and debris;
- Using wheel washes, shaker bars or rotating bristles for vehicles leaving the site where appropriate to minimise the amount of mud and debris deposited on the public highway;
- Sheeting vehicles carrying dusty materials to prevent materials being blown from the vehicles whilst travelling;
- Enforcing speed limits for vehicles on unmade surfaces and site haul roads to minimise dust entrainment and dispersion;
- Ensuring any temporary site roads are no wider than necessary to minimise their surface area;
- Damping down of surfaces prior to their being worked; and
- Storing dusty materials away from site boundaries and in appropriate containment (e.g. sheeting, sacks, barrels etc.).

Operational phase

4.8.3. As there are not expected to be any significant adverse effects with the Scheme for the human health receptors considered no mitigation measures would be required.

4.8.4. Mitigation measures for ecological habitats will be determined once the likelihood of a significant effect has been determined.

4.9. Further work

4.9.1. The air quality model verification relies on a small number of diffusion tube monitoring locations to derive adjustment factors. To improve the number of available verification sites, monitoring data at two locations (DT43 and DT44) have been annualised from 2019 to 2018. A high adjustment factor has been derived within Devizes Shanes Castle AQMA, which has led to estimated concentrations potentially being overestimated. Further monitoring data results within this location and throughout the study area would help confirm and improve the accuracy of the model and results.

4.9.2. Further consideration of the identified changes to nitrogen deposition expected at the Kennet & Avon Canal non-statutory designated LWS by the competent biodiversity expert including site investigation where required should be completed at the next stage. This will allow the significance of effect to be determined, as well as whether mitigation would be required at this location. Other ecological receptors identified should not need further assessment unless the air quality model inputs (traffic data, emission factor toolkit etc.) are revised.

4.10. Summary

4.10.1. The study area is within the administrative boundary of Wiltshire Council. There is one designated

AQMA within the study area which could be affected: Devizes Shanes Castle AQMA, located approximately 8 km to the southeast of the Scheme.

4.10.2. Monitoring data for 2018 shows exceedances of the annual mean NO_2 AQS objective however subsequent 2019 concentrations are below the annual mean NO_2 AQS objective. There are no exceedances of particulate matter (PM_{10} and $PM_{2.5}$) AQS objectives within the study area. All background concentrations for 2018 are below AQS objectives, and all DEFRA PCM links within the study area are compliant with relevant limit values in the base year and future years.

4.10.3. During construction, there is the potential for increased emissions of dust, however, with the application of appropriate mitigation, significant adverse effects at nearby receptors would be unlikely. Additional traffic during the construction phase and construction related traffic management measures have been determined as unlikely to affect air quality, and any effects would be temporary.

4.10.4. During operation, it is considered there would not be an overall beneficial not significant effect as a result of the Scheme as a result of a decrease in NO_2 concentrations at receptors within Devizes Shanes Castle AQMA despite one receptor with a large decrease. As previously outlined the air quality model verification relies on a small number of diffusion tube monitoring locations to derive adjustment factors. A high adjustment factor has been derived within Devizes Shanes Castle AQMA, which has led to the change in concentrations potentially being overestimated between with and without the Scheme scenarios.

4.10.5. During operation, there is not expected to be a significant adverse effect at the statutory designated habitats (SSSI and LNR), nor on the majority of non-statutory designated sites within the study area (LWS, Ancient Woodland and veteran trees). Further consideration of potential impacts at the Kennet & Avon Canal non-statutory designated LWS is required to confirm the significance of effect at this location.

4.10.6. On this basis, there is unlikely to be a significant effect on air quality due to the Scheme but further consideration of any impact and its significance on the Kennet & Avon Canal LWS is required.

5. Noise and Vibration

5.1. Introduction

5.1.1. This chapter provides the preliminary environmental assessment for noise and vibration. The chapter sets out the standards and methodologies that have been used to assess the potential impacts of the Scheme during both construction and operation, and these same standards and methodologies will be used to carry out the assessment of noise and vibration for the Environmental Statement (ES) at the next stage. This chapter also contains information about the existing and the potential noise constraints and, where relevant, identifies potential mitigation measures which will then be explored in greater details within the ES.

5.2. Planning policy

National policy

5.2.1. Current noise policy in England is based on the Noise Policy Statement for England (NPSE)[27], which through the effective management and control of environmental noise within the context of Government policy on sustainable development, aims to:

- avoid significant adverse impacts on health and quality of life
- mitigate and minimise other adverse impacts on health and quality of life
- contribute to improvements to health and quality of life, where possible.
- These aims are reflective of those contained in the National Planning Policy Framework (NPPF) and are further echoed in Planning Practice Guidance concerning noise[28].

5.2.2. The Explanatory Note to the NPSE assists in the definition of significant adverse and adverse with the following concepts:

- NOEL – no observed effect level. This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- LOAEL – lowest observed adverse effect level. This is the level above which adverse effects on health and quality of life can be detected.
- SOAEL – significant observed adverse effect level. This is the level above which significant adverse effects on health and quality of life occur.

5.2.3. The Government policy and guidance referenced above do not state values for the NOEL, LOAEL and SOAEL, rather, it considers that they are different for different noise sources, for different receptors and at different times and should be defined on a strategic or project basis taking into account the specific features of that area, source or project.

5.2.4. NPSE also states that sustainable development is a core principle underpinning all government policy. The goal is pursued in ways that protect and enhance the physical and natural environment, and that use resources and energy as efficiently as possible.

5.2.5. NPPF section 174(e) states that planning policies and decisions should contribute to and enhance the natural and local environment by “preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability” and that “development should, wherever possible, help to improve local environmental conditions”.

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[27] DEFRA (2010). “NOISE POLICY STATEMENT FOR ENGLAND (NPSE).
[28] DEPARTMENT FOR COMMUNITIES AND LOCAL GOVERNMENT, PLANNING PRACTICE GUIDANCE (http://planningguidance.planningportal.gov.uk/).

5.2.6. NPPF section 185 notes that "planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

(a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

(b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."

Legislation

5.2.7. The following noise legislation documents will be referenced as required:

- The Control of Pollution Act 1974 (as amended);
- The Environmental Protection Act 1990 (as amended);
- The Control of Noise (Code of Practice for Construction and Open Sites) (England) Order 2015; and
- Noise Insulation Regulations 1975 (as amended).

5.3. Study area and PEAR methodology

Construction

Construction study area

5.3.1. Construction plant lists, a draft schedule of works, and details of construction plant haul routes, are not currently available. The effects of construction (including any potential haulage routes and construction vibration impacts) will therefore be assessed in greater detail as part of the ES, with an indicative high-level summary of the potential for noise impacts arising from Scheme construction presented within this report.

5.3.2. For informative purposes, it should be noted that the study area for construction noise impacts typically encompasses a 300 m buffer from the physical works associated with the Scheme as per Design Manual for Roads and Bridges (DMRB), LA 111 Noise and Vibration[29] (LA 111). The requirement within LA 111 is based upon on guidance contained within BS 5228-1, 'Code of practice for noise and vibration control on construction and open sites - Part 1: Noise' (BS 5228). Also as stipulated within LA 111, a vibration study area of 100 m from the closest construction activity with the potential to generate vibration is typically sufficient to encompass all vibration sensitive receptors.

Construction methodology

5.3.3. A full construction noise assessment using appropriate methodology as detailed within BS5228-1:2009+A1:2014[30], and construction vibration assessment using appropriate methodology as detailed within BS5228-2:2009+A1:2014[31], will be undertaken as part of the ES.

5.3.4. The significance criteria for construction noise will be confirmed at a future design stage as the significance criteria used in BS5228-1:2009+A1:2014 are set depending on the ambient noise

[29] https://www.standardsforhighways.co.uk/dmrb/search/cc8cfcf7-c235-4052-8d32-d5398796b364
[30] BRITISH STANDARDS INSTITUTION (2014) BS5228:2009 + A1:2014 CODE OF PRACTICE FOR NOISE AND VIBRATION CONTROL ON CONSTRUCTION AND OPEN SITES, PART 1: NOISE. LONDON BSI.
[31] BRITISH STANDARDS INSTITUTION (2014) BS5228:2009 + A1:2014 CODE OF PRACTICE FOR NOISE AND VIBRATION CONTROL ON CONSTRUCTION AND OPEN SITES, PART 2: VIBRATION. LONDON BSI.

levels measured at noise sensitive receptors in proximity to the proposed construction works. For the purposes of this assessment, a conservate approach is taken whereby it is assumed that existing baseline noise level are relatively low, and would result in construction noise limits according to BS5228 Category A thresholds for significant impact.

5.3.5. A detailed assessment for the potential for construction vibration impact will be undertaken once construction plant, activity, schedules, and locations are available as part of the ES. The significance criteria for construction vibration will be based upon fixed threshold criteria as detailed within BS5228-2:2009+A1:2014.

5.3.6. The construction noise and vibration assessment at this design phase is qualitative and based on previous experience of similar projects. The construction assessment will identify typical activities which have the highest potential to cause disturbance at nearby noise sensitive receptors, and will indicate potential mitigation measures and best practice that may be considered.

Operational

Operational study area

5.3.7. A typical operational study area as defined within LA 111 is:

- The area within 600 m of new road links or road links physically changed or bypassed by the project; and
- The area within 50 m of other road links with potential to experience a short term Basic Noise Level (BNL) change of more than 1.0dB(A) as a result of the project.

5.3.8. LA111 also notes that ‘variations in the study area can be defined for individual projects’, and that the study area shall be defined to include ‘noise sensitive receptors in areas where there is a reasonable stakeholder expectation that noise assessment is undertaken’.

5.3.9. With the above in mind, the study area for appraising the operational noise of the Scheme has been expanded to incorporate the entirety of Melksham town centre. The study area for noise is shown on Figures 5.1 to 5.3, Volume 3.

5.3.10. As with all study areas for the noise and vibration assessment, the operational study area can be modified to encompass local considerations following consultation with stakeholders for use in the ES assessment if required.

Operational methodology

5.3.11. As per LA111, operational vibration is scoped out of the assessment methodology as a maintained road surface will be free of irregularities as part of project design and under general maintenance, so operational vibration will not have the potential to lead to significant adverse effects.

5.3.12. The operational noise assessment is carried out in line with DMRB LA 111, with predictions carried out using a 3D noise model of the Scheme using Noisemap® v5.2 software. The road traffic noise calculations are undertaken in accordance with the modified CRTN methodology set out in DMRB LA 111 Appendix A2, Volume 2.

5.3.13. The predictions are undertaken at all Noise Sensitive Receptors (NSRs) within the study area, in order to identify the risks and constraints that noise imposes on the Scheme.

5.3.14. The results of the noise modelling are used to determine potential noise impacts, the requirement of noise mitigation, and overall significance.

5.3.15. Road traffic noise calculations are undertaken using the following outputs from the traffic model:

- Traffic flows in vehicles Annual Average Weekday Traffic (AAWT) 18hour, the average number of vehicles over a year, on weekdays from 6am until midnight;

- Traffic composition (the proportion of heavy duty vehicles (HDV)); and
- Traffic speeds.

5.3.16. DMRB LA 111 requires that the following traffic scenarios are assessed for the Scheme for a quantitative assessment:

- Do Minimum scenario in the opening year (DMOY), in this case 2028;
- Do Minimum scenario in the future assessment year (DMFY) (typically 15 years after opening) in this case 2043;
- Do Something scenario in the opening year (DSOY); and
- Do Something in the future assessment year (DSFY).

5.3.17. The following datasets have been used produce the 3D noise model:

- Ordinance Survey Terrain 50 (10m vertical separation contours);
- OS Master map data including building outlines and carriageways;
- OS Address base Plus data; and
- 3D alignment of the Scheme.

5.3.18. Using DMRB LA 111, the following comparisons are required in order to determine the impact of the Scheme in both the short and long term:

- DMOY against DSOY (short term, impacts due to scheme alone);
- DMOY against DSFY (long term, impacts due to scheme and traffic changes); and
- DMOY against DMFY (long term, impacts due to traffic changes alone).

5.3.19. LA111 also gives guidance for the classification of magnitude of impacts for road traffic noise changes over both the short-term and long-term, as shown in Table 5-1 below.

Table 5-1 - DMRB Magnitude of impact for given change in noise

Magnitude of Impact	Short Term Noise Change, LA10,18h (dB)	Long Term Noise Change, LA10,18h (dB)
No change	0	0
Negligible	0.1 – 0.9	0.1 – 2.9
Minor	1 – 2.9	3.0 – 4.9
Moderate	3 – 4.9	5.0 – 9.9
Major	5+	10.0+

5.3.20. In addition to this, the predicted noise levels at the NSRs will be used to provide an indication of the number of properties that may potentially exceed the SOAEL and the LOAEL.

5.3.21. The thresholds assigned to the LOAEL and the SOAEL are set based upon the example thresholds for significance set out in DMRB LA 111 guidance, as provided in Table 5-2.

Table 5-2 - Operational Noise Levels of Significance for all Receptors (Daytime and Night time)

Effect Level	Façade dB LA10, 18h (Daytime)	Free-field dB Lnight, outside
Adverse Effect (LOAEL)	≥ 55	40
Significant Adverse Effect (SOAEL)	≥ 68	55

5.3.22. The DMRB LA 111 states that moderate and major adverse impacts are to be considered as potential significant adverse effects as part of an initial assessment. Final operational significance is determined with reference to contextual factors. This process requires the assessor to consider a number of holistic points related to the receptor and the wider environment before determining whether a significant adverse effect has arisen.

5.4. Assumptions and limitations

5.4.1. This is a preliminary assessment for the purposes of consultation based on the data gathered to date. Inherent limitations and uncertainties exist within the source datasets used for appraisal, including:

- Traffic data (AAWT, %HGV, kph);
- Ordinance Survey Terrain 50 (10m vertical separation contours);
- Building Layer from OS Mastermap (limited information for areas of in-progress residential development);
- Address Base Plus (limited information for areas of in-progress residential development);
- Scheme alignment (3D with earthworks for main Scheme alignment, 3D for bridge at Lower Woodrow, 2D for other junctions); and
- Surfacing of all roads within noise model assumed to be bitumen.

5.4.2. Limitations regarding the availability of construction phase specifics (such as proposed construction methods, plant itinerary, activity schedules etc) mean that assumptions based on previous experience of similar projects have been used to inform a high-level indicative assessment at this stage.

5.4.3. The final assessment will be reported within the ES taking into account consultation comments, further design details, and the further assessments detailed in section 5.9.

5.5. Consultation

5.5.1. Wilshire Council were consulted on the noise and vibration approach for the PEAR in September 2021. No concerns were raised at this time.

5.5.2. Previous general consultations regarding the Scheme have not highlighted specific concerns related to noise and vibration.

5.5.3. Prior to the ES, consultation with the environmental health officer or noise specialist at Wiltshire Council will be undertaken to discuss the methodology, gain an understanding of local concerns and determine essential noise monitoring locations.

5.6. Baseline conditions

5.6.1. A detailed baseline noise survey will be undertaken at a later design stage following consultation with Wiltshire Council. Based on aerial imagery it is expected that road traffic noise from the A350 and local roads are the main noise source influencing noise levels in the study area.

5.6.2. Information regarding the existing ambient noise climate i.e. baseline conditions, and identification of potential noise impact constraints of the Scheme, are determined through reference to the following sources:

- Ordnance Survey base mapping to identify locations of residential and non-residential NSRs (residential properties, schools, hospitals and elderly care homes); and
- Extrium Noise Map Viewer showing DEFRA NIA.

5.6.3. A total of 11 Noise Important Areas are located within the noise study area, including 7 Noise Important Areas that are located along the section of the A350 bypassed by the Scheme (IDs

12744, 3752, 3751, 12745, 3749, 3745, 3747). Noise Important Areas are also located along A3102/Bank Street in Melksham Town Centre (ID 12746), Symington Road (part of NIA ID 3747), Symington High Street (ID 3746), A342 (ID 12743), and A361 (ID 12751). The NIAs are shown on Figure 1.1, Volume 3.

5.6.4. For the purposes of apprising operational impacts of the scheme, road traffic noise baseline conditions are calculated via noise modelling using supplied traffic data for the opening-year without the Scheme (Do-Minimum 2028/DMOY), enabling comparison against predicted opening-year 'with Scheme' (Do-Something 2028/DSOY) and future-year 'with scheme' (Do-Something 2043/DSFY) and 'without scheme' (Do-Minimum 2043/DMFY) scenarios.

5.7. Potential effects

Construction

5.7.1. The main construction activities that are likely to take place are site preparation, demolition, earthworks, bridge construction and road works. All activities have the potential to cause some disturbance at nearby noise and/or vibration sensitive receptors. Demolition works (as may be required at junctions with existing roads), and piling works (as may be associated with bridge works for example), are likely to cause some of the highest noise levels dependent on the methods chosen.

5.7.2. A construction programme detailing the specific activities that will take place, phasing and duration of each activities, and a plant list are not yet available for the Scheme. In the absence of specific data at this stage, a high-level indicative summary of the potential impacts from construction noise associated with the Scheme are presented in Table 5-6 and are based on previous experience of similar projects.

5.7.3. The need for temporary noise mitigation during the construction phase will be determined at the next stage by undertaking a full BS5228-1:2009+A1:2014 assessment that takes into account the following factors:

- The ambient noise environment are the closest noise sensitive receptors to the construction works;
- The distance between the nearest noise sensitive receptors and the construction works;
- The duration and time of day that the construction works occur; and
- The noise produced by the plant or equipment involved in the construction activities, which is influenced by the sound power of the equipment and its usage pattern.

Operation

5.7.4. Effects from operational vibration have been scoped out as detailed within section 5.3.11.

5.7.5. Once the Scheme is operational, the noise climate could be affected (positively or negatively) by changes in traffic flows, speeds, and composition on existing roads. The introduction of road traffic on the Scheme itself has the potential to adversely impact on NRSs in proximity to the road alignment. Additionally, noise levels at nearby receptors could also be affected by any changes to the distance between carriageways and the NSR, as a result of a changes to existing road alignments.

5.7.6. A summary of the potential impacts from operational noise associated with the Scheme are presented in Table 5-6 below.

Short-term impacts

5.7.7. To appraise the opening year noise impacts of the Scheme, a comparison has been made between the noise model results of the Do-Something 2028 scenario vs the Do-Minimum 2028 scenario for daytime only. The magnitude of these opening year (short-term) noise impacts are summarised in

Table 5-3 below.

Table 5-3 - Short-Term daytime traffic noise impacts

Increase/ decrease in noise	Change in noise level dB $L_{A10, 18h}$	Magnitude of impact	Number of dwellings	Number of other sensitive receptors
Increase	1 - 2.9	Minor	1491	29
Increase	3 - 4.9	Moderate	533	16
Increase	>=5	Major	702	13
Negligible	-0.9 - 0.9	Negligible	2609	87
Decrease	1 - 2.9	Minor	4712	347
Decrease	3 - 4.9	Moderate	715	32
Decrease	>=5	Major	141	2

5.7.8. Table 5-3 above shows that 2609 dwellings, and 87 non-residential receptors are predicted to experience a negligible change in road traffic noise level over the short-term due to the Scheme.

5.7.9. There are 4712 dwellings predicted to experience a minor beneficial impact upon opening, due to traffic using the new bypass, rather than the A350 (benefitting dwellings at north-west Shurnold, and to the western and southern extents of the centre of Melksham), and due to traffic changes on local roads such as A3102, A342, roads within Lacock, Hither Way, The Wharf, and Bowdon Hill.

5.7.10. The 715 dwellings predicted to experience a moderate beneficial impact upon opening are located alongside the A350 at Beanacre (south of Westlands Way), and north-east Shurnold with properties located along Forest Lane and Eastern Way benefiting from changes in traffic flow.

5.7.11. There are 141 dwellings predicted to experience major beneficial impacts upon opening of the Scheme, and these are located closest to the carriageway along the A350 at Beanacre, and on Forest Lane.

5.7.12. There are 347 non-residential sensitive receptors predicted a minor beneficial impact, 32 predicted to have a moderate beneficial impact and 2 predicted major beneficial impact due to the Scheme.

5.7.13. Adverse impacts are predicted in the short-term upon opening of the Scheme due to changes in traffic flow and alignment.

5.7.14. There are 1419 dwellings that are predicted to experience a minor adverse impact due to the Scheme upon opening. These include isolated properties located away from the Scheme alignment, and properties along Bollands Hill, A365/Bath Road, around Blackmore Road, and in the middle of the Bowerhill housing area.

5.7.15. 533 dwellings are predicted to experience a moderate adverse impact due to the Scheme upon opening. These include isolated properties located closer to Scheme alignment, and properties at Bowerhill.

5.7.16. There are 702 major increases predicted at residential NSRs. These include isolated properties located close to Scheme alignment, and properties at Bowerhill closest to the scheme.

5.7.17. There are 29 minor, 16 moderate and 13 major increase predicted at non-residential sensitive receptors upon opening due to the Scheme.

5.7.18. The short-term noise difference contours are shown on Figure 5.1, Volume 3.

Long-term impacts

5.7.19. To appraise the future year noise impacts of the Scheme, a comparison has been made between the noise model results of the Do-Something 2043 scenario vs the Do-Minimum 2028 scenario for daytime only. The magnitude of these opening year (short-term) noise impacts are summarised in Table 5-4 below.

Table 5-4 - Long-Term daytime traffic noise impacts

Increase/ decrease in noise	Change in noise level dB $L_{A10, 18h}$	Magnitude of impact	Number of dwellings	Number of other sensitive receptors
Increase	3 - 4.9	Minor	536	20
Increase	5 - 9.9	Moderate	608	13
Increase	>=10	Major	111	1
Negligible	-2.9 - 2.9	Negligible	8954	463
Decrease	3 - 4.9	Minor	644	27
Decrease	5 - 9.9	Moderate	50	2
Decrease	>=10	Major	0	0

5.7.20. Table 5-4 above shows that 8954 dwellings, and 463 non-residential receptors are predicted to experience a negligible change in road traffic noise level over the short-term due to the Scheme.

5.7.21. There are 644 dwellings predicted to experience a minor beneficial impact upon opening, due to traffic using the new bypass, rather than the A350 (benefitting dwellings along the A350 between Beanacre and Shurnold), and due to traffic changes on local roads such as Forest Lane and New Road.

5.7.22. The 50 dwellings predicted to experience a moderate beneficial impact upon opening are located at alongside the A350 at Beanacre, and between Beanacre and the A350 Scheme junction at Lacock.

5.7.23. There are no dwellings predicted to experience major beneficial impacts upon opening of the Scheme.

5.7.24. There are 27 non-residential sensitive receptors predicted a minor beneficial impact, 2 predicted to have a moderate beneficial impact and 0 predicted major beneficial impact due to the Scheme.

5.7.25. Adverse impacts are predicted in the long-term upon opening of the Scheme due to the location of the Scheme alignment.

5.7.26. There are 536 dwellings that are predicted to experience a minor adverse impact due to the Scheme upon opening. These include isolated properties located away from the Scheme alignment, and dwellings located in the middle of the Bowerhill housing area.

5.7.27. There are 608 dwellings that are predicted to experience a moderate adverse impact due to the Scheme upon opening. These include isolated properties located closer to Scheme alignment, and properties at Bowerhill.

5.7.28. There are 111 major increases predicted at residential NSRs, these include isolated properties located closest to Scheme alignment, and properties at the south-east extent of Bowerhill closest to the Scheme.

5.7.29. There are 20 minor, 13 moderate and 1 major increase predicted at non-residential sensitive receptors upon opening due to the Scheme.

5.7.30. The long-term noise difference contours are shown on Figure 5.2, Volume 3.

Do-minimum impacts

5.7.31. The Do-Minimum changes in noise between the opening year 2028 and the future year 2043 have been compared and the magnitude of these do-minimum noise impacts are summarised in Table 5-5.

Table 5-5 - Do-Minimum daytime traffic noise impacts

Increase/ decrease in noise	Change in noise level dB $L_{A10, 18h}$	Magnitude of impact	Number of dwellings	Number of other sensitive receptors
Increase	3 - 4.9	Minor	0	0
Increase	5 - 9.9	Moderate	0	0
Increase	>=10	Major	0	0
Negligible	-2.9 - 2.9	Negligible	10903	526
Decrease	3 - 4.9	Minor	0	0
Decrease	5 - 9.9	Moderate	0	0
Decrease	>=10	Major	0	0

5.7.32. The results of the Do-Minimum 2025 vs Do-Minimum 2041 comparison, in Table 1-5 above show that all predicted changes in noise are negligible.

5.7.33. The long term Do-Minimum noise difference contours are shown on Figure 5.3, Volume 3.

Summary of potential effects

5.7.34. Tables 5-6 and 5-7 below present the potential effects, mitigation measures and residual effects on noise during construction and operation.

5.7.35. Potential mitigation measures are summarised in the tables and more details are provided in section 5-8 below.

Table 5-6 - Potential effects during construction

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
NSRs (Daytime)					
NSRs within ~40m	High	Noise from construction activity	Significant	Noise barriers, best practice construction working practices.	Significant (only at the very closest NSRs ~20m or closer)
				Consider noise insulation or temporary rehoming where appropriate (as will be determined within full BS5228 appraisal when construction schedule is available).	Not significant
NSRs beyond ~40m	High	Noise from construction activity	Not significant	Noise barriers, best practice construction working practices	Not significant
NSRs (Evening)					
NSRs within ~90m	High	Noise from construction activity	Significant	Noise barriers, best practice construction working practices.	Significant for NSRs closer than ~60m
				Consider noise insulation or temporary rehoming where appropriate (as will be determined within full BS5228 appraisal when construction schedule is available).	Not significant
NSRs beyond ~90m	High	Noise from construction activity	Not significant	Noise barriers, best practice construction working practices	Not significant
NSRs (Night-time)					
NSRs within ~225m	High	Noise from construction activity	Significant	Noise barriers, best practice construction working practices.	Significant for NSRs closer than ~200m

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
				Consider noise insulation or temporary rehoming where appropriate (as will be determined within full BS5228 appraisal when construction schedule is available).	Not significant
NSRs beyond ~225m	High	Noise from construction activity	Not significant	Noise barriers, best practice construction working practices	Not significant
NSRs - Vibration					
NSRs	High	Vibration from piling activity	Significant	Best practice construction working practices, low impact piling methods (augur/rotary bored).	Not significant
NSRs within ~20m	High	Vibration from construction activity (not piling)	Significant	Best practice construction working practices. Consider temporary rehoming if/where appropriate.	Not significant
NSRs beyond ~20m	High	Vibration from construction activity (not piling)	Not significant	Best practice construction working practices.	Not significant

Table 5-7 - Potential effects during operation

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
Operational Noise					
Receptors along A350 (including those within	High	Decreases in noise	Upon Scheme opening, major decreases in noise at northern extent of	Mitigation not required	As per potential effects (without mitigation)

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
identified Noise Important Area IDs 12744, 3752, 3751, 12745, 3749, 3745, 3747)			Beanacre, with moderate decreases at the southern extent of Beanacre, and minor decreases on the A350 towards Melksham; reducing to minor to moderate benefits around Beanacre in the future year.		
Receptors at Lacock, The Wharf, Bowdon Hill, A3102, A342	High	Decreases in noise	Upon Scheme opening, minor decreases in noise, reducing to negligible change by the future year.	Mitigation not required	As per potential effects (without mitigation)
Receptors along Forest Lane/Lower Woodrow/Woodrow Road	High	Decreases in noise	Upon Scheme opening, minor to moderate decreases in noise, reducing to minor change by the future year.	Mitigation not required	As per potential effects (without mitigation)
Receptors along Eastern Way	High	Decreases in noise	Upon Scheme opening, minor to moderate decreases in noise, reducing to negligible change by the future year.	Mitigation not required	As per potential effects (without mitigation)
Isolated receptors along Scheme alignment corridor	High	Increases in noise	Minor to Major increases in noise predicted along Scheme corridor, reduced geographic spread by future year.	Low noise surfacing along Scheme and optimised noise barriers.	Minor to Major with reduced geographic spread.
Receptors at Bollands Hill and Bath Road	High	Increases in noise	Minor increases in noise predicted upon Scheme opening (due to traffic flow changes on these links),	Increase due to change in traffic flow on links, no mitigation applicable.	As per potential effects (without mitigation)

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
			reducing to negligible by future year.		
Receptors at south-east Bowerhill	High	Increases in noise	Minor to Major increases in noise predicted for NSRs	Low noise surfacing along Scheme and optimised noise barriers.	Minor to Major with reduced geographic spread.
NSRs along Bath Road	High	Noise levels above SOAEL, increase greater than 1dB over long-term	SOAEL exceeded	Increase due to change in traffic flow on Bath Road, limited opportunities for mitigation on existing non-scheme road.	As per potential effects (without mitigation)
NSRs along Sandridge Common	High	Noise levels above SOAEL, increase greater than 1dB over long-term	SOAEL exceeded	Increase due to cumulative impact of changes in long-term traffic flow on Bath Road and proximity to scheme. Low noise surfacing along Scheme and optimised noise barriers may limit increase in noise, limited opportunities for mitigation on existing non-scheme road.	SOAEL exceeded
Operational Vibration					
NSRs in proximity to scheme	High	None (assumes a maintained road surface free of irregularities, scoped out as per guidance within LA111)	None	Mitigation not required	N/A

5.8. Potential mitigation measures

Construction best practice

5.8.1. To mitigate any potential noise problems during the construction phase, the construction contractor should consult with the Environmental Health Departments at the relevant Local Planning Authorities (in this case Wiltshire Council) to obtain guidance on their requirements for managing and controlling noise and vibration from construction works.

5.8.2. A Construction Environmental Management Plan (CEMP) will be created and implemented by the contractor and be approved by the Local Authorities prior to the commencement of construction works and will outline the following:

- Environmental management and responsibilities;
- Monitoring and auditing processes;
- Procedures that will be used to complete different construction activities;
- Complaints response procedures; and
- Community and stakeholder liaison processes.

5.8.3. The contractor may also be able to submit a Section 61 application under the Control of Pollution Act 1974 for some construction works, especially if night-time working is proposed.

5.8.4. The contractor should also be encouraged to join (if not already a member) the Considerate Contractors Scheme that is recognised by industry and the Government for encouraging firms to be sensitive to the environment.

5.8.5. Good stakeholder relations are often the most effective way to manage potential noise impacts on site. Therefore, the contractor should keep local residents and other affected parties informed of the progress of the works, including when and where the noisiest activities will be taking place and how long they are expected to last. All noise complaints should be effectively recorded, investigated and addressed.

5.8.6. In addition, the contractor should use the following good working practices:

- All vehicles and plant should be fitted with effective exhaust silencers which should be maintained in good and efficient working order;
- All compressors and generators should be ‘sound reduced’ models fitted with properly lined and sealed acoustic covers which should be kept closed whenever the machines are in use;
- All ancillary pneumatic percussive tools should be fitted with mufflers or suppressors as recommended by the manufacturers which should be kept in a good state of repair;
- Machines in intermittent use should be shut down when not in use or where this is impracticable, throttled down to a minimum;
- The site compound and static machines should be sited as far as is practicable from noise sensitive buildings;
- Where practicable, plant with directional noise characteristics should be orientated to minimise noise at nearby properties;
- Plant should be certified to meet the current EU legislation and should be not be louder than the noise levels provided in Annex C and D of BS5228-1;
- Where appropriate, temporary noise barriers or other noise containment measures should be installed to minimise construction noise levels;
- The loading or unloading of vehicles and the movement of equipment or materials should be undertaken in a manner that minimises noise generation; and
- Concrete mixers should not be cleaned by hammering the drums.

5.8.7. In addition to the above good working practices, where piling is required, the piling method should be selected carefully to minimise noise and vibration impacts at noise sensitive receptors. Where practicable, piling methods that result in low levels of vibration, such as rotary bored piling should

be used. Methods that cause much higher levels of vibration, such as percussive piling, can cause cosmetic damage to buildings within 50m of the construction works and should be avoided wherever possible.

5.8.8. Even with appropriate mitigation in place, it may not be possible to eliminate all noise impacts. However, best practice, considerate working hours as well as frequent and open communications with stakeholders will help to reduce the residual impact of construction noise.

Operational

5.8.9. Operational noise mitigation may consist of noise barriers, earth bunds, or low noise road surfacing, or combinations thereof. Since optimisation of appropriate mitigation measures requires the Scheme design to be finalised, assessment and optimisation of mitigation options will be undertaken in detail within the ES.

5.9. Further work

5.9.1. Baseline noise surveying should be undertaken once Scheme alignment reaches a final design freeze for the ES. The results of such a survey would then be used to inform the detailed construction noise appraisal and, where appropriate, used to refine the noise modelling.

5.9.2. Once a final design freeze is reached for the ES, the noise model will be refined to incorporate the final Scheme design, and where further data is available for currently in-progress residential developments this will also be incorporated into the noise model as appropriate.

5.9.3. Mitigation optimisation for both construction noise, and operational noise, will be undertaken as part of the detailed assessments at the next stage.

5.10. Summary

5.10.1. A preliminary construction and operational noise assessment has been undertaken for the Melksham Bypass Scheme.

5.10.2. The construction noise assessment determined that daytime works within 40 m of a noise sensitive property, evening or weekend works within 90 m of a noise sensitive property or night-time works within 225 m of a noise sensitive property has the potential to lead to a significant noise effect. Properties that are particularly at risk are those closest to the Scheme alignment at Lower Woodrow.

5.10.3. With mitigation in place, as well as good community engagement, the impact of the construction noise can be reduced. Where it is not possible to adequately reduce noise impact at these locations, it may be necessary to consider noise insulation or temporary rehoming. This will be assessed in detail within the ES.

5.10.4. The levels of construction vibration are unlikely to lead to a significant effect however, this will be assessed when data is available at the next stage.

5.10.5. The operational assessment considered the changes in noise due to the Scheme alignment and changes in traffic on existing roads, in both the short term and long term.

5.10.6. Upon Scheme opening, beneficial changes in noise are anticipated along the A350 between the junction with the Scheme at Lacock through to Hampton Park Roundabout. By the future year the geographic extent of these beneficial changes in noise has been reduced to between the A350 junction with the Scheme at Lacock through to Shurnold.

5.10.7. Decreases in noise are also anticipated at Lacock, Hither Way, The Wharf, Bowden Hill, A3102, A342 and Eastern Way upon Scheme opening, reducing to a negligible change in noise by the future year.

5.10.8. Increases in noise are predicted for receptors located in proximity to the Scheme corridor, including isolated receptors along the route, and receptors located at Bowerhill. The geographic spread of these increases reduces by the future year, but residual impacts remain. Mitigation measures such as low noise surfacing and noise barriers could be employed to reduce these impacts, but it should be noted that a full elimination of impacts is unlikely.

6. Biodiversity

6.1. Introduction

6.1.1. This chapter describes the baseline terrestrial and aquatic ecological features as they are understood at present and considers the potential effects on nature conservation of the Scheme. The Scheme is near Melksham in Wiltshire.

6.1.2. This report has been undertaken with reference to current good practice[32] and provides an initial appraisal of any likely ecological constraints upon designated sites, terrestrial and freshwater habitats, and species. Following the principles of the mitigation hierarchy and British Standard (BS) 42020:2013[33], this report also identifies the need for measures to avoid, mitigate or compensate for damage and disturbance to designated sites, habitats and species. Opportunities to provide biodiversity enhancements in accordance with local, regional, and national biodiversity planning strategies are also identified where relevant.

6.2. Planning policy

National policy

National Planning Policy Framework 2021[34]

6.2.1. Paragraph 174 states that 'planning policies and decisions should contribute to and enhance the natural and local environment by':

- protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);
- recognising the intrinsic character and beauty of the countryside and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and more versatile agricultural land, and of trees and woodland; and
- minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures.

6.2.2. Paragraph 179 states that 'to protect and enhance biodiversity and geodiversity, plans should':

- identify, map and safeguard components of local wildlife-rich habitats and wider ecological networks, including the hierarchy of international, national, and locally designated sites of importance for biodiversity; wildlife corridors and steppingstones that connect them; and areas identified by national and local partnerships for habitat management, enhancement, restoration or creation; and
- promote the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species; and identify and pursue opportunities for securing measurable net gains for biodiversity.

6.2.3. Paragraph 180 states that, 'if significant harm to biodiversity resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused.'

6.2.4. Building on the previous version of the National Planning Policy Framework, planning practice guidance: Natural Environment (published July 2019) explains the key issues in implementing policy to protect biodiversity, including local requirements.

[32] CIEEM (2017) Guidelines for preliminary ecological appraisal. 2nd Edition.
[33] British Standard (2013) BS 42020 2013 Biodiversity – code of practice for planning and development
[34] National Planning Policy Framework (publishing.service.gov.uk)

Local policy

Wiltshire Core Strategy (2015-2026)[35]

6.2.5. The Wiltshire Core Strategy adopted in January 2015, sets out the spatial vision, key objectives, and overall principles of development for communities in Wiltshire for the period 2015-2026. This strategy forms part of the adopted development plan for Wiltshire.

6.2.6. The Core Strategy has identified six Strategic Objectives. Strategic Objective 5 aims to attract investment and development into the county in a way which protects and enhances the environment:

- Development should be directed away from valuable natural assets, habitats, and species.
- New development will have contributed to the delivery of the Wiltshire Biodiversity Action Plan (BAP) targets, and will protect, maintain, and enhance BAP habitats and species;
- Local biodiversity and wildlife corridors will be incorporated into new development;
- Wiltshire's network of multi-functional green infrastructure will have been maintained and enhanced to contribute towards achieving the vision set out in the Wiltshire Green Infrastructure Strategy;
- The multi-functional green infrastructure network will have assisted Wiltshire in adapting to a changing climate, and in attracting business investment and tourism, enhancing the local economy, and promoting physical and social well-being;
- Good air quality will have been maintained and significant progress will have been made in treating areas of risk through the implementation of air quality management plans;
- The quality and quantity of Wiltshire's groundwater and surface water features will have been improved, helping to achieve the objectives of the Water Framework Directive; and
- Increased recreational pressures on sensitive wildlife will be effectively managed.

6.2.7. Within Strategic Objective 5, Core Policy 50 seeks to ensure protection and enhancement of Wiltshire's biodiversity sites, and halt and reverse current negative trends. Core Policy 50 states that:

- Development proposals must demonstrate how they protect features of nature conservation as part of the design. These features will be retained, buffered, and managed favourably to maintain their ecological value, connectivity, and functionality in the long term;
- Where it has been demonstrated such features cannot be retained, removal or damage shall only be acceptable in circumstances where the anticipated ecological impacts have been mitigated as far as possible and appropriate compensatory measures can be secured to ensure no net loss of the local biodiversity resource, and secure the integrity of local ecological networks and provision of ecosystem services;
- All development proposals shall incorporate appropriate measures to avoid and reduce disturbance of sensitive wildlife species and habitats throughout the lifetime of the development.
- All development should seek opportunities to enhance biodiversity; and
- Sustainable development will avoid direct and indirect impacts upon local sites through sensitive site location and layout, and by maintaining sufficient buffers and ecological connectivity with the wider environment.

[35] https://www.wiltshire.gov.uk/media/372/Wiltshire-Core-Strategy-adopted-2015/pdf/Wcs.pdf?m=637099399373530000

6.3. Study area and PEAR methodology

6.3.1. The overall study area comprises the alignments of the Scheme, including the road alignment and any off-site ancillary works or areas and extends beyond the construction footprint in accordance with the Design Manual for Roads and Bridges (DMRB)[36].

6.3.2. The working area assessed within this report includes the main Scheme works (referred to in this report as the main scheme):

- The construction of the A350 bypass;
- The dualling works on the existing A350 (south of Melksham); and
- Upgrades and improvements to the Littleton roundabout.

6.3.3. Additionally, some online works are required, located approximately 5 km east of Melksham (referred to in this report as the junction signalling works):

- Signalling works on the junction of A342/A3102.

6.3.4. The extent to which the study areas extend beyond the working corridor was determined by the likely spatial scale of potential significant effects for each type of biodiversity feature, i.e., the Zone of Influence (ZoI). These are based on good practice guidance (where available), but in most cases are determined by professional judgement. Details of these feature-specific study areas that have been used in this scoping assessment are provided in Table 6-1.

[36] LA 108 Biodiversity (Highways England, March 2020). [Online]. [Accessed July 2021]. Available from: https://www.standardsforhighways.co.uk/dmrb/search?discipline=SUSTAINABILITY_AND_ENVIRONMENT

Table 6-1 - Zone of Influence (ZoI) for each ecological feature

Feature	Zone of Influence[37] for main Scheme works	Zone of Influence for the online signalling works on the A342/A3102 junction
Identification of Special Areas of Conservation (SACs) where bats are one of the qualifying features	30 km	
Identification of all other statutory designated nature conservation sites, including international and European sites[38], Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNRs) and Local Nature Reserves (LNRs)	2 km (This will be extended to any distance where there is a direct hydrological connection and extended where the air quality analysis subsequently identifies designated sites within 200 m of the "affected road network"[39], however at the time of writing the extent of the affected road network was not known).	
Non-statutory designated nature conservation sites such as Local Wildlife Sites (LWS)	1 km (extended where the air quality analysis subsequently identifies sites within 200 m of the 'affected road network')	500 m (extended where the air quality analysis subsequently identifies sites within 200 m of the 'affected road network')
Priority habitats[40] and ancient woodland	1 km (extended where the air quality analysis subsequently identifies sites within 200 m of the 'affected road network')	500 m (extended where the air quality analysis subsequently identifies sites within 200 m of the 'affected road network')
Aquatic features (watercourses and standing waterbodies) for assessment of aquatic habitats and associated species groups (aquatic macroinvertebrates, macrophytes and fish)	For aquatic features identified within 150 m of the Scheme, the search for background records has been extended up to 2 km upstream and downstream of the Scheme to identify the presence of hydrologically connected aquatic features, designated sites and ecological background records.	No assessment required, as there is no impact pathway associated with the works to aquatic receptors

[37] Each ZoI is measured from the working corridor for each feature. It will be reviewed and refined as the project progresses.
[38] These should be taken as including: Sites of Community Importance (SCIs), Special Protection Areas (SPAs), potential SPAs (pSPAs), Special Areas of Conservation (SACs), candidate SACs (cSACs), possible SACs (pSACs) and Ramsar sites. Following the changes made to the Conservation of Habitats and Species Regulations 2017 (as amended) by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019, SACs and SPAs in the UK no longer form part of the EU's Natura 2000 ecological network and now form part of a UK national site network. In this document they are still referred to as European Sites.
[39] LA 105 Air Quality (Highways England November 2019). [Online]. [Accessed July 2021]. Available from: https://www.standardsforhighways.co.uk/dmrb/search/10191621-07df-44a3-892e-c1d5c7a28d90
[40] Priority habitats are those habitats listed in accordance with Section 41 of the Natural Environment and Rural Communities Act 2006 (hereafter referred to as the NERC Act) as being of principal importance for the conservation of biodiversity in England.

Feature	Zone of Influence[37] for main Scheme works	Zone of Influence for the online signalling works on the A342/A3102 junction
Protected or priority species records[41]	1 km (extended to 2 km for bats)	500 m (extended to 2 km for bats)
Waterbodies that could potentially support breeding populations of great crested newt (GCN)[42]	500 m	250 m
Habitat surveys and assessment of potential to support protected or priority habitats and species (Phase 1 survey extent)	250 m	50 m
Ancient and veteran trees	500 m (This will be extended where the air quality analysis subsequently identifies ancient or veteran trees within 200 m of the “affected road network”, however at the time of writing, the extent of the affected road network was not known.)	50 m (This will be extended where the air quality analysis subsequently identifies ancient or veteran trees within 200 m of the “affected road network”, however at the time of writing, the extent of the affected road network was not known.)
Assessment of structures and trees for bat roost potential	100 m	50 m
Bat activity surveys	250 m	250 m (assuming a change to the current lighting is required)
Badger survey	250 m (This will be extended to 500 m around main badger setts, where these are subsequently identified and where potential territory fragmentation / isolation may occur as a result of the new road)	50 m
Assessment of habitats with potential to support breeding and wintering birds	Initially 100 m. This will be extended where designated sites are identified with birds as a qualifying feature. This will be extended further (up to 250 m) where the desk study and initial walkover surveys identify potentially locally	50 m

[41] Priority species in this context comprise species listed in accordance with Section 41 of the NERC Act; International Union for Conservation of Nature and Natural Resources (hereafter IUCN) Red List species; Red and Amber Birds of Conservation Concern (hereafter referred to as BOCC); and species that are Nationally Scarce or Rare.
[42] This species typically uses suitable terrestrial habitat up to 500 m from a breeding pond. Natural England (2001). GCN Newt Mitigation Guidelines. English Nature, Peterborough.

Feature	Zone of Influence[37] for main Scheme works	Zone of Influence for the online signalling works on the A342/A3102 junction
	important features for birds. Specific species surveys (e.g., barn owl) will extend up to 1.5 km	
Priority invertebrates	Initially comprising suitable habitats within and immediately adjacent to the working corridor	
Reptiles	Initial survey comprising suitable habitats within and adjacent to the working corridor. This will be extended to 100 m where discrete survey areas representing locations with potentially suitable habitat to support reptiles is identified.	
Otter	Watercourses and linked waterbodies up to 100 m, surveying 200 m – 500 m from crossing points (where considered proportionate to likely disturbance and fragmentation effects)	
Water vole	Watercourses and linked waterbodies up to 100 m, surveying up to 200 – 500 m up and down stream at all interaction points (where considered proportionate to likely fragmentation effects)	
White-clawed crayfish	Watercourses and linked waterbodies up to 100 m, surveying up to 200 – 500 m up and downstream from watercourse interactions	
Hazel dormouse	Initially comprising suitable habitats within the working corridor and extended to 250 m where discrete survey areas representing locations with potentially suitable habitat (i.e., hedgerows, woodlands) are identified	
Further floral species surveys	Where botanical interest is noted from the extended Phase 1 habitat survey. Initially comprising suitable habitats within the working corridor and extended to 150 m (where discrete survey areas representing locations with potentially suitable habitat are identified)	

PEAR methodology

6.3.5. This report presents baseline ecological information obtained during the following:

- A desk study undertaken between August and December 2020, for both terrestrial and aquatic ecology; and
- A walkover of accessible land within the study area, for terrestrial ecology only (land within 250 m of the working corridor of five preliminary route options in November and December 2020).

Terrestrial ecology desk study

6.3.6. A request was made to Wiltshire and Swindon Biological Records Centre (WSBRC) in August 2020. At the time of the data request, three route options were being considered, none of which are now being taken forward. However, the area of the request is similar to the Scheme being considered. Due to the records centre request being based on old route options, records of protected and priority species for the entire current Scheme working corridor plus the appropriate buffers are not currently available, including the junction signalling works area. The following information was requested based on the three route options which were being considered at the time of the data request:

- Details of non-statutory designated sites of nature conservation importance within 1 km of the route options;
- Details of species legally protected under the Conservation of Habitats and Species Regulations 2017 (as amended) and the Wildlife and Countryside Act 1981 (as amended) within 1 km of the route options (extended to 2 km for bats); and
- Details of other priority species within 1 km of the route options, including UK and Local Biodiversity Action Plan (BAP) priority species and Species of Principal Importance in England as listed in accordance with Section 41 of the NERC Act 2006.

6.3.7. The following online resources were accessed:

- Bing Maps[43];
- Google Earth[44]; and
- Woodland Trust Ancient Tree Inventory[45].

6.3.8. The Multi-Agency Geographic Information for the Countryside (MAGIC) website[46] was reviewed for the following information:

- Statutory designated sites of nature conservation importance (LNRs, NNRs, SSSIs, Special Protection Areas (SPAs), Wetlands of International Importance (Ramsar sites) and SACs within the Zone of Influence, as detailed in Table 6-1; and
- Notable habitats within the ZoI, these being areas of ancient woodland and habitats of Principal Importance for the Conservation of Biodiversity in England, as listed under Section 41 of the NERC Act 2006.

6.3.9. Ordnance Survey maps and aerial photographs were used to identify the presence of waterbodies within the ZoI of the Scheme, in order to establish if the land within and immediately surrounding the Scheme could be used as terrestrial habitat for great crested newt. This species typically uses suitable terrestrial habitat up to 500 m from a breeding pond. However, there is a notable decrease in great crested newt abundance beyond a distance of 250 m from a breeding pond[47].

[43] https://www.bing.com/maps/
[44] https://earth.google.com/web/
[45] https://ati.woodlandtrust.org.uk/
[46] https://magic.defra.gov.uk/MagicMap.aspx
[47] Natural England (2004) An assessment of the efficiency of capture techniques and the value of different habitats for the great crested newt (ENRR576). http://publications.naturalengland.org.uk/publication/134002.

Aquatic ecology desk study

6.3.10. An initial review of the Environment Agency Ecology and Fish Data Explorer website[48] and the Environment Agency Catchment Data Explorer website[49] has been undertaken to identify relevant aquatic species (macrophyte, invertebrate, and fish) survey data collected within the last five years.

6.3.11. Environment Agency Water Framework Directive (WFD)[50] classification data and River Basin Management Plans (RBMPs) were also reviewed to inform the baseline for aquatic habitats and species within the PEAR.

6.3.12. For the purposes of the assessment of aquatic habitats and species for this PEAR, watercourses include Main Rivers[51] (as shown on the Environment Agency's Main River Map), Canals[52] (as shown on OS mapping) and ordinary watercourses[53] (all other watercourses shown on OS mapping which are not classified as Main Rivers or Canals). Standing waterbodies include both ponds and lakes, where lakes are greater than 2 hectares (ha) in size[54].

6.3.13. A review of OS District Vector Map layers[55], Bing Maps and Google aerial imagery was undertaken to identify all watercourses (main river, ordinary watercourses and ditches) and standing waterbodies (lakes and ponds) within 150 m of the design extent boundary which could support a range of truly aquatic species (macrophytes, aquatic macroinvertebrates and fish).

6.3.14. This assessment is only for aquatic features and species associated with the main works, as the signalling works have no direct or indirect impact pathways to aquatic receptors.

Extended Phase 1 habitat survey

6.3.15. At the time of the extended Phase 1 habitat survey, five route options were being considered. The study area was defined by the working corridor of the five route options, plus a 250 m buffer. These surveys were conducted in November and December 2020.

6.3.16. Prior to visiting site, habitats within the survey area were identified using Atkins Next Generation Environmental Assessment (NGEA) GIS tool that utilises the most up to date data from Ordnance Survey MasterMap, priority habitat inventory, Crop Map of England, EA Statutory Main Rivers Map, National Forestry Inventory, and OS Greenspaces (referred to as 'GIS tool' hereafter). The habitats within the survey area were assigned polygons and an initial habitat classification was attributed to each polygon using the data listed above. This was to assist with an initial habitat classification for survey planning as well as desk analysis to inform this PEAR in the absence of survey data.

6.3.17. Surveys broadly followed the extended Phase 1 habitat survey methodology[56]. Prior to the survey the Atkins GIS tool was used to assign a Phase 1 habitat to the land prior to survey. The Phase 1

[48] https://environment.data.gov.uk/ecology-fish/
[49] https://environment.data.gov.uk/catchment-planning/
[50] 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.
[51] A watercourse shown on the statutory Main River map dataset. These are typically larger streams and rivers, but some of them are small watercourses of significance. They include certain structures that control or regulate the flow of water in, into or out of the channel. The Environment Agency has permissive powers, but not a duty, to carry out maintenance, improvement or construction work on designated Main Rivers and powers to regulate the activities of others affecting rivers and their flood plains under the Environmental Permitting Regulations 2016, the Water Resources Act 1991 and land drainage byelaws.
[52] Canals are a manmade watercourse typically characterised by artificial banks, uniform profiles and often relatively heavily used for navigational purposes. The Canal & River Trust hold a number of objects and powers over the canal network, notably to preserve, protect, operate, and manage inland waterways.
[53] An ordinary watercourse is any watercourse not designated a Main River. The Lead Local Flood Authority (LLFA) or, if within an Internal Drainage District, the Internal Drainage Board (IDB) have permissive powers to maintain and improve ordinary watercourses and to regulate works under the provisions of the Land Drainage Act 1991 and local byelaws.
[54] Williams, P., Biggs, J., Thorne, A., Bryant, S., Fox, G. and Nicolet, P., 1999. The Pond Book: a guide to the management and creation of ponds. Ponds Conservation Trust, Oxford.
[55] https://www.ordnancesurvey.co.uk/business-government/products/vectormap-district
[56] Joint Nature Conservation Committee (2010) Handbook for Phase 1 habitat survey - a technique for environmental audit.

surveys were then used to ground truth this mapping. All accessible land within and adjacent to the Scheme including land up to 250 m from the Scheme boundary (the Survey Area) was surveyed according to CIEEM guidance[57]. Plant names recorded in this survey follow Stace (2010)[58].

6.3.18. The walkover survey recorded information on the habitats within the Survey Area and also included a search for evidence of the presence of, and the potential for each habitat to support, priority and protected species as recommended by CIEEM[59].

6.3.19. This survey method comprised the following:

- Mapping habitats present according to the JNCC Phase 1 habitat survey methodology, with target notes (TN) used to record specific details on the plant species composition of the habitats, current management and condition. TNs were also used to record features of ecological importance such as veteran trees;
- Assessing the potential of terrestrial and aquatic habitats to support amphibians. Aquatic habitat was assessed for its suitability to support great crested newts using the Habitat Suitability Index (HSI) assessment;
- Assessing the suitability of habitats for nesting and wintering birds;
- Assessing the suitability of habitats for reptiles;
- Assessing the suitability of habitats to support commuting and foraging bats;
- Assessing the suitability of watercourses for water vole, otter, and white-clawed crayfish
- Assessing the suitability of habitats for hazel dormouse;
- Assessing the suitability of habitats for priority invertebrates; and
- Assessing the suitability of habitats for flowering plants.

6.3.20. In addition to the above, specific searches were made of the following:

- Potential roosting sites for bats within trees and structures e.g., identification of suitable cracks and crevices (survey undertaken from ground only). The assessment of potential of the trees and structures for roosting sites for bats were categorised based on the Bat Conservation Trust good practice guidance[60]; and
- Signs of badger activity including setts, tracks, snuffle holes and latrines.

6.3.21. Evidence of the presence of the following invasive species was recorded where seen:

- Evidence of animal species as listed on the Invasive Alien Species (Enforcement and Permitting) Order 2019; Chinese mitten crab, red swamp crayfish, signal crayfish, spiny cheek crayfish, muntjac deer, ruddy duck, Egyptian goose and grey squirrel;
- Evidence of the presence of the following invasive plant species: Japanese knotweed, giant knotweed, hybrid knotweed, giant hogweed, Himalayan balsam, rhododendron, New Zealand pigmy weed, Virginia creeper, variegated yellow archangel, and cotoneaster. These are listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) and subject to strict legal control; and
- In addition to those listed above, evidence of plant species as listed on the Invasive Alien Species (Enforcement and Permitting) Order 2019: Nuttall's waterweed, Chilean rhubarb, floating pennywort, curly waterweed and parrot's feather, fanwort, water hyacinth and floating water primrose.

6.3.22. At the time of writing, no Phase 2 surveys have been conducted.

[57] https://www.cieem.net/competency-framework

[58] Stace, C. (2010) New Flora of the British Isles. Cambridge University Press.

[59] Chartered Institute of Ecology and Environmental Management (2017) Guidelines for Preliminary Ecological Appraisal, Second Edition.

[60] Collins, J. ed (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London.

Aquatic ecology walkover surveys

6.3.23. The aquatic ecology assessment at this stage is based on aerial imagery, professional judgement, and review of limited desk study species data. Desk study was limited due to the lack of available data within the study area of suitable age.

Evaluation criteria

6.3.24. Biodiversity features are valued following DMRB[61] guidance. Biodiversity resource values are classified as International or European, UK or National, Regional, County, or Local

6.3.25. The evaluation is based on information gathered from the desk study and walkover survey, using a combination of professional judgement and accepted criteria[62] (e.g., diversity, rarity, and naturalness).

6.3.26. Features that have been identified to be of less than local importance are not considered to be important biodiversity features and as such will not be considered within the impact assessment of this PEAR, unless mitigation is considered to be necessary for these features for legal reasons.

Characterisation of impacts

6.3.27. The assessment is informed by the DMRB[63] and CIEEM[64] methods. The level of impacts on biodiversity resources are categorised as major, moderate, minor and negligible (beneficial or adverse), or no change, in accordance with the criteria provided in DMRB.

6.3.28. The significance of effects on biodiversity features identified will consider both on-site impacts and those that may occur to adjacent and more distant ecological features, including:

- Direct loss of habitats (including temporary loss);
- Fragmentation or isolation of habitats;
- Changes to the local hydrology, water quality or air quality;
- Direct mortality or injury to wildlife through construction activities; and
- Disturbance to species from noise, light, or other visual stimuli.

6.3.29. Level of impact will be determined by the assessment of the following characteristics:

- Positive or negative (e.g., beneficial or adverse);
- Duration (e.g., permanent or temporary);
- Reversibility (e.g., irreversible or reversible);
- Extent or magnitude; and
- Frequency and timing.

Significance of effects

6.3.30. Significance of effects has been undertaken in accordance with DMRB, which broadly follows characterisation of impacts and determination of effects which are significant following CIEEM guidance, with the level of impact categorised on a scale from “negligible” to “major” (See Table 6-2). Where there is no significant effect predicted, the impact is categorised as “no change”.

[61] LA 108 Biodiversity, Revision 1 (formerly Volume 11, Section 3, Part 4 Ecology and Nature Conservation and IAN 130/10), Highways England
[62] Set out in Ratcliffe, D.A (1977). A Nature Conservation Review. Cambridge University Press.
[63] LA 108 Biodiversity Revision 1 (formerly Volume 11, Section 3, Part 4 Ecology and Nature Conservation and IAN 130/10), Highways England
[64] CIEEM (2017) Guidelines for preliminary ecological appraisal. 2nd Edition.

Table 6-2 - Categories for assessing the level of impact and typical descriptions[65]

Significance category	Typical descriptors of effect
Major	Permanent or irreversible damage to a biodiversity resource The extent, magnitude, frequency or timing of an impact negatively affects the integrity or key characteristics of the resource
Moderate	Temporary or reversible damage to a biodiversity resource The extent, magnitude, frequency or timing of an impact negatively affects the integrity or key characteristics of the resource
Minor	Permanent or irreversible damage to a biodiversity resource The extent, magnitude, frequency or timing of an impact does not negatively affect the integrity or key characteristics of the resource.
Negligible	Temporary or reversible damage to a biodiversity or resource The extent, magnitude, frequency or timing of an impact does not affect the integrity or key characteristics of the resource
No change	No observable impact, either positive or negative.

6.3.31. The importance of the resource and level of impact are used to determine the significance of effect shown in Table 6-3 below.

Table 6-3 - Categories for assessing the preliminary significance of effects on ecological features (following DMRB LA 108)

	Level of impact					
		No change	Negligible	Minor	Moderate	Major
Resource importance	International or European importance	Neutral	Slight	Moderate or large	Large or very large	Very large
	UK or national importance	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
	Regional importance	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
	County importance	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
	Local importance	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

6.3.32. The significance of effects is likely to be negligible where features of low value or sensitivity are subject to small or short-term impacts. However, where a number of small-scale effects occur that are not significant alone, an assessment will be made as to whether, cumulatively, these may result in an overall effect of greater significance.

6.3.33. For designated nature conservation sites, effects are considered significant if the potential effects of the Scheme are likely to either undermine or support the conservation objectives or condition of the site and its features of interest.

[65] LA 108 Biodiversity (Highways England, March 2020). [Online]. [Accessed July 2021]. Available from: https://www.standardsforhighways.co.uk/dmrb/search?discipline=SUSTAINABILITY_AND_ENVIRONMENT

6.3.34. For habitats which may constitute either whole or in part an ecosystem, effects are considered significant if the potential effects of the Scheme are likely to result in a change to the ecosystem structure and function. Consideration is given to whether:

- Any processes or key characteristics of the ecosystem would be removed or changed;
- There would be an effect on the nature, extent, structure, and function of component habitats of the ecosystem; and
- There would be an effect on the population size and viability of component species within an ecosystem.

6.3.35. Functions and processes acting outside the formal boundary of a designated site are also considered, particularly where a site falls within a wider ecosystem (e.g., wetland sites).

6.3.36. Some ecosystems can tolerate a degree of minor change, such as localised or temporary disturbance or changes in physical conditions, without such changes harming their function or value. Ecological effects are considered in the light of any information available about the resilience of ecosystems to accommodate change.

6.3.37. Conservation status has been used to determine whether the effects of the Scheme on priority habitats or species are likely to be significant. The conservation status of priority habitats and species within a defined geographical area is described as follows:

- For habitats, conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure, and functions as well as its distribution and its typical species within a given geographical area; and
- For species, conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area.

6.4. Assumptions and limitations

6.4.1. Local record centres do not hold exhaustive records that occur within a given area. Therefore, the absence of records does not demonstrate that a species is absent. In addition, the local records centre request was conducted prior to the current emerging route option being confirmed. As a result of this, the entire ZoI has not been surveyed. An updated data request to the local records centre will be made at the next stage of the project.

6.4.2. The desk study reviewed the Woodland Trust Ancient Tree Inventory[66]. This provides records of veteran trees but is not an exhaustive list and other veteran trees may be present in the area. The walkover survey aimed to identify such features and as such this is not considered a constraint. Arboricultural surveys are planned to be conducted in autumn 2021 which would identify veteran and ancient trees within the working corridor of the Scheme.

6.4.3. The list of invasive plant species included on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) is extensive and these plants are found in a range of different habitats, including aquatic habitats. The extended Phase 1 habitat survey checked for the presence of Japanese knotweed, giant knotweed, hybrid knotweed, giant hogweed, Himalayan balsam, rhododendron, New Zealand pigmyweed, Virginia creeper, variegated yellow archangel, and cotoneaster species. Other invasive species, especially those associated with aquatic habitats, may not have been recorded.

6.4.4. During the Phase 1 surveys, access was not granted to all areas, therefore full survey coverage was not possible. Of the total area within 250 m of the current preferred route option, plus the total area within 50 m of the A3102/A342 junction signalling works, approximately 40% of the land has been subject to Phase 1 survey. The A3102/A342 junction was not surveyed at all. The GIS tool aimed to classify habitats based on aerial data and open-source information sources, which was able to give an indication of the habitats present in the areas where survey access was not granted.

[66] https://ati.woodlandtrust.org.uk/

It is considered that this goes some way to addressing this limitation. However, the GIS tool relies completely on OS Master map for its data and, therefore, some key information will be omitted. For example, this data does not identify all hedgerows or other linear features within the landscape, or any of the small ditches within the OS open rivers layer.

6.4.5. It is important to note that ecological walkover surveys do not constitute a thorough, systematic search of the entire survey area for evidence of protected and priority species. The primary purpose of these surveys is to characterise the habitats and identify any areas that have the potential to support such species. Where suitable habitats have been identified, further survey is usually required.

6.4.6. Ecological surveys are limited by factors which affect the presence of plants and animals such as the time of year, migration patterns and behaviour. The ecological surveys undertaken to support this PEAR have not therefore produced a complete list of plants and animals and the absence of evidence of any particular species should not be taken as conclusive proof that the species is not present or that it will not be present in the future.

6.4.7. The Phase 1 surveys were undertaken in November and December 2020, which is outside the main growing season for plant species and out of the active season for many animal species. As a result of this, surveys may not have identified all constraints within the survey area.

6.4.8. Aquatic walkover surveys have not been undertaken at the time of reporting due to restrictions posed on the aquatic survey team governed by the Covid-19 pandemic. Therefore, the aquatic ecology assessment at this stage is based on aerial imagery, professional judgement, and review of limited desk study species data. It is anticipated that walkover surveys will be undertaken during 2022.

6.4.9. These limitations have been partially addressed in the assessment by application of the precautionary principle, but there could still be relevant ecological features present in the ZoI of the Scheme that are not considered in the assessment. Future surveys will aim to cover the study areas for the Scheme in its entirety. In the meantime, the surveys undertaken to date are considered to have covered sufficient areas for the PEAR

6.5. Consultation

6.5.1. Natural England have been consulted on the initial proposals and have provided feedback on the preliminary route options. Consultation with Natural England is ongoing.

6.5.2. The Wiltshire County Council Ecologist was consulted on proposals in July 2021. A meeting was held to discuss the outcomes of the Phase 1 surveys, and likely impacts anticipated. Further to this meeting, the County Ecologist provided further information on potential impacts to rare bat species in the area as a result of the proposals, details of which are considered within this report. Consultation with the County Ecologist is ongoing.

6.5.3. Consultation with the Environment Agency is anticipated at later stages of the project.

6.5.4. The consultees' views will be taken into account in the subsequent stages of the project, including the final design of the Scheme and its associated mitigation and compensation measures.

6.6. Baseline conditions

6.6.1. The Scheme is located to the east of Melksham, Wiltshire. It is within the National Character Area (NCA) 'Avon Vales'[67], which is an undulating, low-lying landscape of mixed agriculture and small limestone-built towns. The area is more than 80% agricultural. The Bristol River Avon and its tributaries cut the landscape.

[67] http://publications.naturalengland.org.uk/file/5057323605164032

6.6.2. The majority of the habitats in the survey area are arable, improved grassland, and semi-improved grassland. There are small areas of woodland, scrub, bare ground, buildings, and running and standing water throughout the landscape.

6.6.3. The Bristol River Avon and its tributaries are crossed by the Scheme.

6.6.4. Other habitats recorded within the study area for the entire Scheme are summarised in the table below. This table sets out the verified habitats as well as the data for the predicted habitats (based on the GIS tool).

Designated sites

6.6.5. Table 6-4 details the statutory and non-statutory designated nature conservation sites identified through the desk study. Analysis of the potential impacts on the designated sites from the Scheme is provided in section 6.6.

Table 6-4 - Statutory and non-statutory designated nature conservation sites within the ZoI of the working corridors[68]

Site Name	Designation	Distance to Scheme (main road scheme, not junction signalling works)	Features of Interest[69]
Bristol River Avon	LWS	Directly crosses the route alignment to the north (as shown on Figure 6.2, Volume 3)	One of the main river systems draining north-west Wiltshire. Important for dragonfly populations including scarce chaser. It is also important for aquatic plants. The Bristol River Avon flows into the Severn Estuary, which is designated as a SAC, SPA and Ramsar. This is approximately 70 km downstream when following watercourse connections.
Inwood, Lacock	LWS	20 m west of the working footprint of the Scheme (as shown on Figure 6.2, Volume 3)	Broadleaved woodland and neutral grassland
Kennet and Avon Canal	LWS	Directly crosses the southern extent of the route alignment (as shown on Figure 6.2, Volume 3)	High bird biodiversity, as well as populations of water vole
Eighteen Acre Plantation	LWS	400 m east (as shown on Figure 6.2, Volume 3)	Plantation woodland with field maple, ash and oak.
Hill Planting	LWS	570 m east (as shown on Figure 6.2, Volume 3)	Even-aged plantation of mature oak and ash. Hazel, hawthorn, and elm understory
Hack Farm Meadow	LWS	600 m east (as shown on Figure 6.2, Volume 3)	A small area of species-rich neutral meadow

[68] Where designated sites are situated outside of the working corridor, the distance and direction is given to the closest point that the designated site is from the working corridor. This is an approximate estimate based on tools to measure aerial imagery
[69] Including qualifying features of internationally designated sites and reasons for designation for SSSIs

Site Name	Designation	Distance to Scheme (main road scheme, not junction signalling works)	Features of Interest[69]
Hanging Wood	LWS	780 m east (as shown on Figure 6.2, Volume 3)	Mature poplar plantation on a very wet ancient site. Hazel understory
Morass Wood	LWS	830 m east (as shown on Figure 6.2, Volume 3)	Former coppice woodland
Spye Park	SSSI	1.1 km north east (as shown on Figure 6.1, Volume 3)	Habitat mosaic comprising undisturbed alder woodlands, oak woodlands, parkland and dry acidic grassland which contains locally uncommon plants. Wet soil conditions in much of the park which has rich communities of lichens, bryophytes and vascular plants.
Seend Cleeve Quarry	SSSI	1.2 km south east (as shown on Figure 6.1, Volume 3)	Designated for geological purposes, therefore not considered further in this report.
Seend Ironstone Quarry and Road Cutting	SSSI	1.5 km south east (as shown on Figure 6.1, Volume 3)	Designated for geological purposes, therefore not considered further in this report.
Bath and Bradford on Avon Bats	SAC	7 km north west (as shown on Figure 6.1, Volume 3)	Designated for the Annex II species greater horseshoe bat, lesser horseshoe bat, and Bechstein's bat
Mells Valley	SAC	27 km south west (as shown on Figure 6.1, Volume 3)	Designated for the Annex II bat species greater horseshoe bat
Chilmark Quarries	SAC	29 km south (as shown on Figure 6.1, Volume 3)	Designated for the Annex II species greater horseshoe bat, lesser horseshoe bat, Bechstein's bat and Barbastelle bat
Severn Estuary	SAC, SPA and Ramsar	40 km north west	Designated for the following habitats: Estuaries; mudflats and sandflats not covered by seawater at low tide; Atlantic salt meadows; sandbanks slightly covered by seawater at all times; and reefs

Site Name	Designation	Distance to Scheme (main road scheme, not junction signalling works)	Features of Interest[69]
			Designated for the following species: sea lamprey, river lamprey, twaite shad, allis shad, Bewick's swan, and wintering populations of curlew, dunlin, pintail, redshank and shelduck, and passage populations of ringed plover. The site also sees regular assemblages of over 20,000 wildfowl70, which qualify the site as a wetland of international importance.

[70] Over winter, the area regularly supports 93,986 individual waterfowl (5 year peak mean 1991/2 - 1995/6), including: gadwall (*Anas strepera*), shelduck, pintail, dunlin, curlew, redshank, Bewick's swan, wigeon (*Anas penelope*), lapwing (*Vanellus vanellus*), teal (*Anas crecca*), mallard (*Anas platyrhynchos*), shoveler (*Anas clypeata*), pochard (*Aythya ferina*), tufted duck (*Aythya fuligula*), grey plover (*Pluvialis squatarola*), white-fronted goose (*Anser albifrons albifrons*) and whimbrel (*Numenius phaeopus*).

Ancient woodland, veteran trees, and other habitats

Main works area

6.6.6. The desk study identified four pockets of ancient woodland within 1 km of the Scheme alignment (as shown on Figure 6.3, Volume 3). The closest is an unnamed 2 ha woodland located 85 m to the west of the Scheme, at the point where the Scheme will meet the existing A350 at the north of the Scheme extents. Ancient woodland is ascribed a valuation of National.

6.6.7. There are four records of ancient, veteran, and notable trees within the study area, according to the Woodland Trust Inventory. The closest records are a notable English oak 50 m north east of the Scheme, and one veteran English oak 80 m north east of the Scheme. In addition, the Phase 1 survey identified a further 79 large trees within the survey area which are potentially veteran, notable, or ancient. Arboricultural surveys planned for autumn 2021 will aim to characterise these trees and determine which, if any, are to be impacted by the Scheme.

6.6.8. Within the working corridor of the Scheme, there are 12 pockets of broadleaved woodland, a priority habitat. These woodlands are distributed along the route corridor. In addition, there are 113 pockets of deciduous woodland within 1 km of the Scheme, as well as 22 traditional orchards (closest 350 m east of the Scheme, east of the Littleton roundabout). All are shown on Figure 6.3, Volume 3.

6.6.9. During the Phase 1 surveys, native hedgerow priority habitat was found to be present throughout the study area. The hedgerows are considered to be a key ecological feature in the predominantly arable landscape, with many of the hedgerows being species rich. The Scheme crosses 101 hedgerows.

Junction signalling works

6.6.10. The desk study identified one pocket of ancient woodland within 500 m of the Junction Signalling Works at the A3102/A342. Wyatt's Wood is located 250 m south west of the signalling works.

6.6.11. There are no ancient, veteran or notable trees within 50 m of the junction signalling works.

6.6.12. There are three pockets of deciduous woodland within 500 m of the junction signalling works, the closest of which is the Wyatt Wood ancient woodland mentioned above.

6.6.13. Phase 1 surveys have not been conducted of the junction signalling works area. From a review of aerial imagery, it appears that hedgerows and trees are within the works area. However, it is not anticipated that any habitat will be lost as a result of this part of the Scheme.

Table 6-5 - Habitat types within the study area subject to phase 1 survey

Habitat type	Area surveyed (ha)
Semi-natural broadleaved woodland	5.8
Plantation broadleaved woodland	0.8
Mixed Plantation Woodland	0.02
Dense Scrub	3.9
Scattered Scrub	0.004
Improved Grassland	135.9
Poor Semi-Improved Grassland	27.7
Tall ruderal	2
Broadleaved Parkland/Scattered Trees	0.1
Standing Water	0.8

Habitat type	Area surveyed (ha)
Running Water	4300 m
Arable	111
Amenity Grassland	1.3
Ephemeral/Short Perennial	0.05
Buildings	1
Bare Ground	2
Hedgerows	48 km

6.6.14. There are 880 ha land within the Scheme Phase 1 survey area (within 250 m of the working footprint of the main route, and within 50 m of the working footprint of the junction signalling works. Of this, 342 ha have been subject to survey, 40% of the total work footprint, as shown on Figure 6.5, Volume 3.

6.6.15. As only 40% of the land within the study area was subject to survey, the GIS tool was used to indicate the habitat types of the remaining land which was not accessed during the survey. This is shown in the table below.

Table 6-6 - Habitat types within study area not subject to survey (within 250 m of main route, within 50 m of junction signalling works)

Habitat Type (Estimated from GIS Tool)	Area (ha)
Woodland (type unspecified)	7.6
Semi-natural broadleaved woodland	1.5
Plantation broadleaved woodland	0.15
Scrub (type unspecified)	6.7
Parkland/Scattered Trees	0.19
Broadleaved Parkland/Scattered Trees	2
Coniferous Parkland/Scattered Trees	0.2
Neutral Grassland	0.42
Standing Water	1.8
Running Water	3445 m
Arable	367
Amenity Grassland	3
Ephemeral/Short Perennial	16.8
Buildings	13
Bare Ground	50.6
Other/Unidentified Habitat	5.8

Aquatic habitats and species (aquatic macroinvertebrates, macrophytes and fish)

6.6.16. The screening area used for the identification of aquatic features (watercourses and ponds) was 150 m from the Scheme (as shown on Figure 6.12, volume 13). This is considered to cover the area in which impacts on aquatic features may arise. However, impacts may propagate further within a watercourse due to hydrological connectivity, typically in a downstream direction. Therefore, a study area of 2 km was used within the desk study to identify any biological records for watercourses and

ponds identified within the screening area (see Figure 6.13, volume 13 for biological records for watercourses and ponds).

6.6.17. The following aquatic features were identified within the screening area:

- Five main rivers[71]:
  - The Bristol River Avon
  - Unnamed tributary of the Bristol River Avon
  - Forest Brook
  - Clackers Brook (North)
  - Semington Brook
- One Canal[72]:
  - Kennet and Avon Canal
- 15 ordinary watercourses[73];
- Tributary of Clackers Brook (Clackers Brook South);
- Unnamed tributary of the Bristol River Avon;
- Southern branch of the Semington Brook;
- 12 unnamed ditches (Aquatic feature codes to be confirmed at a later stage); and
- 12 ponds - P170, P208/P209, P251, P52, P50, P55, P61, P64, P70/P71, P83, P90, P115. Of which two are lie within the Scheme (P52 and P170). Seven further ponds were identified within the Scheme during the terrestrial ecology Phase 1 surveys which were not identified during the aquatic ecology desk study. P55 and P90 are online ponds that are hydrologically connected to the Semington Brook.

6.6.18. Biological metrics from the individual sample records have been reviewed to assess community and habitat conditions and have been interpreted in the following sections. The following macroinvertebrate community metrics have been described:

- Whalley, Hawkes, Paisley & Trigg (WHPT[74]), is an index that is primarily used to monitor the impact of organic water quality, but will also show responses to toxic pollution, siltation, habitat reduction and reduced flows. Derived metrics include Average Score Per Taxon (WHPT ASPT) and total number of scoring taxa (WHPT N TAXA);
- Lotic Invertebrate Flow Evaluation (LIFE[75]) is an index used to assess the sensitivity of the recorded community to changes in flows; and
- Proportion of Sediment-sensitive Invertebrates (PSI[76]) is a biotic index that assesses the macroinvertebrate community's sensitivity to sedimentation.

Bristol River Avon and unnamed tributary of the Bristol River Avon

6.6.19. The Bristol River Avon and unnamed tributary of the Bristol River Avon are a reportable WFD water body, with an overall classification of 'Moderate' (WFD water body ID: GB109053027440 – Avon

[71] Main Rivers are typically larger streams and rivers. Main Rivers typically include certain structures that control or regulate the flow of water in, into or out of the channel. The Environment Agency has permissive powers, but not a duty, to carry out maintenance, improvement or construction work on designated Main Rivers. Moreover, the Environment Agency has powers to regulate activities of others affecting rivers and their flood plains under the Environmental Permitting Regulations 2016, the Water Resources Act 1991 and land drainage bylaws.

[72] Canals are a manmade watercourse typically characterised by artificial banks, uniform profiles and often relatively heavily used for navigational purposes. The Canal & River Trust hold a number of objects and powers over the canal network, notably to preserve, protect, operate, and manage inland waterways.

[73] Ordinary watercourses are all other watercourses not designated a main river. Lead local flood authorities, district councils and internal drainage boards carry out flood risk management work on ordinary watercourses.

[74] WFD-UKTAG(2014), River Assessment Method, benthic Invertebrate Fauna. Invertebrates (General Degradation): Whalley, Hawkes, Paisley & Trigg (WHPT) metric in River Invertebrate Classification Tool (RICT) UKTAG Method Statement. ISBN: 978-1-906934-62-0
Biological Monitoring Working Party (1978). Final report: assessment and presentation of the quality of rivers in Great Britain. Unpublished report, Department of the Environment, Water Data Unit.

[75] Extence, C.A., Balbi, D.M. and Chadd, R.P. (1999) River flow indexing using British benthic macroinvertebrates: A framework for setting hydroecological objectives. Regulated Rivers: Research and Management 15, 543-574.

[76] Turley, M.D., Bilotta, G.S., Chadd, R.P., Extence, C.A., Brazier, R.E., Burnside, N.G., Pickwell, A.G.G. (2016) A sediment-specific family-level biomonitoring tool to identify the impacts of fine sediment in temperate rivers and streams. *Elsevier: Ecological Indicators* **70**, 151 – 165.

(Brist) confluence River Marden to confluence Semington Brook). The objective of the WFD is for all water bodies to achieve good status. In order to achieve this objective, each individual quality element is assessed for the water body are monitored and given a classification relative to an expected condition for a river of a particular typology. For the Bristol River Avon, the WFD biological quality elements are classified at 'Moderate' as of 2019, with macrophytes and phytobenthos combined at 'Moderate', fish at 'High' and invertebrates at 'Good'. The water body is not designated as an artificial or heavily modified water body and its hydromorphological status is classified as supporting 'Good'.

6.6.20. The desk study has identified one Environment Agency macrophyte monitoring site (Site ID: 147541) on the Bristol River Avon, approximately 1.1 km downstream from the Scheme, which has been sampled once on 22 August 2016. Biological metrics[77] for the macrophyte assemblage are indicative of high nutrient loads (RMNI: 8.31), with an assemblage preference for slow flowing conditions (RMHI: 8.43). Both taxon and functional group richness is considered to be good, at 16 and 9 respectively. No notable species were recorded. However, two invasive species were identified: water fern (*Azolla filliculoides*) and common duckweed (*Lemna minuta*).

6.6.21. The desk study identified one Environment Agency invertebrate monitoring site (Site ID: 7783) on the Bristol River Avon, approximately 1.5 km upstream from the Scheme. This site has been sampled twice since 09 May 2016, most recently in 07 November 2016. Biological metrics from the most recent survey were indicative of unstressed conditions (WHPT[78] Total: 151.7) and good biological water quality (WHPT ASPT: 4.74), with high taxon richness (32). The invertebrate assemblages has a low sensitivity to reduced flows (LIFE[79]: 6.34) and indicate a Sedimented channel bed (PSI[80]: 29.09). No notable invertebrate species were recorded. However, two invasive non-native species were identified: the New Zealand mud snail (*Potamopyrgus antipodarum*) and the freshwater amphipod, *Crangonyx pseudogracilis/floridanus*.

6.6.22. The desk study has identified one Environment Agency fish monitoring site (Site ID: 10534) on the Bristol River Avon, 1.21 km upstream of the Scheme, which has been sampled three times since 23 August 2016, most recently on 21 August 2019 (record date back to 2003). Surveys within the last five years have yielded 14 species, indicating the presence of a diverse population of coarse fish that exhibit a broad range of tolerances[81] (low to high) to environmental disturbance.

6.6.23. The August 2019 survey yielded 11 species that included: dace (*Leuciscus leuciscus*), gudgeon (*Gobio gobio*), chub (*Leuciscus cephalus*), barbel (*Barbus barbus*), bleak (*Alburnus alburnus*), roach (*Rutilus rutilus*), pike (*Esox lucius*), lamprey sp. (Petromyzontidae) (assumed to be brook lamprey), bullhead (*Cottus gobio*), stone loach (*Barbatula barbatula*) and minnow (*Phoxinus phoxinus*). The most abundant species recorded were roach, which have a high tolerance to environmental disturbance and are known to cope with high organic enrichment. This species prefers slow flowing conditions of varying depths and dense macrophytes. Barbel, a species of medium tolerance mainly associated with faster-flowing sections, with clean gravel substrates and macrophyte beds, were also abundant.

6.6.24. Other species recorded within the last five years at the monitoring site include European eel (*Anguilla anguilla*), perch (*Perca fluviatilis*) and 3-spined stickleback (*Gasterosteus aculeatus*). Whilst there have been no recent records of salmonids, brown trout (*Salmo trutta*) have been

[77] Biotic indices are used to characterise and assess macrophyte community data. Macrophyte biotic indices reported: RMNI = River Macrophyte Nutrient Index, RN_A_Taxa = Richness of Aquatic Taxa or number of recorded taxa, and NRFG = number of functional groups out of a total of 23.

[78] WFD-UKTAG (2014), River Assessment Method. Benthic Invertebrate Fauna. Invertebrates (General Degradation): Whalley, Hawkes, Paisley & Trigg (WHPT) metric in River Invertebrate Classification Tool (RICT) UKTAG Method Statement. ISBN: 978-1-906934-62-0.

[79] Extence, CA, Balbi, DM and Chadd, RP (1999) River flow indexing using British benthic macroinvertebrates: A framework for setting hydroecological objectives. Regulated Rivers: Research and Management 15, 543-574.

[80] Turley, MD, Bilotta. GS, Chadd, RP Extence, CA, Brazier, RE, Burnside, NG & Pickwell, AG (2016) A sediment-specific family-level biomonitoring tool to identify the impacts of fine sediment in temperate rivers and streams. Ecological Indicators 70,151-165.

[81] Water Framework Directive - United Kingdom Technical Advisory Group (2008) UKTAG Rivers Assessment Methods Fish Fauna (Fisheries Classification Scheme (FSC2)).

recorded previously.

6.6.25. Of note are bullhead, lamprey and eel. Bullhead are an Annex II species under the Habitats Directive. Lamprey are UK BAP species and is a Species of Principal Importance (SPI) for nature conservation in England, under the Natural Environment and Rural Communities (NERC) Act 2006. Eels are listed as Critically Endangered on the IUCN Red List of Threatened Species 2020[82].

6.6.26. Eel and lamprey species are also listed as qualifying features for the Severn Estuary Ramsar Site and SAC. As such, the potential for impacts to connectivity and pollution of the Scheme location will be considered. The designated site is approximately 40 km downstream from the Scheme; however, impacts are not likely to propagate further than 2 km downstream. with the designated site and any implications arising from the Scheme to these species. Impacts will be further assessed within the HRA.

6.6.27. At this stage, a precautionary approach has been taken in valuing the Bristol River Avon (including the unnamed tributary of the Bristol River Avon which is assessed under the same WFD waterbody). A Regional importance has been applied due to the presence of a diverse aquatic species assemblage that includes notable fish species, in particular lamprey. However, this will be re-evaluated at a later stage following further assessment and surveys.

Forest Brook

6.6.28. Forest Brook (GB109053021940 – Forest Brook) is a reportable WFD waterbody, with an overall classification of ‘Poor’. The biological quality elements are classified at ‘Poor’, with macrophytes and phytobenthos combined at ‘Poor’, with invertebrates at ‘High’. It is not designated as an artificial or heavily modified water body.

6.6.29. Desk study has not identified any spatially (within 2 km) or temporally (< 5 years old) suitable Environment Agency monitoring data for aquatic species (macrophytes, aquatic macroinvertebrates and fish) for Forest Brook.

6.6.30. Walkover surveys have not been undertaken at this stage. Therefore, Forest Brook will be surveyed at a later stage, where species, habitat and geomorphological characteristics and diversity will be fully assessed.

6.6.31. In line with other similar Schemes and review of aerial imagery, in addition to the WFD biological quality elements classification, Forest Brook has been valued at Local importance, as it is likely to provide habitat of value to aquatic species at the local scale.

Clackers Brook

6.6.32. Clackers Brook (MR05) (GB109053021920 – Clackers Brook – source to confluence Bristol River Avon (Brist)) is a reportable WFD water body, with an Overall Classification of ‘Poor’. Biological quality elements are classified as ‘Poor’, with macrophytes and phytobenthos combined at ‘Poor’, with invertebrates at ‘Moderate’.

6.6.33. It should be noted that at the point of interaction with the Scheme, two watercourses flow into Clackers Brook: one is designated as a Main River (Clackers Brook North) and an ordinary watercourse (Clackers Brook South).

6.6.34. The desk study identified one Environment Agency invertebrate monitoring site (Site ID: 161234), which has been sampled four times since 24 March 2016, most recent of which was on 16 November 2017. Biological metrics were indicative of good habitat and moderate water quality (WHPT Total: 104.3; WHPT ASPT: 4.97). Invertebrate assemblages here were moderately sensitive to reduced flows (LIFE: 6.74) and indicate a moderately sedimented channel bed (PSI: 40.63). No notable species were recorded. However, one invasive non-native species, the New

[82] https://www.iucnredlist.org/species/60344/152845178

Zealand mud snail (*Potamopyrgus antipodarum*) was identified.

6.6.35. The desk study has not identified Environment Agency monitoring data for aquatic macrophytes or fish for Clackers Brook.

6.6.36. Walkover surveys have not been undertaken at this stage. Therefore, Clackers Brook will be surveyed at a later stage, where species, habitat and geomorphological characteristics and diversity will be fully assessed.

6.6.37. In line with other similar Schemes and review of aerial imagery, in addition to the WFD biological quality elements classification, Clackers Brook has been valued at Local importance, as it is likely to provide habitat of value to aquatic species at the local scale.

Semington Brook

6.6.38. The Semington Brook is a reportable WFD water body, with an overall classification of 'Moderate' (WFD water body ID: GB109053022200– Semington Brook - Milebourne Str to confluence River Avon (Bristol)). For the Semington Brook, the WFD biological quality elements are classified at 'Moderate' as of 2019, with macrophytes and phytobenthos combined at 'Good', fish at 'moderate' and invertebrates at 'High'. The water body is not designated as an artificial or heavily modified and its hydromorphological status is classified as supporting 'Good' status. Reasons for not achieving good status (RNAG) included: barriers for fish passage and sewage discharge.

6.6.39. Upstream from the Scheme at ST 91638 60603 (approximately 0.4 km), Semington Brook bifurcates to two channels, one of which is a mill leat. The mill leat then re-joins the main watercourse at ST 90823 60557.

6.6.40. The Semington Brook bifurcates at ST 90521 60636, approximately 0.09 km upstream of where the watercourse interacts with the Scheme and re-joins at ST 90352 60732. There are a series of hydrologically connected ponds (P55 and P90) along the northern branch of the Semington Brook bifurcation.

6.6.41. Desk study identified one Environment Agency macrophyte monitoring site (Site ID: 159964), located approximately 0.6 km downstream from the Scheme, which has been sampled on one occasion since 2016, on 03 September 2020. Biological metrics were indicative of an assemblage with a preference for slow flows (RMHI: 7.86) and moderate nutrient load conditions (RMNI: 7.95). Taxon and functional richness were moderate, at 12 and 9 respectively. Macrophyte percentage cover was low at 0.05%.

6.6.42. No notable or invasive non-native species were recorded. Species recorded at survey included: branched bur-reed (*Sparganium erectum*), brooklime (*Veronica beccabunga*), reed canary grass (*Phalaris arundinacea*) and fool's watercress (*Apium nodiflorum*).

6.6.43. Desk study has not identified any spatially (within 2 km) or temporally (< 5 years old) suitable Environment Agency monitoring data for other aquatic species (aquatic macroinvertebrates and fish) for Semington Brook.

6.6.44. Walkover surveys have not been undertaken at this stage. Therefore, Semington Brook will be surveyed at a later stage, where species, habitat and geomorphological characteristics and diversity will be fully assessed.

6.6.45. In line with other similar Schemes and review of aerial imagery, in addition to the WFD biological quality elements classification, Semington Brook has been valued at Local importance, as it is likely to provide habitat of value to aquatic species at the local scale.

Kennet and Avon Canal

6.6.46. The Kennet and Avon Canal is a reportable WFD water body (WFD water body ID: GB70910178 – Kennet and Avon Canal, summit to Bath), with an Overall Classification of 'Moderate' as of 2019,

and is designated as artificial. Ecological status was classified at 'Moderate' and Chemical classified as 'Fail'. Biological quality elements are not assessed.

6.6.47. Desk study has not identified any spatially (within 2 km) or temporally (< 5 years old) suitable Environment Agency monitoring data for aquatic species (macrophytes, aquatic macroinvertebrates and fish) for Kennet and Avon Canal.

6.6.48. A number of fisheries[83] are operational along the Kennet and Avon Canal which are noted for their bream (*Abramis brama*), roach, perch, tench (*Tinca tinca*), carp (*Cyprinus carpio*) and European eel.

6.6.49. Walkover surveys have not been undertaken at this stage. Therefore, the Kennet and Avon Canal will be surveyed at a later stage, where habitat and geomorphological characteristics and diversity will be fully assessed.

6.6.50. The Kennet and Avon Canal is a major canal system and recreational resource, noted for its coarse fishery and connectivity with other watercourses within the catchment. In the absence of detailed survey data, a precautionary approach has been taken to value it at Regional importance.

All other ordinary watercourses

6.6.51. Walkover surveys have not been undertaken at this stage. Therefore, ordinary watercourses that are within 150 m of the alignment will be surveyed at a later stage, where habitat and geomorphological characteristics and diversity will be fully assessed.

6.6.52. In line with similar habitat typology within the county, which have recently been surveyed for other Schemes and review of aerial imagery, all other ordinary watercourses have been valued at Local importance.

6.6.53. Review of aerial imagery indicates that the majority of ordinary watercourses have a primary function as drainage ditches. Therefore, these are unlikely to support truly aquatic species such as fish, however, may support isolated communities of macrophytes and invertebrates.

Standing waterbodies

6.6.54. No pond habitat or aquatic species data (macrophytes, invertebrates and fish) are available for ponds that are crossed or lie within the footprint of the Scheme. Review of aerial imagery identified that the ponds are found within agricultural settings. Two online ponds were identified within 150 of the Scheme. During the terrestrial ecology walkover surveys, a further seven ponds were identified within the Scheme, meaning that nine ponds in total will likely be lost as a result of the Scheme, with more to potentially be disturbed. Waterbodies within 500 m of the Scheme extent are shown on Figure 6.4, volume 3.

6.6.55. Ponds will be surveyed and assessed at a later stage.

6.6.56. Ponds in agricultural settings often still provide important ecological habitat at the local scale. All pond habitats have been given an initial valuation of Local importance.

Terrestrial priority and protected species

6.6.57. Habitats with the potential to support protected and priority species are shown on the extended Phase 1 habitat map. The following species are assessed within the study area of the emerging route option and have been ascribed preliminary valuation only, given that surveys are incomplete.

6.6.58. Please note that in this section, local records centre information and the distances to the Scheme refers to distances to the main route area, as a local records centre request has not yet been made

[83] http://www.avonac.co.uk/fishing.html [Accessed: September 2021)

to cover the additional junction signalling works.

Amphibians

6.6.59. The desk study records search returned two records of common frog (25 m west of the Scheme), two records of common toad (270 m south east), and 31 records of great crested newt (200 m north west) within the ZoI of the Scheme, as shown on Figure 6.7, Volume 3. There are no records of smooth or palmate newt within 1 km of the Scheme.

6.6.60. The terrestrial habitat of great crested newts can extend to include habitats up to 500 m from a breeding pond. However, if suitable terrestrial habitat is present close to a breeding pond, great crested newts are more likely to stay within 250 m of a breeding pond, and are most commonly found within 100 m of a breeding pond[84]. The closest record identified to the Scheme is 270 m west of the proposed main route. The junction signalling area is considered unlikely to support populations of amphibians due to the hardstanding habitat and the fact works are not expected to extend beyond the hardstanding.

6.6.61. A search of granted European Protected Species (EPS) licence applications within 1 km returned four results, the closest of which is 530 m north of the Scheme main route. A single pond HSI and eDNA survey for District Level Licensing conducted in 2018 returned positive results for great crested newts. This pond is located 900 m north of the Scheme. A search for class licence returns within 1 km of the Scheme route returned no results. There are no class licence returns within 1 km of the junction signalling works.

6.6.62. During the extended Phase 1 habitat survey, 33 ponds were identified within 250 m of the Scheme. Nine ponds are directly within the Scheme working corridor. In addition, there are 22 watercourses within 250 m of the Scheme, some of which may support breeding populations of great crested newts. Furthermore, informal discussions with a landowner and a photograph provided showed a great crested newt individual within the study area.

6.6.63. Anecdotal evidence from a landowner to the north of the Scheme identified toads and newt species on their land.

6.6.64. Within 250 m of the Scheme, the route passes through areas of farmland with hedgerows and small parcels of woodland that are likely to provide connectivity between ponds and provide suitable terrestrial habitat for great crested newts. Great crested newts and other amphibians, such as common toad, require a combination of suitable aquatic breeding habitat and terrestrial habitats, such as woodland, scrub, hedgerows, marshland and rough grassland.

6.6.65. Due to the presence of great crested newts in the footprint of the Scheme and likely loss of suitable habitat for great crested newt and other amphibians as a result of the Scheme, amphibians are considered to pose a constraint to the Scheme. Based on the existing information at this stage, amphibians, including great crested newts, have been ascribed a value of up to County importance.

Bats

6.6.66. The desk study records search returned 231 records of bats within 2 km of the Scheme, excluding the junction signalling works, as shown on Figure 6.6, Volume 3. These records consist of the following species:

- Common pipistrelle;
- Daubenton's;
- Greater horseshoe;
- Lesser horseshoe;
- Long-eared bat species;

[84] English Nature (2004). *An assessment of the efficiency of capture techniques and the value of different habitats for the great crested newt* (ENRR576) http://publications.naturalengland.org.uk/publication/134002

- Nathusius' pipistrelle;
- Natterer's;
- Noctule;
- Nyctalus species;
- Pipistrelle species;
- Serotine;
- Soprano pipistrelle;
- Whiskered; and
- Unidentified bat species.

6.6.67. Lesser and greater horseshoe bats are of particular conservation importance through their inclusion on Annex II of the Habitats Directive and for which SACs are designated[85].

6.6.68. The closest lesser horseshoe record provided by WSBRC is 450 m east of the Scheme, although this is not a roost record. Two greater horseshoe records are found 1.5 km south and west of the Scheme. Bath and Bradford on Avon Bats SAC is designated for the population of greater horseshoe bats, as it is associated with the hibernation sites of 15% of the UK population[86]. It is also designated for its populations of lesser horseshoe and Bechstein's bats. A known lesser horseshoe maternity roost is located 1.5 km south of the Scheme.

6.6.69. Natural England has previously granted seven EPS licences for bats, the nearest of these is located directly in the route's current alignment, at approximate grid reference ST93006619. The licence allows for destruction of a resting place and impact on a breeding site for common pipistrelle. The licence is in effect until 2026.

6.6.70. During the Phase 1 surveys, a landowner provided records of a bat roost at their property. This property is approximately 500 m west of the Scheme working corridor. Surveys conducted by a professional ecological consultancy showed that this is a multi-species roost: lesser horseshoe, greater horseshoe, soprano pipistrelle, a brown long-eared bat, and a whiskered bat. These surveys were conducted in 2018. The EPS licences identified above do not appear to be associated with this site.

6.6.71. Another landowner provided records of a now-demolished multi-species bat roost, comprising lesser horseshoe, brown long-eared, whiskered and pipistrelle species bats. These surveys were carried out sometime before 2018. Although the building housing the bat roost is now demolished, the remaining house in the site has incorporated bat bricks, and a bat mitigation building is adjacent to the main house. This property is approximately 150 m west of the Scheme. The EPS licences identified above do not appear to be associated with this site.

6.6.72. Anecdotal evidence from another landowner to the north of the Scheme identified at least two species of bats on their land, and said there was a bat roost in the roof of their house. Further surveys will help to characterise this roost.

6.6.73. Habitats within the survey area include well-connected hedgerows, treelines, woodland blocks and watercourses that could provide suitable foraging and commuting habitat for bats, including the Annex II species. Trees and buildings within the survey area have the potential to contain bat roosts. Buildings and trees within the study area will require further survey.

6.6.74. Due to the presence of bats in the footprint of the Scheme and likely loss of suitable habitat for bats as a result of the Scheme, bats are considered to pose a constraint to the Scheme and recommendations are provided. Due to the proximity of the Scheme to the Bath and Bradford on Avon Bats SAC, and the previous records as described above, the Survey Area could support bat populations that are up to National importance.

[85] European Council Directive 92/43/EEC
[86] https://sac.jncc.gov.uk/site/UK0012584

Hazel Dormouse

6.6.75. The desk study returned no records of hazel dormouse within 1 km of the Scheme, excluding the junction signalling works. In addition, a search for granted EPS licence applications for hazel dormouse within 1 km of the entire Scheme returned no results.

6.6.76. The extended Phase 1 habitat survey identified hedgerow habitat, the majority of which included blackthorn, hawthorn and bramble which act as good seasonal food sources for hazel dormouse. Hedgerows in the study area were mostly intact, providing connectivity. Parcels of woodland were found throughout the Study Area, and there were some areas of hazel woodland in the north of the Scheme which would provide a variety of food sources and a layered structure. Various areas of scrub would provide habitat for hazel dormouse. The junction signalling works area has very limited value to dormouse as all the works are confined to the hardstanding, and surrounding habitats are regularly disturbed as they are on the junction of two main roads.

6.6.77. Further surveys will identify specific areas where hazel dormice are present in the Study Area, however under a precautionary approach and due to the presence of suitable habitat for dormice, presence is assumed. Hazel dormouse is therefore considered to pose a constraint to the Scheme and recommendations are provided below. A valuation of up to County importance has been ascribed.

Otter and Water Vole

6.6.78. The desk study returned four records of otter within 1 km of the Scheme, associated with the Kennet and Avon Canal, the Semington Brook and the Bristol River Avon, which the Scheme directly crosses. The desk study records returned eight records of water vole within 1 km of the Scheme footprint. Seven records were associated with the Kennet and Avon Canal, and one is associated with Clackers Brook, which directly crosses through the Scheme main route.

6.6.79. During the extended Phase 1 habitat survey, 15 watercourses were identified which have potential to support populations of otters. Three of these, the Bristol River Avon, Clackers Brook and Forest Brook are crossed by the Scheme. Furthermore, eight watercourses were identified during the surveys which have the potential to support water voles, including the Bristol River Avon and Clackers Brook which the Scheme directly crosses.

6.6.80. In addition, holes in the riverbank at Clackers Brook were identified as possible water vole burrows, although it is possible the holes were created by rats. A burrow underneath an oak tree was also identified, which was noted as a potential otter holt. This is directly to the east of the Scheme.

6.6.81. As suitable habitat for otter and water vole has been recorded within the Study Area and both species have been recorded on the Bristol River Avon within 1 km of the Scheme, these species may pose a constraint to the Scheme. A valuation of up to County importance has been ascribed based on their level of protection and the high number of watercourses that are potentially suitable for these species within the Study Area.

White-Clawed Crayfish

6.6.82. The desk study returned no records of white-clawed crayfish within 1 km of the Scheme, neither recent nor historic.

6.6.83. During the extended Phase 1 habitat survey, the Bristol River Avon was identified as having some potential to support populations of white-clawed crayfish, although no desk study records were returned for white-clawed crayfish in the Bristol River Avon. The Bristol River Avon is directly crossed by the Scheme.

6.6.84. Based on the suitability of the Bristol River Avon to support populations of white-clawed crayfish and the absence of further survey data, presence of white-clawed crayfish is assumed. Based on this assumption, and given the level of protection afforded to white-clawed crayfish, this species has been ascribed a value of up to County importance.

Reptiles

6.6.85. The desk study returned 40 records of slow worm within 1 km of the Scheme, excluding the junction, as shown on Figure 6.9, Volume 3. The closest record to the site is approximately 125 m north to the southwestern extent of the Scheme and is separated from the Scheme by the existing A350.

6.6.86. In addition, the desk study returned eight records of grass snake within 1 km of the Scheme. The closest record is approximately 130 m north of the Scheme, and as with the slow worm records, these are separated from the Scheme by the existing A350.

6.6.87. The extended Phase 1 habitat survey identified some areas of habitat within the study area that could be suitable for supporting common reptiles. These areas are primarily field margins around some arable fields with wider rough grassland margins, mature hedgerows and treelines where grazing has less of an impact on ground flora. Earth bunds, log piles, rubble piles and spoil heaps within individual farms provide small individual areas of suitable habitat. The junction signalling works area has very limited value to reptiles as all the works are confined to the hardstanding, and surrounding habitats are regularly disturbed as they are on the junction of two main roads.

6.6.88. The majority of the study area is not considered to be optimal for supporting common reptile species, due to the heavy management of the pasture and arable fields dominating the study area.

6.6.89. Based on the precautionary assumption that the study area supports populations of common species of reptiles and habitats that are important in maintaining the distribution of the species' across this part of Wiltshire, reptiles have been ascribed a value of Local importance.

Birds

6.6.90. The desk study returned 44 bird records from within 1 km of the Scheme, not including the junction signalling works area, as shown on Figure 6.8, Volume 3.

6.6.91. Records of bird species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) were returned. This includes the Schedule 1 bird species brambling, red kite, barn owl, kingfisher, and firecrest. In addition, records of birds that feature on the British Trust for Ornithology Birds of Conservation Concern (BoCC) red list include skylark, cuckoo, grey wagtail, house sparrow, starling, and song thrush.

6.6.92. Spye Park SSSI is located 1.1 km north east of the Scheme. It is designated in part as it is an important site for breeding woodland birds including buzzard, redstart, nightingale, and tree pipit. Birds associated with this SSSI could use features within the Scheme working corridor. During the extended Phase 1 habitat survey, buzzards were sighted, which could be associated with the SSSI.

6.6.93. The survey identified suitable areas of habitat for notable wintering bird species such as wildfowl and waders. This primarily includes semi-improved grassland and arable land. Other habitats present that could support wintering bird species include semi-natural broadleaved woodland, broad-leaved and mixed plantation woodland, scrub, built-up areas and hedgerows; the latter being considered especially important for common passerine species, as well as migrant redwing and fieldfare, which were recorded during the Phase 1 surveys.

6.6.94. Habitat suitable for breeding birds was also identified throughout the Survey Area. This includes hedgerows, mature treelines and woodland habitats. These habitats provide nesting areas for many common breeding birds, as well as food sources. In addition, ground nesting birds, such as skylark, are likely to be found in the arable fields and some species, such as barn owl are likely to utilise the farm buildings.

6.6.95. A barn owl box was noted on a tree during the Phase 1 surveys, approximately 200 m from the Scheme working corridor. Discussions with the landowners indicated that barn owls were breeding within the box in recent years.

6.6.96. The habitats present are likely to also support resident farmland bird species during the winter months. However, considering the habitats present and the distance from designated sites noted for wintering water bird assemblages (with no SPAs or Ramsar sites located within 20 km), it is considered unlikely that the habitats within the study area would be of particular importance in supporting protected and priority wintering water bird assemblages.

6.6.97. Based on the information that is currently available concerning the distribution of suitable habitats and protected and priority species previously recorded within the study area, the breeding and wintering bird assemblages have precautionarily been ascribed a value of up to National importance.

Priority invertebrates

6.6.98. The desk study returned one record of five small heath butterflies 500 m west of the Scheme main route, as shown on Figure 6.10, Volume 3. This was the only record within 10 years, however there are also historic records of grizzled skipper, marsh fritillary and wall butterflies. There are also historic records of blood vein, cinnabar, Highland grey, sallow and shaded broad-bar moths and a scare chaser dragonfly within 2 km of the Scheme.

6.6.99. The intensive agricultural habitats that dominate most of the Study Area are unlikely to support notable assemblages of terrestrial invertebrates. However, the following habitats may support notable invertebrate assemblages or species: Mature hedgerows, mature trees, arable field margins, and watercourses. A soil bank identified during the Phase 1 survey was indicated to have potential for priority insect species.

6.6.100. Due to the limited extent of habitats within the footprint of the Scheme to support notable invertebrate species, no further surveys are recommended in relation to terrestrial invertebrates at this stage. Any populations present have been ascribed a value of Local importance.

Flowering plants

6.6.101. The desk study returned a record of cornflower, a priority species listed in accordance with Section 41 of the NERC Act, within 2 km of the Scheme. The following species are listed on the Wiltshire Rare Plant Register[87] and have also been recorded within 2 km of the Scheme: Spotted medick, meadow brome, lesser bulrush, cornfield knotgrass, cotton thistle, great yellow-cress, rye brome, narrow-leaved water-plantain, marsh willowherb, smooth brome, Loddon pondweed and sweet briar. Additionally, stinking chamomile is on this list as nationally scare. These flowering plants are all shown on Figure 6.11, Volume 3.

6.6.102. Spye Park SSSI supports a population of several flowering species which are uncommon in Wiltshire such as marsh violet, smooth-stalked sedge, and thin-spiked wood-sedge. These species may be found in the Scheme area.

6.6.103. The intensive agricultural habitats that dominate the Scheme are considered unlikely to support notable plant species. The dominant habitat types were arable land, improved and semi-improved grassland, with species-poor hedgerows and mature trees present on field boundaries.

6.6.104. Extended Phase 1 habitat surveys were undertaken at a sub-optimal time of the year for botanical survey. Therefore, the lack of the identification of protected or notable plant species does not confirm the absence of important populations of notable plant species. Flowering plant assemblages has been ascribed a value of Local importance.

Badger

6.6.105. The desk study returned four badger records within 1 km of the Scheme main route. The closest record is 30 m to the west of the Scheme working footprint, and was a reported dead badger found

[87] Wiltshire Rare Plant Register (2007). Available at: https://bsbi.org/wp-content/uploads/dlm_uploads/WiltsRPR2007.pdf

on the road. However, the grid reference provided was imprecise.

6.6.106. Habitat within the working corridor predominantly comprises arable and pasture fields with hedgerow networks, which provide suitable habitat for badgers. Signs of badger presence were recorded during the extended Phase 1 habitat survey. Several main and secondary setts were located throughout the Study Area. This includes setts present along field boundaries and tracks associated with farm complexes within 250 m of the Scheme. In addition, latrines and mammal paths were found throughout the survey area, indicating that there is a substantial badger population.

6.6.107. Populations of badger are therefore likely to pose a constraint to the Scheme. Due to the fact badgers are common in the surrounding landscape, badgers have been ascribed a value of Local importance.

Other protected and priority species

6.6.108. The desk study returned five records of brown hare within 1 km of the Scheme. One record was found within the Scheme boundary. The desk study also returned 25 hedgehog records, the closest being 50 m south of the Scheme.

6.6.109. The surrounding habitat in the Scheme area supports brown hare and hedgehog, including arable fields, grassland, woodland edges, hedgerows and scrub. During the Phase 1 survey, six brown hares were sighted.

6.6.110. No further surveys for other notable mammal species are considered necessary, as impact assessment will be based on the assumption that hedgehog and brown hare occur intermittently in suitable habitats throughout the study area and that these are the only other notable mammal species present.

Invasive non-native species

6.6.111. The desk study did not return any records of invasive non-native species (INNS) within 1 km of the Scheme.

6.6.112. During the Phase 1 survey, pampas grass and invasive non-native snowberry were identified, as well as a flock of Canada geese. However, as the survey was conducted during November and December when invasive non-native plants would be less conspicuous and harder to identify, some may have been missed.

6.6.113. As a precaution, it is therefore assumed that invasive non-native plant species may pose a constraint to the Scheme and recommendations are provided.

6.7. Potential effects

6.7.1. This section characterises the potential impacts and the subsequent potential effects (both beneficial and adverse) of the Scheme on the biodiversity resources within the study area in the absence of mitigation. Potential mitigation measures for each receptor are also considered on the basis of the survey and the Scheme information that is currently available.

6.7.2. Where the air quality assessment identifies Ramsar sites, SPAs, SACs, SSSIs, LNRs, LWSs, nature improvement areas, ancient woodland and veteran trees within 200 m of the affected road network, there is the potential for air quality impacts during construction. The extent of the affected road network is not currently known, but when this information is available it will be reviewed against the location of the above mentioned sites and habitats and a detailed impact assessment will be undertaken, along with further air quality modelling as necessary. To avoid repetition, operational phase air quality impacts are not listed in relation to every potential ecological receptor in the sections below.

Construction phase impacts

6.7.3. The predicted construction phase impacts are:

- Permanent habitat loss (e.g., permanent loss of land comprising habitats that plants and animals rely on);
- Temporary habitat loss (e.g., land used during construction that is subsequently to be restored);
- Habitat degradation (e.g., through sediment release, pollution events, construction traffic, air quality impacts and dust);
- Habitat severance and fragmentation affecting movements of protected and priority species;
- Injury or mortality of protected and priority species through construction activities;
- Disturbance from noise, light, and vibration to protected and priority species; and
- Changes to hydrological conditions.

Operational phase impacts

6.7.4. The predicted operational phase impacts are:

- Injury and mortality of protected and priority species from collision with vehicles;
- Disturbance from noise, lighting, and vibration to protected and priority species;
- Pollution events including changes in air quality resulting in degradation of habitats and designated sites;
- Changes to discharge volume and water quality (i.e., outfalls from new drainage infrastructure); and
- For new crossings (especially culverts), watercourse habitat may be affected through changes in hydro-morphological character both upstream and downstream of their location. Associated alterations to sediment delivery rates and changes in flow character have the potential to reduce morphological diversity and reduce habitat complexity.

Designated sites and priority habitats

6.7.5. Impacts to the receptors are anticipated to be the same at both construction and operation phases, unless otherwise stated.

Table 6-7 - Potential effects during construction and operation for designated sites and priority habitats and potential mitigation measures

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
Bath and Bradford on Avon Bats SAC, Mells Valley SAC, Chilmark Quarries SAC and Severn Estuary SAC/SPA/ Ramsar	International	Impacts at both the construction and operation stages will be assessed in the separate Habitats Regulations Assessment (HRA), which will determine potential impacts of the Scheme on the qualifying features of these European Sites. General impacts may include: Impacts to habitats associated with qualifying bat populations Hydrological impacts to the Severn Estuary designations via pollution events to the River Avon Impacts to qualifying fish species associated with the Severn Estuary designations.	Unknown. To be determined following outcome of HRA.	A separate initial HRA screening assessment has been prepared (see Appendix D, Volume 2) which identifies any effect pathways that would trigger the need for Appropriate Assessment ('HRA Stage 2'). The Appropriate Assessment will assess the likely significant effects and determine whether specific mitigation is required. This will be detailed in the next stage of the Scheme. To mitigate the potential for a pollution incident to occur during construction, works will proceed following standard good practice working methods for environmental protection which will adhere to GPPs[88] and CIRIA C715[89] Environmental good practice. Bats and their habitats found within the Scheme which are qualifying features of some of the sites are considered in Table 6-8.	Unknown. To be determined following outcome of HRA.
Spye Park SSSI	National	Spye Park SSSI is 1.1 km from the Scheme at the nearest point. Forest Brook and the Bristol River Avon flow close to the SSSI. Potential hydrological pollution to the watercourses because of the work could	Unknown. To be determined following outcome of air quality analysis	To mitigate the potential for a pollution incident to occur during construction, works will proceed following standard good practice working methods for environmental	Unknown. To be determined following outcome of air

[88] https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/
[89] CIRIA (2006), CIRIA C648 Control of water pollution from linear construction projects Technical guidance. London.

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
		result in an indirect adverse effect on the SSSI. The Scheme falls within the Impact Risk Zone for the Spye Park SSSI. The SSSI may be subject to air pollution impacts. Hydrological and air pollution impacts may affect the SSSI at both the construction and operation phases		protection which will adhere to GPPs[90] and CIRIA C715[91] Environmental good practice. Specific mitigation with regard to air quality impacts will be determined following air quality analysis.	quality analysis.
Inwood, Lacock LWS	County	Inwood, Lacock LWS is 20 m west of the Scheme main works. There is the potential for air pollution to the LWS at both construction and operation phase. This is to be determined following detailed air quality analysis.	Minor adverse	Specific mitigation with regard to air quality impacts will be determined following air quality analysis.	Minor adverse
Kennet and Avon Canal LWS	County	**Construction:** Potential hydrological pollution to the watercourses because of the work could result in an indirect adverse effect on the LWS, which could have an adverse impact on downstream habitats. **Operation:** The existing A350 crosses the Kennet and Avon Canal, therefore no impacts at the operational phase are anticipated.	Minor adverse	To mitigate the potential for a pollution incident to occur during construction, works will proceed following standard good practice working methods for environmental protection which will adhere to GPPs[92] and CIRIA C715[93] Environmental good practice.	Minor adverse

[90] https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/
[91] CIRIA (2006), CIRIA C648 Control of water pollution from linear construction projects Technical guidance. London.
[92] https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/
[93] CIRIA (2006), CIRIA C648 Control of water pollution from linear construction projects Technical guidance. London.

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
Other LWS: Hill Planting, Eighteen Acre Plantation, Morass Wood, Hanging Wood, Hack Farm Meadow	County	The remaining local wildlife sites (Hill Planting, Eighteen Acre Plantation, Morass Wood, Hanging Wood, Hack Farm Meadow) are all greater than 200 m from the Scheme and have no hydrological connection and as such, impacts to the sites are likely to be minimal. However, these sites could be impacted by air pollution, to be determined following the outcome of the air quality analysis. Potential air quality impacts could affect the sites at both the construction and operation phases.	Unknown. To be determined following the outcome of air quality analysis.	Specific mitigation with regard to air quality impacts will be determined following air quality analysis.	Unknown. To be determined following the outcome of air quality analysis.
Ancient Woodland	County	There is the potential for air pollution to ancient woodland at both construction and operation phase. This is to be determined following detailed air quality analysis.	Unknown. To be determined following the outcome of air quality analysis.	Ancient woodlands are to be protected and avoided wherever possible Specific mitigation with regard to air quality impacts will be determined following air quality analysis.	Unknown. To be determined following the outcome of air quality analysis.
Ancient, veteran and notable trees	County	Some potential veteran, notable and ancient trees are directly within the route alignment. Construction: Trees within the route alignment may be lost as a result of construction works. Arboricultural surveys will provide further indication of whether these trees are ancient or veteran.	Unknown. To be determined following detailed arboricultural surveys and air quality analysis.	Ancient, veteran and notable trees should be retained and protected wherever possible Further arboricultural surveys will indicate precisely where ancient, veteran and notable trees are in relation to the road alignment, and further recommendations can be made	Unknown. To be determined following detailed arboricultural surveys and air quality analysis.

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
		Operation: There is the potential for air pollution to ancient, veteran and notable trees during the operational phase. This is to be determined following detailed air quality analysis.		Specific mitigation with regard to air quality impacts will be determined following air quality analysis.	
Deciduous woodland and Traditional Orchard	Local	Within the working corridor of the Scheme, there are 12 pockets of broadleaved woodland, a priority habitat. These woodlands are distributed along the route corridor. In addition, there are 113 pockets of deciduous woodland within 1 km of the Scheme, as well as 22 traditional orchards (closest 350 m east of the Scheme, east of the Littleton roundabout). Priority habitats within 250 m of the working corridor are assessed separately below. Priority habitats within the wider 1 km search area could be impacted by air quality pollution, to be determined following the outcome of the air quality analysis. Potential air quality impacts could affect the sites at both the construction and operation phases.	Moderate adverse	Specific mitigation with regard to air quality impacts will be determined following air quality analysis.	Minor adverse
Priority habitats in the survey area	Local	Pockets of priority habitat are present within the working corridor and wider study area: semi-natural broadleaved woodland, plantation broadleaved woodland, mixed plantation woodland, hedgerows, and running water	Moderate adverse	Scheme design should minimise habitat loss as far as is reasonably practicable Habitat creation should be used to mitigate the effects of habitat loss on site. This could also contribute to biodiversity net gain targets.	Minor adverse

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
		Construction: Temporary and permanent habitat loss is anticipated. Likely shading impacts of running water features due to creation of new river crossings Potential for indirect adverse impacts to adjacent retained habitats from pollution events during construction Operation: Potential for indirect adverse impacts to adjacent retained habitats from pollution events during construction		Scheme design to incorporate habitat connectivity features, such as habitat corridors, wildlife underpasses, and/ or green bridges. Road verge planting will follow Highways England's Low Nutrient Grasslands policy, by removing nutrient-rich topsoil and adding subsoil or bare substrate to promote wildflower growth. Works will proceed following standard good practice working methods for environmental protection which will adhere to GPPs[94] and CIRIA C715[95] Environmental good practice. These will be secured via a CEMP followed by the Principal Contractor.	
Non-priority habitats in the survey area	Survey Area	The majority of habitats within the working corridor of the Scheme are arable grassland, improved grassland and semi-improved grassland which are not priority habitats. Construction: Temporary and permanent habitat loss is anticipated. Likely shading impacts of running water features due to creation of new river crossings	Minor adverse	Scheme design should minimise habitat loss as far as is reasonably practicable Habitat creation should be used to mitigate the effects of habitat loss on site. This could also contribute to biodiversity net gain targets Scheme design to incorporate habitat connectivity features, such as habitat corridors, wildlife underpasses, and/ or green bridges.	Negligible (Not Significant)

[94] https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/
[95] CIRIA (2006), CIRIA C648 Control of water pollution from linear construction projects Technical guidance. London.

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
		Potential for indirect adverse impacts to adjacent retained habitats from pollution events during construction Operation: Potential for indirect adverse impacts to adjacent retained habitats from pollution events during operation		Road verge planting will follow Highways England's Low Nutrient Grasslands policy, by removing nutrient-rich topsoil and adding subsoil or bare substrate to promote wildflower growth. Works will proceed following standard good practice working methods for environmental protection which will adhere to GPPs[96] and CIRIA C715[97] Environmental good practice. These will be secured via a CEMP followed by the Principal Contractor.	
Bristol River Avon LWS and associated aquatic species (aquatic macrophytes, invertebrates and fish).	Regional	Construction: Construction activities such as excavation, plant/material movements to accommodate a new watercourse crossing (viaduct at ST 91869 67336, approximately 350 m long) may result in disturbance to aquatic habitats and species and reduced water quality. Piling may cause acoustic disturbance to fish species. Spillage of fuels or other contaminating pollutants through uncontrolled site runoff	Moderate adverse	Construction: Embedded design mitigation[98] to limit impacts of new crossings such as: Design amendments to reduce new structures over watercourses and, where structures cannot be avoided, an understanding that clear span structures are preferential for biodiversity. Structures should be designed appropriately to retain habitat connectivity and minimise channel losses. For the River Avon it is understood that the proposed structure is a viaduct, however for other watercourses if clear span structures cannot be feasibly	Minor adverse

[96] https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/
[97] CIRIA (2006), CIRIA C648 Control of water pollution from linear construction projects Technical guidance. London.
[98] The embedded design mitigation outlined for the Bristol River Avon also applies to the unnamed tributary of the River Avon, Forest Brook, Clackers Brook North and Clackers Brook South affected by the Scheme.

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
		may be released into the system and propagate to downstream habitats. The presence of the viaduct over the River Avon is likely to result in shading which may limit riparian and in channel macrophyte growth and affect aquatic species distribution/abundance. Operation: Potential operational impacts on aquatic receptors are likely to arise from the operation of the new proposed crossing and associated drainage system, that may have potential impacts to water quality and quantity if appropriate attenuation and treatment of road run-off is not in place. Associated designations: The Scheme directly crosses the Bristol River Avon. This ultimately flows into the Severn Estuary which is designated as a SAC, SPA, and Ramsar site. Potential impacts are considered within the HRA. Bristol River Avon LWS is crossed by the Scheme. There will be no land take from the river channel. However, river crossings are expected to create minor disturbance along the watercourse during construction. There is also the potential for pollution to		incorporated, then culverts should be designed to maintain natural bed sediments and levels (i.e. through embedment of the culvert invert or use of portal frames) to ensure they do not act as barriers to fish passage. Any new crossing structures should be perpendicular to the watercourse alignment to reduce length of watercourse affected. Design that acts to reduce requirement for hard engineered bed and bank reinforcement on watercourses, except at locations where it can be demonstrated that it prevents potential loss of life or is necessary to protect critical infrastructure. 'Softer', bioengineered solutions will in many cases afford appropriate erosion protection and be a cheaper/more sustainable design approach. Works should be undertaken in accordance with best practice, with regard to preserving water quality and preventing pollution during the works. All construction works should be undertaken with regard to the Guidance for Pollution Prevention (GPPs[99]) and the Construction Industry Research and Information Association (CIRIA) guidance on the control of water pollution from construction sites. These detail good	

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
		indirectly pass into the river and adjacent habitats as a result of construction work.		practice advice for undertaking works which may have the potential to cause water pollution including management of fine sediment run-off from construction areas. This also includes use of designated, bunded areas away from sensitive ecological features for fuel storage and refuelling. Percussive (hammer) piling shall be avoided in favour of softer alternatives (e.g. silent sheet piling, vibratory sheet piling) where ground conditions allow. Where not possible, soft start piling procedures should be utilised. The soft-start duration should be a period of not less than 20 minutes and should piling cease for a period greater than 20 minutes, the soft start procedure must be repeated. Due to shading, other areas within the system may be enhanced or reinstated to off-set any potential losses of habitat suitable for aquatic species, in particular macrophytes. Minimisation of de-vegetation and reinstatement of any riparian vegetation lost during construction where no permanent structures remain in place. Operation: It is assumed that at this stage, appropriate attenuation and run-off treatment will be	

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
				implemented through the drainage design. However, full details of this are currently not known, therefore, this will be reviewed as the design progresses.	
Unnamed tributary of the River Avon and associated aquatic species (macrophytes, macroinvertebrates and fish)	Regional	Construction: Construction activities such as excavation, plant/material movements to accommodate the new watercourse crossing (viaduct/structure at ST 92334 66815, approximately 20 m long) may result in disturbance to aquatic habitats and species and reduced water quality. Structure type not yet confirmed. Piling may cause acoustic disturbance to fish species. Realignment of the watercourse will result in disturbance, temporary loss of habitat for aquatic species (macrophytes, invertebrates and fish), which may also be lost. Spillage of fuels or other contaminating pollutants through uncontrolled site runoff may be released into the system and propagate to downstream habitats. The presence of the new structure over the unnamed tributary of the River Avon is likely to result in shading which may limit riparian and in channel macrophyte growth and affect aquatic species distribution/abundance.	Minor adverse	Construction: Embedded design mitigation as outlined in previous sections for the River Avon and as follows to limit impacts of new crossings such as: A translocation programme to preserve key plants and invertebrate communities may need to be developed following survey at a later stage. Fish rescue may be required to ensure no harm to fish populations during re-alignment of watercourses. Operation: It is assumed that at this stage, appropriate attenuation and run-off treatment will be implemented through the drainage design. However, full details of this are currently not known, therefore, this will be reviewed as the design progresses.	Minor adverse

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
		Operation: Potential operational impacts on aquatic receptors are likely to arise from the operation of the new proposed crossing and associated drainage system, that may have potential impacts to water quality and quantity if appropriate attenuation and treatment of road run-off is not in place.			
Forest Brook, Clackers Brook North and South, and associated aquatic species (macrophytes, macroinvertebrates and fish)	Local	Construction: Construction activities such as excavation, plant/material movements to accommodate new watercourse crossings (two bridges on the Forest Brook at ST 92820 166063 and ST 93033 65924, both approximately 10 m long and bridges on the Clackers Brook North at ST 93168 63096 and Clackers Brook South at ST 92982 62797 approximately 45 m and 20m long) may result in disturbance to aquatic habitats and species and reduced water quality. Piling may cause acoustic disturbance to fish species. Spillage of fuels or other contaminating pollutants through uncontrolled site runoff may be released into the system and propagate to downstream habitats. The presence of the new bridges on Forest Brook, Clackers Brook North and South are likely to result in shading which may limit riparian and in channel macrophyte growth	Minor adverse	Construction: Embedded design mitigation as outlined in previous sections for the River Avon and unnamed tributary of the River Avon. Operation: It is assumed that at this stage, appropriate attenuation and run-off treatment will be implemented through the drainage design. However, full details of this are currently not known, therefore, this will be reviewed as the design progresses.	Minor adverse

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
		and affect aquatic species distribution/abundance. **Operation:** Potential operational impacts on aquatic receptors are likely to arise from the operation of the new proposed crossing and associated drainage system, that may have potential impacts to water quality and quantity if appropriate attenuation and treatment of road run-off is not in place.			
Semington Brook and associated aquatic species (macrophytes, aquatic macroinvertebrates and fish)	Local	Construction: Construction activities such as excavation, plant/material movements to accommodate the expansion of the existing crossing the Semington Brook (ST 90446 60764 and ST 90439 60626) may result in disturbance to aquatic habitats and species and reduced water quality. Piling may cause acoustic disturbance to fish species. Spillage of fuels or other contaminating pollutants through uncontrolled site runoff may be released into the system and propagate to downstream habitats. The requirement for the extension of the existing crossing over Semington Brook will increase shading, which may limit riparian	Minor adverse	Construction: Embedded design mitigation as outlined in previous sections for the River Avon and unnamed tributary of the River Avon. Expansion of existing crossings should be designed with reference to the principles outlined for new structures in the previous section for the River Avon, but also with consideration of ensuring appropriate tie in to the existing structure to maintain habitat connectivity and sediment continuity. Operation: It is assumed that at this stage, appropriate attenuation and run-off treatment will be implemented through the drainage design. However, full details of this are currently not	Minor adverse

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
		and in channel macrophyte growth and affect aquatic species distribution/abundance. **Operation**: Potential operational impacts on aquatic receptors are likely to arise from the operation of the new proposed crossing and associated drainage system, that may have potential impacts to water quality and quantity if appropriate attenuation and treatment of road run-off is not in place.		known, therefore, this will be reviewed as the design progresses.	
Kennet and Avon Canal	Regional	Construction: The expansion of the existing carriageway will take place beneath the aqueduct of the Kennet and Avon Canal. Therefore, construction impacts are limited to potential vibration disturbance associated with construction activities below the aqueduct. Operation: No impacts should arise from the operation of the Scheme.	Minor adverse	Construction: Percussive (hammer) piling shall be avoided in favour of softer alternatives (e.g. silent sheet piling, vibratory sheet piling) where ground conditions allow. Where not possible, soft start piling procedures should be utilised. The soft-start duration should be a period of not less than 20 minutes and should piling cease for a period greater than 20 minutes, the soft start procedure must be repeated.	Negligible (Not Significant)
Other ordinary watercourses and associated aquatic species (macrophytes,	Local	Construction: The new proposed culverts will result in direct loss of habitat. Without ecologically sensitive culvert design, impacts are likely to arise due to alterations in hydrology and reduced connectivity.	Minor adverse	Construction: Although culvert designs have not been confirmed at this stage, they should have an ecologically sensitive design. Where practically possible, design should include the following: allowance for the appropriate	Minor adverse

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
macroinvertebrates and fish)		Construction activities such as excavation, plant/material movements to accommodate the new watercourse crossing may result in disturbance to aquatic habitats and species and reduced water quality. Spillage of fuels or other contaminating pollutants through uncontrolled site runoff. Operation: Potential operational impacts on aquatic receptors are likely to arise from the operation of the new proposed crossing and associated drainage system, that may have potential impacts to water quality and quantity if appropriate attenuation and treatment of road run-off is not in place.		conveyance of water and sediment for a range of flows (including at low flow conditions); maintenance of the existing channel gradient to avoid erosion at the upstream or downstream end of a culvert; avoidance of reduction of watercourse length through shortening of watercourse planform; minimisation of culvert length through adoption of a perpendicular alignment to the railway/road/etc; embedded culvert inverts for all box culverts and piped culverts where practical, to allow for formation of a natural watercourse bed (culvert invert to a depth of at least 0.15 m to 0.3 m below existing bed level) and to reduce the potential for significant habitat severance and effects on fish passage. Works should be undertaken in accordance with best practice, with regard to preserving water quality and preventing pollution during the works, as outlined above. Due to the introduction of culverts and direct loss of in channel habitat, other areas within the system may be enhanced or reinstated to off-set any potential losses of habitat suitability for aquatic species. Operation: It is assumed that at this stage, appropriate attenuation and run-off treatment will be implemented through the drainage design.	

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
				However, full details of this are currently not known, therefore, this will be reviewed as the design progresses.	
Ponds (P50, P55, P61, P64, P70/P71, P90, P115 P208/P209, P251)	Local	Construction: There may be some impacts associated with spillage of fuels or other contaminating pollutants through uncontrolled site runoff. There is potential for encroachment, which may result in temporary loss of aquatic habitat. Operation: No operational impacts are anticipated.	Minor adverse	Construction: Where feasible, implementation of an exclusion zone around the ponds (ideally 8 m) during construction of the road will be implemented. Works should be undertaken in accordance with best practice, with regard to preserving water quality and preventing pollution during the works, as outlined in previous sections. Operation: Pond habitats may provide opportunities for habitat enhancement and creation, to off-set other losses within the system that arise from the Scheme.	Negligible (Not Significant)
Ponds (P52, P170), plus an additional 7 ponds identified during the Phase 1 survey.	Local	Construction: These ponds are directly crossed by the Scheme. As a result, these ponds, and associated aquatic species (possibly macrophytes, invertebrates, and fish which will be confirmed at a later stage) will be directly lost. Operation: Direct loss of pond habitat is anticipated at the construction stage.	Major adverse	Construction: Works should be undertaken in accordance with best practice, with regard to preserving water quality and preventing pollution during the works, as outlined in previous sections. All construction works are undertaken with regard to the Guidance for Pollution Prevention (GPPs) and the Construction Industry Research and Information Association (CIRIA) guidance on the control of water pollution from	Minor adverse

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
				construction sites. These detail good practice advice for undertaking works which may have the potential to cause water pollution including management of fine sediment run-off from construction areas. This also includes use of designated, bunded areas away from sensitive ecological features for fuel storage and refuelling. A translocation programme to preserve key plants and invertebrate communities may need to be developed following survey at a later stage. It is unlikely that these ponds are suitable for fish. However, following confirmation of suitability for fish species, a fish rescue may be required to ensure no harm to fish populations. Operation: Due to the direct loss pond habitat, these ponds will be replaced in other areas of the system to off-set the loss of habitat.	

Priority and legally protected species

Table 6-8 - Potential effects during construction and operation for protected and priority species and potential mitigation measures

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
Great crested newt and other amphibians	County	Construction: There are nine ponds directly within the working corridor which will likely be lost as a result of the Scheme. Permanent loss of terrestrial and aquatic habitats Operational risk of amphibians becoming stuck in drainage systems, or collisions with vehicles Mortality or injury during habitat clearance and contact with construction vehicles and plant Degradation of terrestrial and aquatic habitats through pollution Operation: Long-term fragmentation of habitats and isolation of breeding ponds Increased chance of collisions as a result of the operational road	Major adverse	Waterbodies should be avoided where possible Where avoidance is not possible, three compensatory ponds will need to be created per lost waterbody. Full pond surveys of waterbodies within 500 m of the route alignment will indicate where great crested newts are present. Any destruction of great crested newt habitat would require a European Protected Species (EPS) licence or District Level Licence (DLL). Displacement or translocation of great crested newt from affected area prior to construction Creation of compensatory terrestrial habitats and breeding ponds Exclusion fencing around the work site to prevent great crested newts re-entering construction areas Any activities involving the translocation of great crested newts must be carried out under a watching brief and under the presence of a suitably qualified and	Minor adverse

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
				experienced ECoW and be appropriately licensed. Habitat creation to increase connectivity between isolated habitats. Creation of suitable off-site habitat for great crested newt to be moved to if populations are found to be present within the road alignment. Terrestrial habitats to be lost should be recreated in a nearby undisturbed area. An underpass could be created to allow amphibians to cross the road and maintain connectivity Permanent amphibian fencing to prevent collision with vehicles when the road is operational.	
Bats	County	Construction: Permanent loss of bat roosts Degradation of foraging and commuting habitats through pollution and light spill during construction Mortality and injury of bats Bat roosts to be retained may be subject to disturbance impacts Temporary loss of vegetation to support foraging before the habitat creation areas become established	Major adverse	Wherever possible, loss of roosts and severance of habitats should be avoided. Roosts which are to be lost or disturbed must be compensated for with artificial habitat. Destruction of roosts must be conducted under a Natural England EPS licence Creation of suitable foraging and commuting habitat to support foraging and provide/maintain connectivity between roosts A sensitive lighting scheme should be developed, minimising light spill into habitats and onto roosts	Major adverse

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
		Noise, light and vibration disturbance to bats during construction work Operation: Flight lines severed as a result of the new road Increased traffic on the road network may result in increased road collisions. Permanent fragmentation of bat roosts as a result of the new road, as this creates a barrier to movement.		Destruction of roosts must be overseen by a suitably qualified and experienced ECoW, and closed under licence Avoidance of night work during the main bat active season Minimisation of noise and vibration in the vicinity of roosts Creation of a bat underpass to provide connectivity in the landscape, especially in areas of fragmented woodland Mitigation planting and bat fences installed to direct flight lines away from the Scheme corridor and towards safe crossing locations Installation of bat boxes in suitable habitat in undisturbed areas to create roosts in more suitable and less disturbed locations At present, an assessment of major adverse is considered appropriate as Annex II bat species associated with three internationally important sites may utilise the location of the Scheme	
Hazel dormouse	County	Construction: Permanent loss of foraging and nesting habitats. Degradation of habitats via pollution and light spill. Vegetation clearance and Scheme construction could result in incidental mortality, injury or disturbance (noise,	Major adverse	Impacts to woodland, scrub and hedgerows with the potential to support populations of hazel dormouse should be avoided wherever possible. Alternative woodland, scrub and hedgerow planting are likely to be necessary to replace habitat loss within the working corridor, should hazel dormouse be recorded. This is	Minor adverse

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
		lighting and visual) to individuals and damage or destruction of nests (e.g. resting or breeding sites) during construction. Operation: Permanent fragmentation of habitats to the east and the west of the new bypass Increased traffic on the road and the new bypass may result in increased road collisions		likely to be a condition of an EPS licence that would be required to legally destroy hazel dormouse habitat. This compensatory planting should be distributed so as to ensure connectivity is maintained between populations and must be planted as early as possible to avoid larger impacts / gaps in connectivity. Any clearance of dormouse habitat must be undertaken in accordance with the timing and methods specified by an EPS licence for those activities and must be overseen by a suitably qualified and experienced ECoW.	
Otter and water vole	County	Construction: Direct loss of riparian (and terrestrial for otter) habitats, fragmentation and isolation, therefore breeding, resting, foraging and commuting habitat. Disturbance to breeding, resting, foraging and commuting habitat through noise and vibration. Degradation/direct loss of riparian habitats through construction. Hydrological pollution and degradation of further riparian habitats downstream. Mortality/injury of otters and water vole during habitat clearance Operation:	Major adverse	Wherever possible, road design should avoid otter holts or other high-status resting sites In the event that this is not possible, alternative holt provision is likely to be required. This is likely to be a condition of an EPS licence that would be required to legally damage or destroy the holt. If any sections of watercourse used or with potential to be used by otter are to be culverted, the design of the culvert will need to be such that the passage of otters along the watercourse is not obstructed or deterred. If sections of the watercourse are to be culverted, they must be able to cope with	Minor adverse

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
		Possibility of injury/mortality to otter and water vole as a result from collision with vehicles if the carriageway is accessible from adjacent land		high water flow in order to prevent otter road casualties. Any destruction or disturbance of otter holts must be undertaken in accordance with the timing and methods specified by the EPS licence for those activities and must be overseen by a suitably qualified and experienced ECoW. Wherever possible, the road alignment should avoid sections of watercourse which are known to be occupied by water voles. If this is not possible, measures will likely need to be taken to displace or translocate water voles from the affected area prior to commencement of construction. If translocation (or displacement in excess of 50 m, i.e. not covered under a class licence in spring) is required, it will be necessary to obtain a conservation licence from Natural England and comply with the conditions of that licence. It is likely that a suitable receptor area(s) would also have to be created or enhanced in order to accommodate the translocated / displaced animals and that water vole fencing would have to be installed to prevent water voles from returning to the construction area. Construction and laydown exclusion zones (at least 10 m wide) will need to be established around any sections of retained	

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
				watercourse where water vole burrows are known to be present.	
White-clawed crayfish	County	Construction: Degradation and direct loss of watercourse habitats by pollution during construction Mortality/injury during habitat clearance and in channel works including realignment (if necessary). Operation: Degradation of habitats due to hydrological pollution events during construction.	Major adverse	Wherever possible, sections of watercourse which are known to be occupied by white-clawed crayfish should be avoided. Measures will need to be taken to ensure that no animals are harmed during the works and that habitat remains present after the works are completed. It may be necessary to obtain a licence from Natural England and comply with the conditions of that licence. Pollution prevention guidelines to be put in place to prevent run off into the Bristol River Avon, which has white clawed crayfish potential. Minimisation of noise and vibration next to known crayfish areas (if this is known following Phase 2 surveys).	Minor adverse
Reptiles	Local	Construction: Permanent loss of foraging, hibernation and basking habitats. Degradation of additional habitats through pollution. Fragmentation and isolation of habitats. Mortality/injury of reptiles during habitat clearance. Operation:	Major adverse	Where suitable reptile habitats are to be cleared, measures will need to be taken to displace or translocate reptiles from the affected area prior to commencement of construction. It is possible that suitable receptor areas would also have to be created or enhanced in order to accommodate the translocated/displaced animals and that herptile exclusion fencing installed to prevent reptiles from returning to the construction area. Suitable receptor sites	Minor adverse

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
		• Permanent fragmentation of habitats to the east and the west of the new bypass • Increased traffic on the road and the new bypass may result in increased road collisions		should avoid areas of high population where possible. Any translocation, displacement or habitat destruction activities must be undertaken at an appropriate time of year, using appropriate methods and must be overseen by a suitably qualified and experienced ECoW. Permanent fencing installed around the road corridor to prevent collisions with vehicles Wildlife underpass to maintain connectivity between populations in the wider landscape.	
Breeding and wintering birds	Local	Construction: Permanent loss of foraging and nesting habitats. Degradation of habitats via pollution and light spill. Fragmentation of foraging and nesting habitats. Disturbance/ destruction of nests during habitat clearance, mortality/injury collision risk with vehicles. Disturbance to or loss of potential barn owl nest or roost sites. Operation: Permanent fragmentation of habitats to the east and the west of the new bypass	Major adverse	In order to avoid destruction of active bird nests, clearance of suitable bird nesting habitat should be undertaken outside of the main bird nesting season (the main breeding season is generally 1 March to 31 August inclusive). In order to prevent disturbance of nesting Schedule 1 bird species (e.g. barn owl), it may be necessary to restrict construction activities in the vicinity of Schedule 1 bird nests while they are active. Alternative habitat provision is likely to be required to compensate for the loss of nesting and foraging habitats, particularly for sensitive species with specialist requirements, such as barn owl. If active bird nests are found, an appropriate buffer zone must be established around the	Minor adverse

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
		Increased traffic on the road and the new bypass may result in increased road collisions.		nest and clearance activities delayed within that zone until the nesting attempt has reached its natural conclusion. Alternative habitat provision is likely to be required to compensate for the loss of nesting and foraging habitats, particularly for sensitive species with specialist requirements, such as barn owl. Barn owl nest boxes in the vicinity of the Scheme may need to be closed under licence to avoid road mortality risk.	
Terrestrial invertebrates	Local	Construction: Permanent loss of habitat Degradation of habitats by pollution. Fragmentation of habitats. Mortality during habitat clearance. Operation of the new route is unlikely to have an impact on the favourable conservation status of these species. Operation: No operational impacts considered likely	Minor adverse	Where additional important species are identified, measures will need to be taken to retain and protect these species and their habitats where possible, otherwise suitable compensation will be required.	Minor adverse
Badger	Local	Construction: Permanent loss of habitat (closure of setts) Collision with construction vehicles and plant Disturbance to populations (noise, light, vibration).	Major adverse	If any main setts are to be lost as a result of the Scheme, these must be closed under licence and a suitable artificial habitat must be created in a nearby undisturbed area.	Minor adverse

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
		Operation: Fragmentation of foraging habitat and fragmentation of territories Collision with vehicles using the road		Creation of frequent wildlife crossings suitable for badger to maintain connectivity throughout the landscape Badger-proof fencing around construction work and construction excavations to be covered over at night Hedgerow planting around the new road to prevent vehicle collisions with badger, or construction of badger proof fencing	
Flowering plants	Local	Construction: Permanent loss of habitats. Degradation of habitats by pollution. Loss of plants during habitat clearance. Operation: Permanent fragmentation of habitats	Minor adverse	Where additional species are identified, measures will need to be taken to retain and protect these species and their habitats where possible, otherwise suitable compensation will be required.	Minor adverse
Other protected and priority mammals	Local	Construction: The creation of the New Link Road could result in populations becoming fragmented, and commuting and foraging routes could become severed. The creation of an all-movements junction will necessitate the demolition of the existing overbridge and construction of a new roundabout junction over the M5, with removal of the two existing Junction 10 slip roads and the construction of four new slip roads. This will result in increased	Minor adverse	Wildlife tunnels will be put in place which will provide connectivity for other protected and priority species. No other specific mitigation to be put in place, however brown hare and hedgehog are to be included in the precautionary method of working and their potential presence within the working corridor is to be communicated to the on-site team through the use of a tool box talk.	Negligible (Not Significant)

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
		fragmentation of the habitats surrounding the existing junction. In addition, the loss of large areas of vegetation, partiaularly around the motorway junction, will affect priority mammal species which may forage in those areas. Operation: Increased traffic on the road network may result in increased road collisions. The impacts from the Scheme on foraging and commuting habitat may result in barriers to movement, mortality through traffic collisions, or an alteration to commuting routes which may expose mammals to different risks that would normally be avoided.			

6.8. Potential mitigation measures

General mitigation measures

6.8.1. The design of the Scheme should aim to follow the mitigation hierarchy wherever possible, by avoiding loss in the first instance.

6.8.2. Environmental enhancement should be viewed as one of the major objectives of the Scheme. This can be seen through the early plan to complete a biodiversity net gain assessment for the project, where areas of land that could be used for off site enhancements are being sought. The following general mitigation measures will be adopted where possible:

- Consultation with the Environment Agency will be required for any works that could impact Main Rivers and WFD reportable water bodies. Any in channel/riparian works e.g. culvert installation would require environmental permits from either the EA of Lead Local Flood Authority (LLFA). There may be requirements for fish rescues ahead of in-channel works;
- Planting of native species-rich hedgerows and tree planting throughout the design;
- Planting of native species-rich wildflower mixes along road verges;
- Road verge planting should follow Highways England's Low Nutrient Grasslands policy, by removing nutrient-rich topsoil and adding subsoil or bare substrate to promote wildflower growth;
- Using native plants in the landscaping design, which are of value in their own right and as habitat for other wildlife;
- Establishment of an appropriately sized, resourced and experienced site environmental management team (including at least one Ecological Clerk of Works (ECoW)) to ensure effective implementation of all environmental mitigation;
- Ecological briefings / toolbox talks for all site operatives to make them aware of relevant constraints and requirements prior to commencing work; and
- Clear demarcation (e.g. fencing) of retained habitats and no allowance of vehicles or storage of materials within these areas.

6.8.3. Use of sediment control measures during construction, such as:

- Timing works to avoid exposure of soil during autumn/winter;
- Seeding/planting exposed topsoil at earliest opportunity; and
- Use of silt fencing, drainage ditches, attenuation ponds, etc.

6.8.4. Use of pollution control measures during construction, such as:

- Use of low emission plant;
- Regular maintenance and inspection of machinery;
- Use of designated, bunded areas away from sensitive ecological features for fuel storage and refuelling (i.e. following EA Pollution Prevention Guidance (PPGs)[100] and the Construction Industry Research and Information Association (CIRIA) guidance on the control of water pollution from construction sites[101]); and
- Location of haul roads away from sensitive features and use of dust suppression measures during dry periods.

[100] Note that a review of the PPGs is currently underway, resulting in a replacement guidance series for Scotland, Northern Ireland and Wales (Guidance for Pollution Prevention (GPPs)). In the absence of the new guidance in England the existing (withdrawn) PPGs provide appropriate guidance to be followed. If individual PPGs have been superseded with a GPP, it is recommended that the newer guidance is used despite not being compiled by the EA and the https://www.gov.uk/guidance/pollution-prevention-for-businesses website is consulted.

[101] The CIRIA documents are a series of publications developed by the Construction Industry Research and Information Association. Each document is targeted at a particular type of business or activity and covers environmental good practice to minimise pollution. Particular attention should be given to CIRIA C532 (Control of water pollution from construction sites, 2001).

6.8.5. Covering excavations overnight or incorporating features such as ramps to prevent animals becoming trapped

6.8.6. Designing wildlife tunnels beneath the road at regular intervals and at key crossing locations (determined by later species-specific surveys), along with associated fencing, will help maintain connectivity across the Scheme, allowing wildlife to cross the landscape safely.

6.8.7. Green bridges will be considered throughout the length of the Scheme to help reduce fragmentation impacts, as well as the collision risk with vehicles during the operation of the road.

6.9. Further work

Further survey recommendations

6.9.1. Additional surveys will be undertaken following appropriate good practice and guidance and may include the following. These surveys will inform the Environment Statement.

6.9.2. Additional walkover surveys will be undertaken in the summer months when it is easier to identify species present in habitats and in hedgerows and key areas will be targeted. Furthermore, all areas which have not yet been subject to surveys will be surveyed. This additional walkover will identify the need for more detailed botanical or National Vegetation Classification (NVC) surveys.

Veteran trees

6.9.3. An arboriculture survey will be undertaken aiming to cover the Phase 1 habitat survey area in its entirety and, where possible, update survey data for areas that have already been surveyed. This survey will include the identification of veteran trees so they are known, can be avoided and inform the Scheme design.

Habitats and plants

6.9.4. Due to the largely agricultural nature of the landscape that the Scheme passes through the likelihood of encountering notable plant species is considered to be low. No targeted survey for plant species (e.g. National Vegetation Classification surveys) are considered necessary for the Scheme. However, any observations of notable flowering species completed during other surveys (including the summer habitat walkover) will be recorded to inform further survey and mitigation.

Amphibians

6.9.5. Habitat Suitability Index (HSI) surveys and Environmental DNA (eDNA) surveys will be carried out on waterbodies within 500 m of the Scheme to determine each waterbody's suitability for supporting GCN and confirm if they are present. A survey area of 250 m will be used around the A3102/A342 junction due to the lower impact on surrounding habitats. eDNA surveys can be carried out from mid-April to the end of June. If great crested newts are identified as present, further population surveys may be required following these surveys.

6.9.6. eDNA surveys will involve the collection of water samples from suitable waterbodies within 250 m of the Scheme to be tested for the presence of great crested newt DNA, which would indicate the species is present in a particular waterbody.

6.9.7. The eDNA water sampling will be undertaken by suitably experienced ecologists with at least one great crested newt survey licensed surveyor present within the survey period for eDNA surveys i.e. between 15 April and 30 June. Sampling will follow an approved methodology, recognised by Natural England, that minimises cross-contamination. Field sampling equipment will be supplied as sterile kits by the laboratory that will carry out the DNA analysis.

6.9.8. No further survey is considered necessary for common toad, as the ecological impact assessment will be based on the assumption that this species occurs in suitable habitats throughout the study area. The further great crested newt surveys will also enable validation/refinement of this assumption.

Badgers

6.9.9. An update walkover of the proposed final route option will be undertaken once a decision has been reached. A survey area of 50 m either side of the Scheme will be covered.

6.9.10. Any setts that are within this buffer are likely to be impacted by the Scheme and will need to undergo further monitoring. Should a main sett be impacted by the proposals, further bait-marking and territory mapping surveys may be required to inform appropriate mitigation design.

Bats

Activity surveys

6.9.11. Due to the potential loss of suitable foraging and commuting habitat for bats, it is recommended that activity transect surveys be completed within suitable habitat present within 250 m of the Scheme in accordance with best practice guidance. Activity surveys will only be required in the part of the Scheme covering the signalling works at the A3102/A342 junction if additional lighting is required. This will comprise walked transects on multiple occasions during the main bat activity season to record bat activity. Static detector surveys may also be undertaken with static detectors left on Site within areas of interest to collect data about potential foraging and commuting activity undertaken by bats in the vicinity of the Scheme. Detectors will remain in set locations for a minimum of two weeks and be collected in/swapped around for analysis. Crossing point surveys are also proposed to understand the potential collision risk between bats and the Scheme.

6.9.12. Habitats within the Scheme boundary were largely assessed as having moderate suitability for foraging and commuting bats. For moderate suitability habitat, one visit per month (April to October) is required with at least one dusk and pre-dawn survey within one 24-hour period.

Surveys of potential roost locations

6.9.13. All trees considered to have moderate or high potential for roosting bats within 100 m of the Scheme will be subject to further survey work to determine the presence of roosting bats. This will involve climbing the trees or using a ladder or elevated platform (where safe to do so) to inspect to the potential roost features. The roost potential of the trees will then be re-assessed in accordance with BCT guidelines. Further aerial survey and/or dusk emergence / dawn re-entry survey may be required for trees where roosts are confirmed or where bat roost potential is confirmed as being moderate or high. The type of survey and level of effort required will be determined on a case by case basis with reference to good practice guidance.

6.9.14. Trees that cannot be inspected through an aerial survey may need to be subject to a dusk emergence / dawn re-entry survey, where feasible. Dusk emergence / dawn re-entry surveys will be undertaken between May and September. Moderate potential trees will typically require two surveys, with at least one survey between May and August. High potential trees will typically require three surveys, with at least two surveys between May and August. Low potential trees will not require any further survey. However, mitigation may be advised for felling. Trees with a confirmed roost (i.e. where a bat has been found to be present) will also typically require three surveys.

6.9.15. Aerial tree surveys may be used to replace dusk emergence / dawn re-entry surveys for moderate or high potential trees (where safe to do so). These surveys will be completed between May-August/September. However, at least one dusk emergence / dawn re-entry survey will be carried out for both moderate or high potential trees alongside repeat aerial surveys to replace a dusk emergence / dawn re-entry survey and all potential roost features in a tree will be fully inspected.

6.9.16. All farm complexes or standalone buildings within 100 m of the Scheme that have been classified as having low, moderate or high potential for roosting bats should be subject to further survey work to determine the presence of roosting bats. This will involve an internal building inspection where safe access can be arranged (including the provision of an asbestos report).

6.9.17. In addition to an internal inspection, these buildings should also be subject to dusk emergence/ dawn re-entry surveys in line with BCT guidelines. This will involve the completion of dusk emergence / dawn re-entry surveys between May and September. Low potential buildings will require one survey between May and August; moderate potential buildings will require two surveys, with at least one survey between May and August; and high potential buildings will require three surveys, with at least two surveys between May and August. Buildings where roosts are confirmed may require further surveys to confirm the status of the roost.

Birds (breeding and wintering)

6.9.18. Breeding bird surveys will be undertaken in habitat suitable for priority species within and adjacent to the footprint of the Scheme to help inform ecological impact assessment and mitigation design for the Scheme.

6.9.19. Surveys will involve use of a transect walk to cover areas that may be used by breeding birds in and around the Scheme. Each transect will be subject to six survey visits during the key season (April – July) with at least 10 days between each visit.

6.9.20. Specialist species surveys will be scheduled for barn owl which may utilise buildings located in farm complexes and habitat in and around the Scheme (e.g. farmland) for foraging and commuting and kingfisher which may utilise watercourses in and around the Scheme.

6.9.21. Barn owl surveys will be undertaken to identify and record features of the landscape that are suitable for use by barn owls (Stage 1 survey) and to determine which features offer suitable habitats for foraging and commuting barn owl, potential nest sites (PNS) or roost sites (Stage 2 survey). Stage 1 and 2 surveys may be carried out in the same survey visit. Features identified as having potential for nesting will be subject to a further (Stage 3) survey, which will confirm which of the potential nest sites are actively used by barn owls for breeding.

Reptiles

6.9.22. Reptile presence / likely absence survey will be undertaken in targeted areas of suitable habitat to determine which reptile species (if any) are present in the vicinity of the Scheme to inform impact assessment and mitigation design.

6.9.23. Common species of reptile presence/ likely absence will be carried out between April and September in accordance with standard survey guidance and CIEEM competencies for undertaking reptile surveys

6.9.24. Artificial refuges consisting of roofing felt measuring approximately 0.5 m^2 will need to be laid out within suitable habitat and will be left to bed in for 7 days minimum to give reptiles a chance to locate them. Other suitable refuge features already present within the Survey Area that could be used by reptiles (e.g. litter and logs) will also checked where present.

6.9.25. Seven checks of the artificial refuges will be undertaken in suitable weather conditions (taken to be daytime air temperatures between 9°C and 18°C with little or no wind or precipitation).

Otter and Water Vole

6.9.26. Focussed habitat suitability surveys and presence / likely absence surveys will be undertaken across the watercourse network within a 500 m buffer.

6.9.27. Otter and water vole surveys will be undertaken concurrently following good practice guidance, and CIEEM competencies for undertaking otter and water vole surveys

6.9.28. Ecologists will need to search for evidence of otter and record the location and detail of all signs and resting sites. The following evidence of otter activity will be searched for and recorded during the surveys: spraints (droppings); feeding remains; paths and slides (defined otter paths on watercourse banks and mud slides evident of where the animal regularly enters the watercourse); and footprints.

6.9.29. The following evidence of water vole activity will be looked for during these surveys: burrows and 'lawns' (area around burrow entrances where there is grazed vegetation, surrounded by taller vegetation); faeces; latrines; feeding stations; runways and footprints; nests; and sightings.

6.9.30. These surveys will need to take place once between the months of April and June and once between July and September in line with good practice guidance, with two competent surveyors carrying out each survey, one of which will be a competent species lead.

Hazel Dormouse

6.9.31. Further surveys in targeted areas (with suitable habitat and connectivity for hazel dormice) within 250 m of the Scheme will be undertaken in areas that may support hazel dormice to determine if dormouse is present within these habitats; this includes hedgerows and tree lines around the grazed pasture fields.

6.9.32. All hazel dormouse surveys will be undertaken in accordance with good practice guidance and CIEEM competencies for undertaking hazel dormouse surveys. This will involve placing nesting tubes across the Scheme area. When present, dormice often find and make nests in these tubes. Their presence can then be detected by means of periodic monitoring to find actual animals, nest remains, feeding remains, droppings or hairs.

6.9.33. The hazel dormouse nest tube survey is required bi-monthly between May and September. Nest tubes will be placed out in March and checked once every other month between May and September by a Natural England licensed ecologist.

White-clawed Crayfish

6.9.34. An aquatic walkover survey will be completed along watercourses present in and around the Scheme to assess for white-clayed crayfish suitability and the presence of other aquatic species.

6.9.35. Suitability assessment for white-clawed crayfish will include a condition assessment of watercourses in and around the Scheme to determine suitable conditions for white-clawed crayfish including the presence of suitably sized, ample loose refuges that is located in relatively stable area resistant to high flows, in water with a slow flow (enough for crayfish to walk in) and in water that is not too silted.

6.9.36. These surveys may be followed up with presence/ likely absence surveys which will be carried out by a suitability experienced ecologist following good practice guidance.

Aquatic habitats and species surveys

6.9.37. Walkover surveys will be undertaken of aquatic features within the aquatic ecology survey area to identify broad habitat characteristics and suitability for aquatic species.

6.9.38. A screening exercise will be undertaken following walkover survey to assess the suitability of aquatic features for detailed aquatic surveys (aquatic macrophytes, aquatic macroinvertebrates and fish). It is assumed further survey will be required for at least the main rivers at this stage.

6.9.39. Potentially affected watercourses have been screened as requiring habitat survey (modular river

survey (MoRPh[102]) survey), where habitat characteristics and river condition will be assessed, will identify opportunities for habitat enhancement or reinstatement.

6.9.40. No species surveys are required for ditches.

Non-native invasive plant species

6.9.41. Due to the largely agricultural nature of the landscape that the Scheme passes through the likelihood of encountering non-native plant species is considered to be low. No targeted surveys for non-native invasive plant species are recommended for the Scheme. However, any observations of non-native invasive plant species completed during other surveys (including the additional walkover) will be recorded to inform further survey and mitigation.

6.10. Summary

6.10.1. Ecological baseline data associated with the Scheme has been gathered. Available information from desk study and field surveys has been used to identify and evaluate ecological features to undertake an assessment of potential impacts for the Scheme. As the Scheme progresses, further surveys will be commissioned which will refine the characterisation of impacts to ecological receptors.

6.10.2. Numerous potential significant impacts have been identified in the absence of mitigation in relation to priority habitats, statutory and non-statutory designated sites, bats, dormouse, great crested newt, otter, water vole, reptiles, badger, invasive species, priority invertebrates, flowering plants, other priority mammal species, and aquatic features.

6.10.3. A range of measures have been identified to avoid, mitigate and compensate for the effects of these impacts. These include design specifications and construction management requirements. Some temporary residual effects are anticipated with regard to compensatory planting, as it will take time for the replacement habitats to grow and be as important features for biodiversity initially as the habitats which have been lost.

6.10.4. Consultation with key stakeholders will continue, to help inform the ongoing assessment.

6.10.5. The impacts to the Scheme on biodiversity will be further assessed by completing the remaining baseline surveys, and from there, refining the mitigation measures proposed as required.

[102] Modular River Physical (MoRPh) survey is a new survey approach adopted by Defra in the Biodiversity 2.0 Metric river condition assessment. It requires surveyors to be accredited. The method is detailed in: Gurnell, A. *et al.* (2020) *A guide to assessing river condition: part of the rivers and streams component of the biodiversity net gain metric.*

7. Water Environment

7.1. Introduction

7.1.1. This chapter provides the preliminary environmental assessment for the water environment. The Scheme has been assessed to identify the likely significant effects with respect to the water environment resulting from the construction and operation of the Scheme.

7.2. Planning policy

7.2.1. Legislation and policy related to protection and management of the water environment is listed in the Table 7-1 and Table 7-2 below. The aim of water legislation and policy in England is to protect both public health and the environment by maintaining and improving the quality of water features. This includes all surface water bodies (e.g. rivers, streams, canals, lakes, ponds) and groundwater.

7.2.2. The Department of the Environment, Food and Rural Affairs (Defra) is responsible for all aspects of water policy in England. Management and enforcement of water policy is the responsibility of Regulators, principally the Environment Agency (EA), but also Lead Local Flood Authorities (LLFAs).

National planning policy

Table 7-1 - National planning policy

Legislation / regulation	Summary of requirements
Antipollution Works Regulations 1999	Where pollution occurs or is likely to occur the EA (Environment Agency) can serve a works notice under Section 161A of the Water Resources Act on any person who has caused or knowingly permitted the pollution (or risk of pollution) to a watercourse, requiring them to carry out anti-pollution/preventative works and operations. The EA can also recover the costs of any investigation and anti-pollution works carried out. The Anti-Pollution Works Regulations prescribe the content of anti-pollution works notices and the particulars that need to be placed on the pollution control registers maintained by the EA.
Environment Act 1995	The Act provides for the establishment of a corporate body to be known as the EA, the key regulator for the water environment.
Environmental Damage (Prevention and Remediation) Regulations 2015	The emphasis of these Regulations is proactively putting in place appropriate pollution prevention measures to reduce risks to the environment.
Environmental Protection Act 1990	This Act brings in a system of integrated pollution control for the disposal of wastes to land, water and air.
Flood Risk Regulations 2009 Amended 2009/3042	These Regulations transpose the Floods Directive (2007/60/EC). They aim to provide a consistent approach to managing flood risk. The EA are responsible for managing flood risk from main rivers, the sea and reservoirs. LLFAs are responsible for local sources of flood risk, in particular surface water, groundwater and ordinary watercourses.
Flood and Water Management Act 2010 and Commencement Orders	The key areas covered by this Act are: Roles and responsibilities for flood and coastal erosion risk management Improving reservoir safety.

Legislation / regulation	Summary of requirements
Highways Act 1980 (HA 1980)	The Act deals with the management and operation of the road network in England and Wales including the drainage of highways into environmental waters and sewers.
National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government (MHCLG), 2021)	The NPPF sets strict tests to protect people and property from flooding which all local planning authorities are expected to follow. It forms the basis of assessment of flood risk for Schemes.
National Planning Practice Guidance (NPPG) 2021	Accompanying the NPPF, the NPPG (MHCLG, 2021) was published in 2014 and last updated in August 2021. This advises on how Local Planning Authorities can ensure protection of water quality, the delivery of adequate water infrastructure and take account of the risks associated with flooding in the plan–making and the planning application process.
The Environmental Permitting (England and Wales) Regulations 2016	These Regulations provide a consolidated system of environmental permitting in England and Wales and transpose provisions of fifteen EU Directives which impose obligations requiring delivery through permits or which are capable of being delivered through permits. Covers EA permits for flood risk (on Main River) and certain discharges to watercourses.
The Water Resources (Environmental Impact Assessment) (England and Wales) Regulations 2006	These Regulations impose procedural requirements in relation to the consideration of applications or proposals for an abstraction or impounding licence under Chapter II of Part II of the Water Resources Act 1991 and require consent in other cases.
Water Act 2003 and Water Act 2014	These Acts aim to improve water conservation, protect public health and the environment, and improve the service offered to consumers. The basis of the Act is three parts relating to water resources, regulation of the water industry and other provisions.
The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017	The Water Framework Directive (WFD), as transposed into domestic legislation by the Water Environment Regulations, aims to protect and enhance the quality of the water environment. It requires all natural surface water bodies to achieve both good chemical status and good ecological status. Artificial and heavily modified water bodies may be prevented from reaching good ecological status due to the modifications necessary to maintain their function, e.g. navigation. They are, however, required to achieve good ecological potential, through the implementation of a series of mitigation measures. The WFD also requires good status (both qualitative and quantitative) to be achieved for all groundwater bodies and the prevention of the deterioration in groundwater status. Status is reported at the water body scale, with individual water bodies forming part of larger River Basin Districts (RBD), for which River Basin Management Plans (RBMPs) have been developed. The first RBMPs were published in 2009 followed by a Cycle 2 update published in 2016. The next (Cycle 3) RBMPs are forecast to be published in December 2021.
WFD (Standards and Classification) Directions (England and Wales) 2015	These Directions set out the environmental standards to be used for the second cycle of river basin plans. They transpose Directive 2013/39/EU on environmental quality standards for priority substances. They also cover Specific Pollutants which include certain

Legislation / regulation	Summary of requirements
	metals that are associated with road are associated with road drainage.
Groundwater (Water Framework Directive) England 2016	Complements the Water Environment Regulations. It requires measures to prevent or limit inputs of pollutants into groundwater to be operational so that WFD environmental objectives can be achieved.
Water Industry Act 1991 (Amendment) (England and Wales) Regulations 2009	This Act sets out the responsibilities of the EA of England and Wales in relation to water pollution, resource management, flood defence, fisheries, and in some areas, navigation. The Act regulates discharges to controlled waters, namely rivers, estuaries, coastal waters, lakes and groundwaters.
Water Resources Act 1991	This Act sets out to regulate water resources, water quality and pollution, and flood defence. It sets out standards for Controlled Waters.
The Land Drainage Act 1991 and 1994	This Act requires that a watercourse be maintained by its owner in such a condition that the free flow of water is not impeded. The 1994 Act amends it in relation to the functions of internal drainage boards and local authorities.
The Control of Pollution (Oil Storage) (England) Regulations 2001	Applicable for storage of more than 200 litres of oil above ground at industrial, commercial or institutional sites. The sites they cover include; factories, shops, offices, hotels, schools, churches, public sector buildings and hospitals. The Regulations apply only in England.

Local planning policy

Table 7-2 - Local planning policy

Legislation / regulation	Summary of requirements
Wiltshire Core Strategy (2015)	**Core Policy 52**: Green Infrastructure. Policy 52 supports the delivery of green infrastructure projects and initiatives. The planning and delivery of these projects will need to address any potential negative environmental impacts, particularly in relation to disturbance of wildlife, flood risk, water quality, landscape character and tranquillity. **Core Policy 53**: Wiltshire's Canals. Proposals for the reinstatement of canal along these historic alignments or any alternative alignments will need to demonstrate that the cultural, historic and natural environment will be protected and enhanced, with no overall adverse effect, and that potential impacts on ecology, landscape, flood risk, water resources (abstraction) and water quality have been fully assessed and taken into account. **Core Policy 67** Flood Risk sets out the requirement for sustainable surface water drainage systems within the development proposals. The Policy encourages opportunities for to improve and increase functional floodplain. The Policy states that there is sufficient land in Flood Zone 1 to meet the proposed land requirements, and any proposals put forward that are within Flood Zones 2 & 3 will need appropriate evidence to prove that there is no alternative sites at lower risk. **Core Policy 68** Water Resources sets out that development must not prejudice the delivery of the actions and targets of the relevant River Basin or Catchment Management Plan and should contribute towards their delivery where possible. Policy 68 states development proposals within a Source Protection Zone, Safeguard Zone or Water Protection Zone must assess any risk to groundwater resources and groundwater quality and demonstrate

Legislation / regulation	Summary of requirements
	that these would be protected throughout the construction and operational phases of development.
Wiltshire Housing Site Allocations Plan (Feb 2020)	The Wiltshire Housing Site Allocations Plan ('the Plan') revises, where necessary, settlement boundaries and allocates new sites for housing, including in Melksham, to ensure the delivery of homes across the plan period. The plan stipulates the requirements for assessing and delivering developments in relation to the water environment.
Joint Melksham Neighbourhood Plan 2020 - 2026	The Plan will guide sustainable future development in the area. The plan has been drawn up with the aim of ensuring that the growth of Melksham is balanced with a clear understanding of the community's aims and aspirations for the future. Policy 3 of the plan sets out the vision for management of flood risk and drainage. The policy states that appropriate mitigation and construction measures are required in areas with known surface flooding issues and that major developments should include provision of Sustainable Drainage Systems.

7.3. Study area and PEAR methodology

Study area

7.3.1. For surface water quality the spatial scope of the assessment includes surface water receptors (Main Rivers, Ordinary Watercourses and ditches) of the water environment within 1 km of the Scheme. This study area is considered appropriate for the assessment of surface water quality as beyond this, dilution would be expected to reduce potential impacts (LA 113, August 2019[103]).

7.3.2. The same study area has also been used for hydromorphology and Water Framework Directive (WFD) assessments but with a focus on potential watercourse and floodplain crossings.

7.3.3. For groundwater (quality, levels and flows), the study area of 1 km has also been used to allow for any potential physical changes resulting from the Scheme that have the potential to affect groundwater.

7.3.4. The study area for fluvial and surface water flood risk is the combination of the extreme flood outlines (1 in 1000 annual exceedance probability (AEP) flood)) that interact with the Scheme. The study area for groundwater flood risk is 1 km buffer from the Scheme as above.

Methodology

7.3.5. The assessment methodology followed for the surface water quality, hydromorphology, groundwater, and flood risk attributes of the water environment is based on the guidance provided in DMRB, LA 113 Road drainage and the Water Environment. Where this was not possible professional judgement has been used with a conservative approach for any assumptions. To support this assessment, specific data were used where available (e.g. road impermeable area, number of river crossings, width of channel crossed, length of channel affected, extent of permeable strata, floodplain area affected).

7.3.6. The method of assessing the importance and magnitude is stated within the tables in the DMRB LA 113 (August, 2019). The significance of effects is based on the matrix within LA 104 (July 2019) shown in Table 3.1. The tables from both documents have not been reproduced in this section and are instead shown in Chapter 3 of this PEAR.

[103] Design Manual for Roads and Bridges (DMRB). LA113. August 2019

Surface water

7.3.7. When assigning a magnitude of impact for surface water quality at this stage, it is it not possible to use the examples provided in Table 3.71 from DMRB LA 113. This is because the Highways England Water Risk Assessment Tool (HEWRAT) that is used to undertake a water quality assessment requires specific quantitative data that are not yet available. In the absence of quantitative data, high level criteria from DMRB LA 113 have been used to allow a qualitative assessment, using professional judgement.

Groundwater

7.3.8. Potential impacts from existing and new contamination sources on groundwater have been considered as part of the geology and land quality assessment in Chapter 9, to determine and classify potential effects associated with ground contamination. This chapter considers the physical quantitative effects on the groundwater resource.

7.3.9. Groundwater receptors have been assessed against the methodology guidance presented in DMRB LA113 (August 2019), where possible at this stage. As stated in the surface water section, when assigning a magnitude of impact for groundwater quality, the examples provided in Table 3.71 from DMRB LA 113 cannot be used as the specific data are not yet available at this stage. In the absence of quantitative data, high level criteria from DMRB LA 113 have been used to allow a qualitative assessment, using professional judgement. At this stage, quantitative data, for example the extent of permeable strata intercepted for the Scheme (i.e. the area of the road which is most likely to directly affect groundwater) and the potential for construction below ground level (i.e. piling foundations at viaduct surface water crossings) as well as qualitative professional judgement, particularly around the potential impacts, has been adopted.

7.3.10. Groundwater has also been included as part of the Preliminary WFD assessment (Appendix B, Volume 2).

WFD

7.3.11. In addition to the DMRB LA 113 methodology, a Preliminary WFD assessment (Appendix B, Volume 2) has been undertaken for consultation with the Environment Agency.

7.3.12. The approach to the Preliminary WFD assessment provides a screening and scoping of the potential biological, physio-chemical and hydromorphological effects of the Scheme on the surface water features, as well as the quality and quantity element impacts on groundwater. It captures the core requirements of a compliance assessment whilst being transparent and simple to interpret. The assessment can (and should) be updated, creating a clear audit trail of WFD compliance as design progresses through each subsequent phase of the Scheme.

7.3.13. A preliminary WFD assessment was undertaken in May 2021 based on the drawings available and design assumptions and is reported in Appendix B, Volume 2. No site visits were undertaken as part of this assessment.

Flood risk

7.3.14. The flood risk attributes have been assessed based on the methodology guidance presented in DMRB LA 113 (August 2019). The design assumptions set out in section 7.4 have been used to define the potential effects on flood risk attributes.

7.4. Assumptions and limitations

7.4.1. This is a preliminary assessment for the purposes of consultation based on the following data outlined in Table 7-3 below.

Table 7-3 - Local planning policy

Data	Source
Surface water	1:25,000 OS mapping OS MasterMap Environment Agency online - Main Rivers mapping Environment Agency online - Catchment Data Explorer Scheme (as shown on Figure 2.2, Volume 3)
Groundwater	Envirocheck report[104] DEFRA's Multi Agency Geographic Information for the Countryside (MAGIC) mapping database[105] British Geological Survey (BGS) geological mapping (1:50,000 scale)[106]
Flood risk	Envirocheck report https://flood-warning-information.service.gov.uk/long-term-flood-risk/map Environment Agency River Chippenham and Calne Flood model
Designated sites	DEFRA's Multi Agency Geographic Information for the Countryside (MAGIC) mapping database.

7.4.2. The assumptions that have been made for this assessment relating to the design of the Scheme include:

- The main river crossing over the River Avon will be a viaduct spanning the full width of the floodplain will be designed, passing the design flood event (i.e. 1 in 100 flood event including climate change);
- Other Main River crossings will be a bridge of sufficient capacity to convey the design flood flows without adverse impacts on flood levels or flows;
- Crossings on Ordinary Watercourses and ditches are assumed to be culverts and may require localised channel realignments;
- The design flood event is the 1 in 100 flood event including an allowance for climate change.
- Any loss of floodplain storage will necessitate the construction of compensatory floodplain storage;
- Drainage is to ground where possible but will predominately be to a watercourse. It is assumed to be within 150 m of the road;
- No drainage will be to ponds;
- The road corridor width has been assumed to be 25 m with a construction buffer of 150 m of the proposed road;
- Surface water features and designated sites have the potential to be in hydraulic continuity with groundwater where underlain by permeable deposits; and
- Piling will be required for the viaduct foundations, with works below ground level.
- Cuttings may be required at any point along the Scheme.

7.4.3. Discharge to ground is being investigated at the time of reporting through the Ground Investigation (GI) scoping exercise to understand the feasibility of discharge to soakaway. However, given the study area is predominantly in Kellaway Formation (Mudstone/Siltstone) and Oxford Clay (Mudstone) it is assumed low / poor infiltration rates and hence the feasibility of this option is to be confirmed. There may be some areas of sands and gravels which may have better infiltration, and these will be targeted during the GI however at the time of reporting it is assumed discharge to ground may be difficult to achieve. Therefore, at this stage it is assumed highway runoff will be

[104] Landmark, Envirocheck Report, 2020

[105] DEFRA, Multi Agency Geographic Information for the Countryside (MAGIC), https://magic.defra.gov.uk, accessed May 2021

[106] British Geological Survey, Opengeoscience online mapping, https://www.bgs.ac.uk/data/mapViewers/home.html, accessed March 2020

discharged to drainage ponds.

7.4.4. A number of assumptions were made when assigning importance and magnitude of impact to the surface water environments. As set out in section 7.3.7 above, when assigning the magnitude of impact for surface water quality as specific quantitative data were not available, high-level criteria have been used to allow a qualitative assessment using professional judgement. The importance criteria for watercourses, which is documented in DRMB LA 113 Table 3.70, is based on WFD classification and Q95 flow. However, Q95 flow data were not readily available for several of the watercourses located in the study area. Where Q95 flow data were not readily available, an assumption has been made based on professional judgement.

7.4.5. The final assessment will be reported within the Environmental Statement taking into account consultation comments, further design details and the further assessments detailed in section 7.9.

7.5. Consultation

7.5.1. An introductory meeting was held with the Environment Agency on the 18 November 2020.

7.5.2. Consultation with regulators, in the form of further introductory meetings and follow up specific technical meetings on site (principally with the Environment Agency, plus LLFAs and other interested parties) will continue regularly throughout the design development to ensure that the Scheme is designed to be compliant with the objectives of the WFD and that feasible opportunities for improvements to the water environment are integrated into the Scheme.

7.6. Baseline conditions

Baseline summary

7.6.1. The dominant surface watercourse in the study area is the River Avon, which flows from north to south with an extensive floodplain. It and its main tributaries are designated water bodies under the WFD. The various tributaries that join along this stretch of the River Avon are classified as Main Rivers:

- Bydemill Brook flows west to east and joins the River Avon at the northern boundary of the study area;
- Forest Brook flows from east to west and joins the River Avon north of Melksham;
- Clackers Brook flows from east to west and passes through Melksham and joins the River Avon in the centre of the town;
- Semington Brook flows from east to west and joins the River Avon south of Melksham; and
- To the south west of study area an unnamed Tributary joins the River Avon.

7.6.2. There are several Ordinary Watercourses (including drains and ditches) throughout the study area that are in hydraulic connectivity to these Main Rivers. The Kennet and Avon Canal passes to the south of Melksham approximately parallel to the Semington Brook.

7.6.3. All surface watercourses within the study area have been identified and mapped. Each has been given an ID, as shown in Figure 8.1.

7.6.4. The majority of the geology within the study area is designated as Unproductive Strata, however Sandstone of the Hazlebury Bryan Formation is present in the east and south of the site and Limestone of the Cornbrash Formation is present in the south west the site. Both the Hazlebury Bryan Formation and the Cornbrash Formation are designated as Secondary A aquifers. There is a WFD groundwater body associated with the Hazlebury Bryan Formation (Part of the Corallian Limestone Groundwater Body). Superficial deposits are present primarily present along the western section of the study area associated with the River Avon. Superficial deposits include Alluvium and River Terrace Deposits as well as pockets of head deposits across the extent of the site. The River Terrace Deposits and Alluvium are designated as Secondary A aquifers. The head deposits are designated as Secondary (undifferentiated). The site is not located within a Source Protection Zone

(SPZ).

7.6.5. The below sections provide further details on the water topics.

Surface watercourses

7.6.6. The study area contains a number of WFD Designated Reaches, Main Rivers, Ordinary Watercourses (including drains) and a Canal (Kennet and Avon). These are shown on Figure 8.1 and in Table 7-4. All fall within the Severn River Basin District (RBD). The current WFD condition and aims for these watercourses are set out within the Severn River Basin Management Plan (RMBP)[107] with information provided in the preliminary WFD assessment in Appendix B, Volume 2.

7.6.7. There are no Special Areas of Conservation (SAC), Special Protection Areas (SPA), Sites of Special Scientific Interest (SSSI) or Ramsar sites within the study area.

7.6.8. DMRB LA 113 has been used to establish the importance of each watercourse within the study area (see Table 7-4). The WFD principal watercourses have been classified as having a high value/ sensitivity as per LA113 guidance on size and Q95 flows. For some watercourses Q95 flow was estimated.

7.6.9. Ordinary Watercourses throughout the study area will be in hydraulic connectivity to these Main Rivers and form part of the WFD water bodies. Included within the Ordinary Watercourse category are several drains and ditches. None of the Ordinary Watercourses are designated WFD reaches. The value/sensitivity of the Ordinary Watercourses has been assigned as medium, except where they are clearly identified as drains and ditches where they have been assigned a low value/ sensitivity. This is based on the assumption that the former have a Q95 flow of >0.001 m3s-1, and the latter a Q95 flow of <0.001 m3s-1, based on the guidance in LA113 (see Table 7-4).

7.6.10. The Kennet and Avon Canal has been assigned a value of medium on the assumption that it is of moderate quality and having a Q95 flow of >0.001 m3s-1.

7.6.11. More details of the baseline WFD data for the surface water bodies are provided in the preliminary WFD assessment (Appendix B, Volume 2).

7.6.12. There are no WFD designated lakes or transitional waterbodies within the study area. Ponds have been considered in Chapter 6 Biodiversity.

7.6.13. The Envirocheck report states that there is one licensed surface water abstraction in the north east of the study area, associated with conservation and rearing of wildfowl. There are six active discharges to surface water to the north east of the study area, all associated with farming. Three of these are trade discharge, two are sewage effluent and one is unknown. The discharges are predominantly into freshwater streams/rivers, with one to land/soakaway.

[107] https://www.gov.uk/government/publications/severn-river-basin-district-river-basin-management-plan

Table 7-4 – Surface waterbody summary

WFD water body ID	Overall waterbody status (2019) Cycle 2	Feature ID	Water feature type	Q95 Flow	Value / Sensitivity
Avon (Brist) conf R Marden to conf Semington Bk (GB10905 3027440)	Moderate	Old Canal (CN01)	Drain (Ordinary Watercourse)	Assumed >0.001 m^3s^{-1}	Low
		DR01, DR02, DR05, DR09, DR10, DR11, DR12, DR13, DR14, DR15, DR16, DR17, DR18, DR19, DR20, DR21, DR22, DR23, DR24, DR25	Drain (Ordinary Watercourse)	Assumed >0.001 m^3s^{-1}	Low
		Berryfield Brook (MR02)	Main River	Assumed <1.0 m^3s^{-1}	Medium
		Frog Ditch (MR08)	Main River	Assumed <1.0 m^3s^{-1}	Medium
		River Avon (MR09)	Main River, WFD Principal Waterbody	0.991 m^3s^{-1} (Avon Guaging Station at Melksham – last recorded in1980)[108]	High
		WC02, WC05, WC16, WC20, WC21, WC22, WC23, WC24, WC39	Ordinary Watercourse	Assumed >0.001 m^3s^{-1}	Medium
Bydemill Bk - source to conf River Avon (Brist) (GB10905 3021960)	Moderate	DR29, DR30	Drain (Ordinary Watercourse)	Assumed >0.001 m^3s^{-1}	Low
		Bydemill Brook (MR30)	Main River, WFD Principal Waterbody	Assumed <1.0 m^3s^{-1}	High
Clackers Bk - source to conf R Avon (Brist) (GB10905 3021920)	Poor	DR03, DR04, DR06, DR07, DR08, DR39	Drain (Ordinary Watercourse)	Assumed >0.001 m^3s^{-1}	Low
		Clackers Brook (MR39)	Main River, WFD Principal Waterbody	Assumed <1.0 m^3s^{-1}	High
		WC07, WC17, WC34, WC35	Ordinary Watercourse	Assumed >0.001 m^3s^{-1}	Medium

[108] NRFA Station Data for 53001 - Avon at Melksham (ceh.ac.uk)

WFD water body ID	Overall waterbody status (2019) Cycle 2	Feature ID	Water feature type	Q95 Flow	Value / Sensitivity
Forest Brook (GB10905 3021940)	Poor	DR26, DR27, DR28	Drain (Ordinary Watercourse)	Assumed >0.001 m^3s^{-1}	Low
		Forest Brook (MR06)	Main River, WFD Principal Waterbody	Assumed <1.0 m^3s^{-1}	High
		Forest Brook (WC06)	Ordinary Watercourse	Assumed >0.001 m^3s^{-1}	Medium
		WC13, WC25, WC26, WC27	Ordinary Watercourse	Assumed >0.001 m^3s^{-1}	Medium
Semington Bk-Milebourne Str to conf R Avon (Brist) (GB10905 3022200)	Moderate	Kennet and Avon Canal (CN02)	Canal	Assumed >0.001 m^3s^{-1}	Medium
		DR31, DR32, DR33, DR34, DR35, DR36, DR37, DR38, DR40	Drain (Ordinary Watercourse)	Assumed >0.001 m^3s^{-1}	Low
		Semington Brook (MR11)	Main River, WFD Principal Waterbody	0.34 m^3s^{-1} (Semington Brook Guaging Station)[109]	High
		Semington Brook (WC11)	Ordinary Watercourse	Assumed >0.001 m^3s^{-1}	Medium
		WC28,WC29, WC36, WC38, WC40	Ordinary Watercourse	Assumed >0.001 m^3s^{-1}	Medium
		DR41, DR42, DR43, DR44, DR45, DR46, DR47	Drain (Ordinary Watercourse)	Assumed >0.001 m^3s^{-1}	Low

Groundwater bodies

Geology

7.6.14. The superficial deposits comprise of River Terrace Deposit (typically comprising sand and gravel), Alluvium (typically comprising clay, silt, sand and gravel) and Head. The Alluvium and River Terrace deposits are concentrated in the north associated with the River Avon. The centre of the Scheme is not underlain by any superficial deposits. The south of the Scheme is underlain by pockets of Head.

7.6.15. Bedrock in the study area is predominantly Oxford Clay Formation underlying the majority of the Scheme. The north west and the south west extent of the Scheme is underlain by the Kellaways Formation consisting of sandstone, siltstone and mudstone. There are small pockets of the Cornbrash Formation consisting of limestone in close proximity to the Kellaways Formation in the

[109] NRFA Station Data for 53002 - Semington Brook at Semington (ceh.ac.uk)

south west. In the far east of the study area and the far south, the Hazelbury Bryan Formation sandstone is present which extends further east. Further detail on the geology within the study area is presented in Chapter 9.

Aquifer designations

7.6.16. The superficial deposits, where present, are designated by the Environment Agency as Secondary A and Secondary (undifferentiated) aquifers. The bedrock deposits of the Oxford Clay Formation and the Kellaways Formation are classified as unproductive. Unproductive strata is defined by the Environment Agency as "*rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow".* The Cornbrash Formation and the Hazlebury Bryan Formation are classified as Secondary A aquifers. A Secondary A Aquifer is defined by the Environment Agency as "*permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers*". Current groundwater levels of the study area are unknown.

WFD groundwater bodies

7.6.17. Consistent with the fact that the majority of the geology within the study area is designated as Unproductive Strata by the Environment Agency, the majority of the study area is not underlain by a WFD Groundwater body. However, the Corrallian Limestone water body (GB40902G806100) is present in the eastern part of the study area, consistent with the presence of the Secondary A Aquifer of the Hazelbury Bryan Formation, part of the Corrallian Group. The WFD groundwater body is not designated as a Drinking Water Protected area.

7.6.18. No published SPZs are present within the study area.

7.6.19. The Envirocheck Report indicates that there are three active groundwater abstractions in the north west of the study area associated with spray irrigation and agriculture. The Envirocheck Report indicates that there are nine discharges of treated sewage effluent to land/soakaway within the study area most of which are related to farms or domestic properties.

Groundwater and surface water interaction

7.6.20. Where surface water features are underlain by Alluvium and river terrace deposits which are Secondary A Aquifers and Secondary A bedrock aquifers of the Hazlebury Bryan and Cornbrash Formations, it is considered that there is the potential for these water features to be in hydraulic continuity.

Groundwater receptor summary

7.6.21. A summary of the groundwater bodies identified within the study area (shown in Figure 7.2, Volume 3), and their importance is presented in Table 7-5. The importance of surface water features potentially receiving baseflow from groundwater is presented in the surface water section.

Table 7-5 Groundwater bodies summary

Receptor	Importance
Head groundwater (secondary undifferentiated aquifer)	Medium
Alluvium groundwater (secondary A aquifer)	Medium
River Terrace Deposits (secondary A aquifer)	Medium
Cornbrash Formation Groundwater (secondary A aquifer)	Medium
Hazlebury Bryan Formation Groundwater (secondary A aquifer). Part of the Corallian Limestone (Calne to Swindon) Groundwater body (GB40902G806100)	Medium

Receptor	Importance
Kellaways Formation Groundwater (unproductive strata)	Low
Oxford Clay Formation Groundwater (unproductive strata)	Low

Flood Risk

Fluvial

7.6.22. There is extensive fluvial floodplain within the study area. The River Avon is a major watercourse and there is significant floodplain associated with the river. There are three Main River tributaries that discharge into the River Avon within the study area, each with associated floodplains: Forest Brook; Clackers Brook; and the Semington Brook.

7.6.23. The importance of the Main Rivers has been based on a review of the Flood Zone 2 extents for each watercourse and background mapping to identify the type of development potentially at risk. The River Avon and Clackers Brook flow through Melksham and within the floodplain there are residential and commercial properties. Within the study area the floodplains of the other tributaries are predominantly rural.

7.6.24. There are several Ordinary Watercourses throughout the study area that will have a minor floodplain (relative to the Main Rivers) associated with them. Included within the Ordinary Watercourse category are several drains and ditches. The importance of the Ordinary Watercourses has been defined based on the type of receptors that are within the flood extent shown in Figure 7.4.

7.6.25. Fluvial flood risk importance is classified as very high for the study area due to the presence of highly vulnerable development in the River Avon and Clackers Brook fluvial flood extents.

Surface water

7.6.26. The surface water flood risk in the study area is predominantly associated with the Main Rivers and the Ordinary Watercourses, the tributaries and overland flow paths discharging into them.

7.6.27. The importance of surface water flooding has been defined based on the type of receptors that are within the flood extent shown in Figure 7.4.

7.6.28. Surface water flood risk importance is classified as very high for the study area due to the presence of highly vulnerable development in the surface water flood extents within Melksham and the surrounding area.

Groundwater

7.6.29. The Envirocheck Report[104] indicates that there is the potential for groundwater flooding of property situated below ground level and at surface in the vicinity of the River Avon and its tributaries, where superficial deposits are present.

7.6.30. For this stage the importance has been based on the potential for groundwater flooding within the study area that could affect property.

7.6.31. Groundwater flood risk importance is classified as very high for the study area due to the presence for groundwater flooding of property situated below ground level and at surface in the vicinity of the River Avon and its tributaries.

Tidal

7.6.32. The study area is not in an area of tidal flood risk. No importance has been assigned to tidal flooding and this will not be considered further.

Canal

7.6.33. The Kennet and Avon canal passes to the south of Melksham. The route will cross under the canal, therefore the canal is a potential source of flood risk.

7.6.34. Canal flood risk importance is classified as very high for the study area due to the presence of more vulnerable development in the area potentially affected by flooding from the canal.

Reservoirs

7.6.35. The Flood risk from Reservoirs[110] maps show that the failure of reservoirs at Bowood Lake (north east of Melksham, near Calne) and Corsham Lake (north west of Melksham) would be a source of flood risk along the River Avon through Melksham.

7.6.36. The flood inundation due to the reservoir breach along the River Avon through Melksham is less extensive than Flood Zone 3. The importance has been based on the vulnerability of receptors within the flood extent of the reservoir inundation.

7.6.37. Reservoir flood risk importance is classified as very high for the study area due to the presence of less vulnerable development in the reservoir inundation flood extents associated with the River Avon in Melksham.

Flood risk importance

7.6.38. Details of the importance of the flood risk sources are provided in Table 7-6.

Table 7-6 - Flood risk importance

Flood risk type	Importance
Fluvial	Very High
Surface Water	Very High
Groundwater	Very High
Canals	High
Reservoirs	Medium

7.7. Potential effects

7.7.1. Tables 7-6 and 7-7 below present the potential effects, mitigation measures and residual effects on the water environment during construction and operation. The effects, mitigation measures and residual effects discussed are not based on specific elements of the Scheme design, but rather a generic example of each type of element.

7.7.2. Potential mitigation measures are summarised in the tables and more details are provided in section 7.8 below.

7.7.3. The details provided in the Table 7-6 and Table 7-7 are generic impacts and effects on the water environment within the study area that would be expected to be present for the type of construction activity and the type of permanent structure associated with the Scheme. As the design develops the Scheme will be assessed (in accordance with the recommendations of the Scoping Report) to identify the potential site specific impacts, and the measures required to avoid or mitigate these impacts.

[110] https://flood-warning-information.service.gov.uk/long-term-flood-risk

Construction

Table 7-7 - Potential effects during construction

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
Drains (DR25, DR08, D13, D19, DR39, DR27, DR34, DR1)	Low	Damage to watercourse bed and banks and riparian habitat. Increased runoff and increase fine sediment to the channel, negatively impacting natural processes and water quality. Potential contaminants entering surface watercourses from spillages of fuels and other contaminating liquids and accidental leaks of hazardous materials, causing potential deterioration in water quality.	Moderate Adverse (Significant)	Best practice construction working methods to minimise working in channel and to manage runoff.	Slight Adverse (Not Significant)
Small watercourses (WC07, WC13, WC35, WC39, WC22, WC17, WC34, WC38, WC11) and the Kennet and Avon Canal (CN02)	Medium		Moderate Adverse (Significant)		Slight Adverse (Not Significant)
Larger watercourses Forest Brook (MR06), Clackers Brook (MR39), Frog Ditch (MR08), River Avon (MR09)	High		Moderate Adverse (Significant)		Slight Adverse (Not Significant)
Secondary A Superficial (Alluvium, River Terrace Deposits) Groundwater.	Medium	Potential contaminated runoff from construction sites (from spillages of fuels and other contaminating liquids and accidental leaks of hazardous materials) to surface water bodies and	Slight Adverse	Best practice construction working methods to manage site runoff and manage potential risks to groundwater levels and quality.	Neutral
Secondary Undifferentiated (Head) Groundwater.	Medium		Slight Adverse		Neutral

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
Secondary A Bedrock (Cornbrash Formation, Hazlebury Bryan Formation) Groundwater.	Medium	infiltration to groundwater bodies. De-watering changing local groundwater levels and the disposal of pumped water to surface waterbodies. Cutting and deep foundations affecting flow paths and provide new pathways for contamination to reach groundwater.	Slight adverse		Neutral
Unproductive Bedrock (Kellaways Formation, Oxford Clay Formation) Groundwater.	Low		Neutral		Neutral
Fluvial flood risk (all watercourses)	Very high	Loss of floodplain storage. Reduction in conveyance in channels and floodplain. Increase runoff into watercourses	Moderate Adverse (Significant)	Best practice construction working methods minimise work within the floodplain and manage site runoff.	Slight Adverse (Not Significant)
Surface water flood risk	Very high	Impact on overland flow paths. Increase runoff into watercourses	Moderate Adverse (Significant)	Best practice construction working methods minimise work within the flood risk areas and manage site runoff.	Slight Adverse (Not Significant)
Groundwater flood risk	Very high	Increase discharge to groundwater from drainage system	Slight Adverse (not significant)	Best practice construction working methods to manage site runoff.	Slight Adverse (Not Significant)

Operation

Table 7-8 - Potential effects during operation

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
Drains (DR25, DR08)	Low	Culverts will lead to a permanent loss of natural watercourse morphology, and processes and loss of in channel and riparian habitat at the culvert location, but can also alter natural processes such as erosion and sediment transport upstream and downstream.	Moderate Adverse (Significant)	Culvert design will follow best practice methods so that they will minimise disruption to the river and riparian zone.	Slight Adverse (Not significant)
Small watercourses (WC35, WC13)	Medium				
Small watercourses (WC07, WC39)	Medium	Bridges and viaducts can cause a loss of bank structure and riparian vegetation due to abutments. Potential for change in flow and sediment transport dynamics in channel and across floodplain due to new piers/embankments.	Slight Adverse (Not Significant)	The design of bridges and viaducts (including approach embankments) will follow best practice methods so that they minimise disruption to the river, the riparian zone and floodplain.	Slight Adverse (Not Significant)
Large watercourses (Forest Brook (MR06), Clackers Brook (MR39), Frog Ditch (MR08) River Avon (MR09))	High		Moderate Adverse (Significant)		Slight Adverse (Not Significant)
Drains (DR25, DR08)	Low	Floodplain encroachment caused by the road can alter the channel -floodplain interactions within the reach as well as upstream and downstream, having a	Slight Adverse (Not Significant)	Any encroachment to the flood plain should be limited and where it is required the road should be designed to allow the continued flow and water and downstream movement of sediment. The road should be construed on a	Slight Adverse (Not Significant)
Small watercourses (WC07, WC13, WC35, WC39)	Medium		Moderate Adverse (Significant)		Slight Adverse (Not Significant)

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
Larger watercourses (Forest Brook (MR06), Clackers Brook (MR39), Frog Ditch (MR08), River Avon (MR09))	High	permanent adverse moderate impact on channel natural processes	Moderate Adverse (Significant)	viaduct across the floodplain with minimal piers, rather than on an embankment.	Slight Adverse (Not Significant)
Drains (DR25, DR08)	Low	The increase in impermeable surface will increase surface runoff from the road and could result in a reduction in water quality. The impact on the River Avon is likely to be less than on the other larger watercourses, as the concentrations of pollutants will likely be more diluted once they reach the River Avon.	Moderate Adverse (Significant)	Any runoff from the road that could cause a reduction in surface water quality should be mitigated by diverting drainage into swales throughout (where possible), and the use of other relevant SuDS measures.	Neutral
Small watercourses (WC07, WC13, WC35, WC39)	Medium		Moderate Adverse (Significant)		Neutral
Larger watercourses (Forest Brook (MR06), Clackers Brook (MR39), Frog Ditch (MR08), River Avon (MR09))	High		Moderate Adverse (Significant)		Neutral
Remaining watercourses (not directly crossed by the road)		Although not directly crossed by the road, the remaining watercourses (which are downstream of the Scheme) could receive some pollution due to their connectivity to the watercourses which could potentially directly receive highway runoff. These	Slight Adverse		Neutral

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
		pollutants will be more diluted by the time they enter these watercourses.			
Secondary A Superficial (Alluvium, River Terrace Deposits) Groundwater.	Medium	Cuttings/foundations could intercept the water table of permeable deposits having localised impact on groundwater levels and flow direction. Long-term dewatering is unlikely to be required. Increase in the impermeable area could change the total volume of infiltration entering the ground. Given that the majority of the option chosen is underlain by unproductive strata, this is not expected to change considerably. The operational phase will potentially introduce new sources of contamination. In addition, below ground services could create additional pathways for the migration of contamination	Slight Adverse	A review of long-term groundwater impact from foundations and below ground services will be undertaken in the design process. Discharge to ground is being investigated at the time of reporting through the Ground Investigation (GI) scoping exercise to understand the feasibility of discharge to soakaway. No mitigation is required for the unproductive bedrock.	Slight Adverse (Not Significant)
Secondary Undifferentiated (Head) Groundwater.	Medium		Slight Adverse		Slight Adverse (Not Significant)
Secondary A Bedrock (Cornbrash Formation, Hazlebury Bryan Formation) Groundwater.	Medium		Slight Adverse		Slight Adverse (Not Significant)
Unproductive Bedrock (Kellaways Formation, Oxford Clay Formation) Groundwater.	Low		Neutral		Neutral
Fluvial flood risk (all watercourses)	Very high	Loss of floodplain storage. Impact on overland flow routes. Reduction in conveyance in channels and floodplain.	Moderate Adverse (Significant)	Structures designed to minimise impact on conveyance and storage. Compensatory floodplain storage to offset loss of floodplain storage.	Slight Adverse (Not Significant)

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
		Increase runoff into watercourses			
Surface water flood risk	Very high	Impact on overland flow paths. Increase runoff into watercourses	Moderate Adverse (Significant)	Drainage system designed to manage runoff. Provision of culverts to preserve overland flow paths.	Slight Adverse (Not Significant)
Groundwater flood risk	Very high	Increase discharge to groundwater from drainage system	Slight Adverse (not significant)	Sub-surface structures designed to ensure no impact during periods of high groundwater levels.	Slight Adverse (Not Significant)

7.8. Potential mitigation measures

Construction

7.8.1. Construction mitigation is likely to include, but not be limited to the following.

Surface and groundwater quality

- Measures within the Construction Environmental Management Plan (CEMP) to control and prevent polluted run-off;
- All works are undertaken with regard to Pollution Prevention Guidelines (PPGs)111. These detail good practice advice for undertaking works which may have the potential to cause water pollution;
- The CIRIA guidance C648, 'Control of Water Pollution from Linear Construction Sites' also provides good advice for undertaking work which may have the potential to result in water pollution;
- Preparation of piling risk assessments as required in accordance with Environment Agency guidance to assess and manage potential risks to controlled waters;
- Temporary works sites, haul roads and other associated works should be designed and maintained to minimise impact;
- Areas which may generate contaminated water would need to be bunded and have water discharged to self-contained units with treatment facilities. There would be no discharge to groundwater; and
- Tests would be undertaken to ensure contaminated material is identified, isolated and reworked or removed to special landfill to avoid any leachate problems.

Hydromorphology

- In channel working should be limited as much as possible, with work undertaken back from the bank top;
- Any riparian vegetation removal should be minimised, and tree root balls should be left in place to aid bank stability where possible; and
- Where temporary watercourse diversions are required or in-channel working, specific mitigation may be needed to ensure the that temporary impacts are minimised.

Flood risk

- Floodplain working will be minimised as far as possible;
- A temporary Flood Defence Consent or Ordinary Watercourse Consent from the Environment Agency and/ or LLFA will be required. This will need to demonstrate method statements, working practices and control measures that are suited to the sensitive location of the works;
- Temporary outfalls would require appropriate consent from Environment Agency and LLFA which in this instance is Wiltshire Council;
- Appropriate management of sediment runoff from the site would be needed to reduce risk of blockage in existing structures downstream of temporary outfalls.
- Any ponds constructed to hold water to manage sediment must be constructed and / or located to avoid the risk of flooding watercourses or adjacent land in the event of overtopping or a breach;
- Any temporary diversion of a watercourse would need to ensure no increase in flood risk to third parties and would require consent of Environment Agency and LLFA;
- Flood Management Plans will be developed where necessary to ensure the development site is safe operationally and that operational activities are not impacted in the event of a flood;

[111] Pollution Prevention Guidelines (PPGs) with particular reference to PPG1 (general guide to the prevention of water pollution), PPG3 (use and design of oil separators in surface water drainage systems), PPG5 (works near or liable to affect watercourses) and PPG6 (working at construction and demolition sites). The PPGs contain a mix of regulatory requirements and good practice advice. They have been withdrawn by the Environment Agency but are still considered good practice advice to avoid pollution of watercourses. All of the PPGs are available from http://webarchive.nationalarchives.gov.uk/20140328084622/http://www.environment-agency.gov.uk/business/topics/pollution/39083.aspx

- Temporary river crossings will be designed to minimise flood risk impacts on site and eliminate flood risk impacts off site;
- Any stockpiling of material will be strictly controlled and avoid floodplain areas where possible, to avoid the risk of adverse flood impacts. This will likely be subject to control via the Flood Defence Consent or Ordinary Watercourse Consent process;
- Temporary land-take required for construction will include adequate areas of land set aside for robust control measures, for example sustainable drainage control. Temporary flood compensation areas to be put in place in advance of any earthworks resulting in loss of floodplain;
- SuDS will be incorporated, aiming to return groundwater to its source. Other mitigation may need to be considered to maintain groundwater levels; and
- For construction work which has drainage implications, the proposed drainage system should comply with the National Standards, such as Schedule 3 under the Flood and Water Management Act 2010. In addition, the development consent order, or any associated planning obligations, will need to make provision for the adoption and maintenance of any SuDS, including any necessary access rights to property.

Operation

7.8.2. Operational mitigation is likely to include, but not be limited to the following. These measures have not yet been fully factored into the assessment of potential residual effects as it is not possible at this stage to confirm what level of effects the drainage strategy will look to mitigate and the approach it will take. The sections below outline mitigation that could be considered by the project.

Surface and groundwater

7.8.3. At this stage, options for discharge are assumed to be to ponds. If there is a discharge to the Kennet and Avon Canal (if this is possible) this would be a departure from LA 113 guidance and therefore consultation with the Canal Trust would continue to agree appropriate mitigation required prior to any potential discharge.

7.8.4. Mitigation will be embedded into the drainage system that is likely to be over the edge drainage into swales throughout (where possible). This is the proposed method for both carriageway runoff and adjacent permeable catchment areas. This in conjunction with attenuation ponds is the proposed method of drainage conveyance and attenuation. These SuDS measures provide multifunctional benefits such as water quantity attenuation, water quality improvement, and amenity and biodiversity enhancements.

Hydromorphology

7.8.5. At this stage a viaduct or bridge is proposed over the Main Rivers, with culverts on all other watercourses, therefore the following mitigation should be considered to reduce the effect of the Scheme on the watercourses:

- Design viaduct structure foundations to accommodate lateral and vertical change of the channel position and minimise impact of the structure on natural flow and sediment process for a range of high and low flows;
- Single span structures across the watercourse are the preferred type of crossing as they minimise the impact on the water environment (when designed appropriately). They should be designed and constructed in such a way as to minimise disruption to the river and riparian zone. Abutments should be set well back from the bank edge to allow the river to function naturally and to maintain a wildlife corridor along the banks;
- The volume of structure in the floodplain should be limited, and should allow for natural process and channel change;
- Culverts present a higher risk (than single span structures). They are therefore not a preferred method of watercourse crossing from the perspective of protecting and improving the water environment. However, where there is no other technical solution, environmentally sensitive culvert design should be followed, including but not limited to, minimising the length and

adopting an open arc structure that avoids disturbing the natural bed of the river rather than a box culvert. Overall channel length and gradient of channel should be maintained;

- If box or pipe culverts are required the culvert invert should be depressed to allow the development of natural substrate, and additional substrate may be required. Overall channel length and gradient of channel should be maintained;
- Culverts should be sized for environmental uses (e.g. mammal shelves and ensuring natural flow / sediment process) as well as conveyance. Flow rates and depths during normal and low flows will need to be conducive to wildlife requirements such as fish passage;
- Bed or bank protection may also be used to manage erosion that can add to the loss of naturalised reaches. These practices will comply with WFD compliance and will not restrict the waterbody from reaching Good or Good Potential by 2021 or 2027; and
- The headwall extent of any outfalls should be minimised to reduce the impacts on the bed and banks and micro siting should take current channel behaviour info consideration to reduce the risk of damage to any structure. Velocity should also be minimal to reduce the risk of scour to the bed and banks.

Flood risk

7.8.6. Fluvial risk is identified as the primary flood risk in the study area and development which results in the loss of floodplain storage is likely to increase the risk of fluvial flooding within the locality. The design criteria that forms the basis of the Scheme design will ensure that the proposed river crossings (viaducts, bridges, culverts) will span the full width of the floodplains and have sufficient capacity to not reduce the conveyance of the existing channels.

7.8.7. Where appropriate, compensatory flood storage areas will need to be provided to offset the loss of floodplain storage. There is expected to be only minor losses of floodplain storage due to viaducts piers in the floodplain and possibly minor losses due to the abutment arrangements at the edge of the floodplains. The quantum of compensatory storage that will be required will be dependent on the number piers in the floodplain.

7.8.8. Surface water flood risk has also been identified in the study area and the options include the potential for an increase in surface water runoff as a result of an increase in impermeable area. The new road, if above existing ground level also has the potential to affect surface water overland flow paths. Therefore, necessary mitigation measures will be required to ensure that there is no increase in surface water flooding as a result of the Scheme.

7.8.9. A drainage strategy will be developed to manage the surface water runoff that includes sustainable drainage designs, and the provision of culverts to preserve overland flow paths that could otherwise be severed by the new road.

7.8.10. If the preferred Scheme is designed and constructed having gained appropriate consents from Environment Agency and LLFA, and considering climate change, such that flood risk issues have been identified and mitigated in the design, then it is not considered that there will be adverse flood risk issues associated with the operation of the Scheme.

7.8.11. Although the risk is very low, relevant reservoir safety management and guidance should be abided to at all times.

7.9. Further work

7.9.1. Table 7-9 presents the scope of assessment for the next stage, which has been established using the baseline data, the water resource value and the potential construction and operation implications of the Scheme on the water environment.

Table 7-9 - Level and scope of assessment

Item	Scope
Surface water	Assessment of the impacts of the Scheme on the surface water quality and hydromorphology of the watercourses based on LA113. This will include: • A surface water quality assessment using the HEWRAT. • Walkover surveys at proposed crossings to record the channel form and process in order to better understand the sensitivity of channels to the Scheme and to identify the location and type of potential measures to mitigate the local adverse effects of the Scheme.
Groundwater	The assessment will consider both groundwater level and quality impacts in accordance with the requirements of LA 113 and the WFD. Consideration will be given to the potential changes to water flow, volumes and quality during both the construction and operation phases. Further information on licenced and unlicensed private water supplies will be identified in consultation with the Environment Agency and the local authority.
Abstractions and discharges	The assessment will consider the location of the abstraction and discharge points and the quality impacts from both the construction and operation phases. This will draw from the outputs of the Geology and Soils assessment.
Flood Risk	The assessment will consider the impacts of the Scheme on all sources of flood risk. An assessment of floodplain compensation is likely to be required due to loss of natural floodplain storage. The analysis will form the basis of a detailed Flood Risk Assessment (FRA) supporting the Scheme.
WFD compliance assessment	A WFD compliance assessment covering the scope outline in the preliminary assessment- Appendix B, Volume 2.

7.10. Summary

7.10.1. The Scheme has been assessed based on the design assumptions and criteria set out in section 7.4. Using the data available at this stage, a preliminary assessment of the importance, magnitude and significance of the potential effects has been determined in accordance with the DMRB LA 113 and LA 104 (2019), as far as is possible at this stage.

7.10.2. There are no predicted significant adverse effects for the Scheme. There are several impacts that are reported to have a slight adverse impact. With appropriate mitigation, the effects presented here could be reduced further, however at this stage of the Scheme, this cannot be guaranteed.

7.10.3. The significance of effects has been determined based on professional judgement, experience on similar Schemes, and the environmental data available at the time, however without further information on the Scheme design, and environmental surveys, there is a risk that unforeseen significant impacts could be present.

8. Landscape and Visual

8.1. Introduction

8.1.1. This chapter describes the existing environment in relation to landscape character, views, and visual amenity. A study area of a 2.5 km buffer around the Scheme has been considered appropriate for this stage but may be altered as the assessment stages progress. This chapter describes the potential effects upon the landscape and visual amenity as anticipated from preliminary studies and outlines proposed design and mitigation measures to help mitigate these potential effects.

8.1.2. This chapter considers the two distinct but related sub-topics of landscape and visual effects. 'Landscape' takes its character from the interaction of natural and/or human factors including landform, watercourses, land use and built form, land cover/vegetation and cultural heritage influences. The assessment of landscape effects addresses potential direct changes to landscape features and direct/indirect changes to the aesthetic and perceptual qualities of the landscape.

8.1.3. The visual amenity value of available views in a landscape as experienced by people can be a key influence on their quality of life. The assessment of visual effects addresses potential changes in the quality and amenity value of existing views as a result of the change or loss of existing landscape elements, and/or the introduction of new elements, considering the extent to which the Scheme would be visible from visual receptors.

8.2. Planning policy

National policy

National Planning Policy Framework (NPPF), 2021

8.2.1. Paragraph 130 asserts that policies and decisions should ensure that developments ‘are sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation or change.’

8.2.2. Paragraph 174 states that the planning system should contribute to and enhance the natural and local environment by protecting and enhancing valued landscapes. As with biodiversity, protection should be commensurate with their status.

8.2.3. Paragraph 185 states that policies and decisions should ensure that new development is appropriate for its location, considering ‘the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.’

Local policy

Wiltshire Core Strategy, adopted January 2015

8.2.4. Paragraph 2.18 states “The challenge of safeguarding high-quality environments whilst accommodating levels of growth to meet local need is demanding. The Core Strategy will need to ensure that Wiltshire’s high quality built, and natural environment is adequately protected, and that opportunities to enhance these significant assets are optimised. However, it needs to go further and set out a proactive approach through which Wiltshire’s rich environments and heritage will be managed to act as a catalyst for the realisation of this strategy and not a barrier to it. This means the careful stewardship of our environmental assets so that growth is complementary and does not erode the very qualities that make Wiltshire so attractive in the first place.”

8.2.5. Paragraph 2.19 states “The Core Strategy will ensure that adequate services and infrastructure provision, to meet the needs of Wiltshire’s growing population and economy, are brought forward in a timely and responsive manner alongside new development proposals.” It further states “To ensure

this is in place, new development will need to be supported by adequate physical, social and green infrastructure."

8.2.6. The Wilshire Core Strategy has in place several strategic objectives (SO), these include SO5 – Protecting and enhancing the natural, historic, and built environment and SO6 – Ensuring that adequate infrastructure is in place to support communities. In addition reference should also be made to Core Policy 51 Landscape and Core Policy 52 Green Infrastructure. The information pertinent to this chapter has been included below.

8.2.7. SO5 Protecting and enhancing the natural, historic, and built environment:

- Where possible, development will have been directed away from our most sensitive and valuable natural assets, habitats, and species, towards less sensitive locations.
- New development will have contributed to delivery of the Wiltshire Biodiversity Action Plan (BAP) targets and protected, maintained, and enhanced BAP habitats and species, particularly within areas identified for landscape scale conservation.
- Local biodiversity and wildlife corridors will have been incorporated into new development, maintaining and enhancing this resource for the future.
- Wiltshire's network of multi-functional green infrastructure will have been maintained and enhanced to contribute towards achieving the vision set out in the Wiltshire Green Infrastructure Strategy.
- The landscape character of Wiltshire will have been protected and enhanced, particularly the special qualities and scenic beauty of the Areas of Outstanding Natural Beauty and the New Forest National Park.
- New development will have incorporated exceptional quality design which reflects local character and fosters community cohesion, and which reinforces Wiltshire as a desirable place in which to live and invest.

8.2.8. 9.2.14. SO6 – Ensuring that adequate infrastructure is in place to support communities:

- Provision of essential infrastructure, including transport, water, energy, flood alleviation, sustainable urban drainage (SUDs), telecommunications, affordable housing, education, health care, emergency services and waste and recycling, will have been coordinated and provided in a timely manner within all new development.
- Appropriate place-shaping infrastructure, such as leisure and open space, green infrastructure, libraries, meeting places, places of worship, public art, and cultural facilities, will have been secured on a priority basis.
- The provision of new or improved infrastructure will have been positively supported provided there is no detrimental environmental impact.
- Strategic transport corridors within Wiltshire will have been safeguarded and, where appropriate, improved in a sustainable way.
- The natural function of floodplains will have been maintained and enhanced and a sequential approach to flood risk will have been followed, with development being located first in areas of lowest risk.
- The use of appropriate surface water management will have become a prerequisite for development to ensure that flood risk is not increased elsewhere. Sustainable urban drainage systems (SUDs) will have been used in most cases.

8.2.9. Core Policy 51 – Landscape:

- The policy states that development should protect, conserve and where possible enhance landscape character. The policy outlines mitigation measures to ensure that development mitigates any harmful impact upon the landscape.
- Proposals should be informed to respect the landscape character and conserve and enhance through sensitive design.

8.2.10. Core Policy 52 – Green Infrastructure:

- The policy states that development should make provision for the retention and enhancement of

Wiltshire's green infrastructure network, maintaining and providing links to the network.
- If damage to the green infrastructure is unavoidable then replacement infrastructure of equal or above current value should be created.

Wiltshire Local Transport Plan (LTP) 2011 – 2026

8.2.11. The Wiltshire LTP states as its vision "To develop a transport system which helps support economic growth across Wiltshire's communities, giving choice and opportunity for people to safely access essential services. Transport solutions will be sensitive to the built and natural environment, with a particular emphasis on the need to reduce carbon emissions."

8.2.12. This is supported by five transport goals (TG) including TG1 - To support national economic competitiveness and growth, by delivering reliable and efficient transport networks and TG5 - To improve quality of life for transport users and non-transport users, and to promote a healthy natural environment. The information pertinent to this chapter has been included below.

8.2.13. TG1 - To support national economic competitiveness and growth, by delivering reliable and efficient transport networks:

- Ensuring local transport networks are resistant and adaptable to impacts such as adverse weather, accidents, and climate change.

8.2.14. TG5 - To improve quality of life for transport users and non-transport users, and to promote a healthy natural environment:

- Reducing the number of people exposed to high levels of noise from road and rail networks.
- Minimising the impacts of transport on the natural environment, heritage, and landscape, and seeking measures that deliver long-term environmental benefits.
- Improving the experience of end-to-end journeys for transport users.

Joint Melksham Neighbourhood Plan (JMNP) 2020 – 2026

8.2.15. Objective 14 of the JMNP ('made' in July 2021) concerns "Conserving and enhancing of the quality of the natural landscape" and is supported by Policy 16: Trees and Hedgerows which states "To be supported, development proposals should ensure that there will be no loss or deterioration of the irreplaceable habitats of ancient woodlands and ancient or veteran trees found outside ancient woodland, unless the need for and benefits of the development in that location clearly outweigh the loss. In accordance with current guidance a minimum buffer of at least 15 metres in width should be maintained between ancient woodland and any development boundary. A buffer zone around an ancient or veteran tree should be at least 15 times larger than the diameter of the tree."

8.2.16. It further states "To be supported, development proposals should ensure that there is no damage to or loss of trees of good arboricultural and amenity value. Existing trees and hedgerows on development sites should be retained where possible and incorporated as placemaking features in new development. Where there is an unavoidable loss of trees on site, the number and type of replacement trees should be informed by the quality and size of trees lost. Integration of existing hedgerows into private curtilage must be avoided where possible. New tree planting in development proposals and throughout the built and natural environments of the Plan area will be supported in principle."

8.2.17. Objective 14 is also supported by Policy 17: Landscape Character which states:

8.2.18. "Development proposals will be expected to:

i. integrate natural features such as trees, hedgerows and the local river systems that contribute to both the landscape character and setting of the development.

ii. demonstrate that the whole scheme, including hard landscape and planting proposals, draws on local landscape characteristics and features through reference to relevant existing

landscape and historic landscape assessments, supplemented by any additional site-specific assessments, and

iii. respond sensitively to the transition between settlement edge and countryside and maintain the separate identity of settlements."

8.2.19. Objective 15 of the JMNP concerns "Ensuring that new development is sympathetic to our built heritage and the character of the area, with high standards of design" and is supported by Policy 18: Locally Distinctive, High Quality Design which states "Development proposals that contribute positively to the conservation, enhancement and extension of the quality and local distinctiveness of Melksham and Melksham Without will be supported. In addition to having regard to the National Design Guidance and Wiltshire Council design policy, development proposals must demonstrate how they have been informed by the Melksham Rapid Community Character and Distinctiveness Statement and therefore how they have responded positively to the history and character of the area in which the site is located. Proposals for major development must demonstrate through a masterplan how the proposed development layout, density, access proposals and building design approach complement and extend the positive characteristics of Melksham and Melksham without settlements and landscape, both historic and topographic."

8.3. Study area and PEAR methodology

8.3.1. The study area for the Scheme has been defined as the footprint of the route plus a 2.5 km buffer zone surrounding that boundary for landscape character and visual impact. Although they are over 6 km away, given the national status of Area of Outstanding Natural Beauty (AONB), the study area has been extended locally to include the two AONB to the east and west of the Scheme. The study area extent was established by professional judgement and relevant guidance as noted below.

8.3.2. Due to the scale, type of Scheme and stage of work, these extents are considered adequate at this stage to identify where the Scheme may have impacts that could result in significant effects on landscape character or visual amenity. As the Scheme and assessment progress this area may be amended.

8.3.3. This assessment has been undertaken to a proportionate level of detail (for example, assessing groups of residential properties rather than individually), in line with the current stage of the assessment.

8.3.4. This preliminary landscape and visual amenity assessment follow the principles of the guidelines produced by relevant professional bodies concerned with transport-related schemes and landscape and visual impact assessment. The guidance includes the.

- National Highways Design Manual for Roads and Bridges (DMRB) LA 107[112];
- DMRB LA 104 Environmental assessment and monitoring[113],
- Landscape Character Assessment Guidance for England and Scotland prepared jointly by the Countryside Agency and Scottish Natural Heritage, 2002[114]; and
- Landscape and visual effects and the Landscape Institute's Guidelines for Landscape and Visual Impact Assessment Third Edition (GLVIA 3)[115][116].

8.3.5. At this stage, the LVIA has been based on the preliminary geometric layout of the Scheme route.

8.3.6. Landscape characteristics are considered to be of importance in their own right and are valued for their intrinsic qualities irrespective of whether they are seen by people. Impacts on visual amenity are effects as perceived by people and are therefore clearly distinguished from, although closely

112 LA 107 revision 2 Landscape and visual effects-web (2).pdf
https://standardsforhighways.co.uk/dmrb/
114 Landscape Character Assessment Guidance for England and Scotland (naturalengland.org.uk)
115 Guidelines for Landscape and Visual Impact Assessment (GLVIA3) | Landscape Institute

linked to, impacts on landscape character and resources. Landscape and visual assessments are therefore separate, linked processes.

8.3.7. The sensitivity of the landscape to accommodate change will be considered and whether mitigation would address any of the potential negative effects arising from the Scheme. Analysis of the visible physical landscape (e.g., landform, vegetation etc.) and visible spatial components (e.g., scale, key views) at the baseline stage of the LVIA will help identify broad site constraints and opportunities to be developed within the Scheme.

8.3.8. The landscape sensitivity of receptors/resource in the assessment will be reported in accordance with the criteria provided in Table 8-1 taken from LA107.

Table 8-1 - Landscape sensitivity (susceptibility and value) and typical descriptions

Landscape sensitivity (susceptibility and value) of receptor/resource	Typical description
Very high	Landscapes of very high international/national importance and rarity or value with no or very limited ability to accommodate change without substantial loss/gain (i.e., nation parks, internationally acclaimed landscapes – UNESCO World Heritage Sites).
High	Landscapes of high national importance containing distinctive features/elements with limited ability to accommodate change without incurring substantial loss/gain (i.e., designated areas, areas of strong sense of place – registered parks and gardens, country parks).
Medium	Landscapes of local or regional recognition of importance able to accommodate some change (i.e., features worthy of conservation, some sense of place or value through use/perception).
Low	Local landscape areas or receptors of low to medium importance with ability to accommodate change (i.e., non-designated or designated areas of local recognition or areas of little sense of place).
Negligible	Landscapes of very low importance and rarity able to accommodate change.

8.3.9. The classification of visual sensitivity will be reported in the assessment in accordance with the criteria provided in Table 8-2.

Table 8-2- Visual sensitivity (susceptibility and value) and typical descriptions

Sensitivity (susceptibility and value)	Typical descriptions
Very high	Static views from and of major tourist attractions Views from and of very important national/international landscapes, cultural/historical sites (e.g., National Parks, UNESCO World Heritage sites); and Receptors engaged in specific activities for enjoyment of dark skies
High	Views by users of nationally important PRoW/recreational trails (e.g., national trails, long distance footpaths). Views by users of public open spaces for enjoyment of the countryside (e.g., country parks). Static views from dense residential areas, longer transient views from designated public open space, recreational areas; and

Sensitivity (susceptibility and value)	Typical descriptions
	Views from and of rare, designated landscapes of national importance.
Medium	Static views from less populated residential areas, schools and other institutional buildings and their outdoor areas. Views by outdoor workers. Transient views from local/regional areas such as public open space, scenic roads, railways or waterways, users of local/regional designated tourist routes of moderate importance. Views from and of landscapes of regional importance.
Low	Views by users of main roads or passengers in public transport on main arterial routes. Views by indoor workers. Views by users of recreational/formal sports facilities where the landscape is secondary to enjoyment of the sport; and Views by users of local public open spaces of limited importance with limited variety or distinctiveness.
Negligible	Quick transient views such as from the fast-moving vehicles. Views from industrial area, land awaiting re-development; and Views from landscapes of no importance with no variety or distinctiveness.

8.3.10. The descriptions for significance (as outlined in Table 8-3) will be applied to the assessment. For the purposes of this assessment Very Large, Large and Moderate Significance of effect are considered significant in EIA terms. Whereas Slight and Neutral are not significant.

Table 8-3- Significance categories and typical descriptions

Significance category	Typical description
Very large	Effects at this level are material in the decision-making process
Large	Effects at this level are likely to be material in the decision-making process
Moderate	Effects at this level can be material decision-making factors
Slight	Effects at this level are not material in the decision-making process
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

8.3.11. Recommendations for landscape mitigation to prevent or reduce predicted significant adverse effects and enhancements will be proposed. The assessment will identify any potential significant residual effects, i.e., those effects which cannot practicably be further reduced through mitigation.

8.3.12. In summary the assessment will follow the process set out in Table 8-4:

Table 8-4- Summary of assessment process

Summary of assessment process
Landscape
• Baseline: including an assessment of the sensitivity of the landscape chapter areas identified. • Evaluate significance of the potential landscape effects; and • Suggest mitigation measures to reduce potential adverse effects

Summary of assessment process
• Visual
• Baseline, confirmation of identification of visual receptors and their sensitivity through more detailed desktop and brief site visit. • Evaluate significance of the potential visual effects; and • Suggest mitigation measures to reduce potential adverse effects

8.3.13. Landscape and visual effects will be assessed by comparing the predicted effects of the scheme with the situation if the project were not to proceed (i.e., the 'Do Minimum'), using the following scenarios:

- On a winters day during construction when mitigation will be restricted; and
- In the winter of the year of opening (when landscape mitigation measures would not be established) together with a longer-term consideration taking account of fully established mitigation and enhancement measures.

8.4. Assumptions and limitations

8.4.1. The location and size of site compounds, potential storage/borrow areas and proposed signage, lighting or other built elements associated with the Scheme, such as noise or environmental barriers, are unknown at this stage and have not been assessed. In addition, full details of the engineering designs and land take for construction have not been finalised. These elements have the potential to increase the magnitude of adverse effects on the landscape and on visual receptors both during the construction and operational phase. This may cause significant but temporary effects during the construction phase; however, long term significant effects are not anticipated.

8.4.2. The assessment has been undertaken on the basis that cutting slopes will be graded to 1:2 and embankments to 1:3. However, there is the potential for beneficial shaping of the proposed earthworks to integrate the Scheme into the existing terrain, which will entail the use of flowing slopes at a range of gradients, depending on the space available and the design intentions. In areas outside of the flood zone some of these may be at slopes of 1:8 or less, to enable partial return of the new slopes to agricultural use. Where this strategy is employed landscape and visual adverse effects may increase during the construction phase and operational year 1 due to the larger area of disturbance and greater loss of existing land cover. However, by operational year 15, when an appropriate replacement land cover would be established, it is considered such a strategy would result in a decrease in the magnitude of adverse effects when compared to the effects predicted in this assessment.

8.4.3. The visual assessment has been informed by broad desk-based baseline information including the study of topography, aerial images and 'street view' images. Access to land to walk the trace of the route has not been gained nor has access to residential properties that might be affected been sought. The level of analysis has allowed the professional judgement of a landscape architect to be made regarding the likely impacts that the Scheme will have on the visual amenity of the various receptor groups when considered as a whole.

8.4.4. Potential landscape and visual impacts are also likely to occur during the construction of any Flood Compensation Areas (FCAs) required as part of the Scheme. The final design and location of these has not been confirmed at this stage therefore these have not been included in the assessment.

8.5. Consultation

8.5.1. Wiltshire Council landscape officers have been consulted on the Scheme. Sensitive landscape and visual receptors were discussed which included:

- Sandstone ridge to the northeast and north of Melksham;
- Bowden Hill;
- Lacock;
- Beanacre including the historic buildings and farmsteads;

- Elevated receptors from northwest;
- Woodland along the ridgelines; and
- Spye Park.

8.5.2. Further consultation with relevant council officers and stakeholders will be undertaken at the next stage. This stakeholder consultation will seek to agree key viewpoints, requirements for photomontages and environmental design measures, as well as finalising appropriate study area extents.

8.6. Baseline conditions

8.6.1. The following sources were consulted to establish the baseline data:

- Mapping data from Natural England including National Character Areas, Country Parks, Local Nature Reserves, Common Land, Ancient and Semi-Natural Woodland, Sites of Specific Scientific Interest, Traditional Orchards and Special Areas of Conservation.
- Mapping data from Historic England including Listed Buildings, Registered Parks and Gardens, World Heritage Sites and Battlefields.
- Google Earth.
- Google Street View.
- Open-Source Data including MAGIC; and
- Atkins Geospatial Information.

8.6.2. No site visit has been conducted to date.

Landscape character

8.6.3. The published Landscape Character Areas (LCA) described below, each extend over the whole study area and beyond, therefore a figure indicating their location has not been provided. The typical descriptions of the LCA are outlined below.

National landscape character

8.6.4. The study area of the Scheme route option lies within the National Character Area (NCA) 117 Avon Vales as defined by Natural England 2012. The character is broadly defined as an undulating, low-lying landscape of mixed, predominantly pastoral agriculture and small limestone-built towns, cut by the (Bristol) River Avon and its tributaries, and surrounded to the west, south and east by higher land.

8.6.5. Key characteristics of this NCA are:

- An undulating clay vale with a mix of arable and pasture.
- Small and medium-sized fields with mostly hedgerow boundaries with few hedgerow trees, varying in shape from irregular piecemeal enclosure to rectilinear planned enclosure.
- Numerous low ridges with local views over towns and villages.
- Wide River Avon corridor, with an ancient pattern of flood meadows and closely associated settlements and more recent development.
- Transport corridors along roads and watercourses, heavily influential on all development in the NCA.
- Large historic parks and mansions often established from former monastic establishments.
- Attractive stone-built centres to market towns that reflect the former agricultural productivity and wealth of the area.
- Wide views across whole area from higher areas of surrounding chalk.

County and District landscape ypes

8.6.6. The study area of the Scheme lies within the County Landscape Type of (12B) Avon Open Clay Vale as defined by the West Wiltshire Landscape Character Assessment (Chris Blandford Associates 2007).

8.6.7. The key characteristics include:

- Underlying geology of Alluvium and River Terrace Gravels around the watercourses and tracts of sand throughout the vales;
- Landform generally flat, or very gently rolling throughout the area and ranges from 30 to 60m AOD;
- Dominated by a mixture of arable farmland and pasture, with hedgerows or drainage channels demarcating field boundaries;
- Settlement pattern is generally scattered, consisting of small, nucleated settlements and isolated farmsteads; and
- The underlying geology is reflected in local building materials (brick and tile) within traditional historic buildings.

District and local landscape character area

8.6.8. The study area of the Scheme lies within the Local LCA of Open Clay Vale as defined by the Local Landscape Character Neighbourhood Plan Evidence Base Report (Melksham Neighbourhood Plan 2020) referencing the West Wiltshire Landscape Character Assessment analysis of District character type.

8.6.9. The key characteristics include:

- Flat, low-lying landscape (in places adjacent to the floodplain of the River Avon);
- Mixed use farmland, with 'horsey culture' as a significant element to the east of Melksham;
- General sense of openness throughout the character area;
- Road corridors lined in places with mature deciduous hedgerows and telegraph poles;
- Pylons are also visible as dominant vertical elements in certain parts of the character area and large areas of solar farms are in areas to the East of the Neighbourhood Plan area;
- Comprehensive footpath network;
- Narrow rural routeways;
- Scattered settlement pattern, with isolated farmsteads;
- Brooks and stream corridors scattered across the landscape – notably Clackers Book and Semington Brook; and
- A strong edge between the south of Bowerhill and the landscape through a bunded tree edge that follows an old railway route (Brazabon Way).

Study area landscape

8.6.10. Within the study area, the landscape includes key characteristics that are typical of the Local Character Area described above.

8.6.11. The majority of the study area is in low-lying, open, mixed use farmland with isolated farmsteads. These are generally well screened by field vegetation (including mature individual and hedgerow trees) with some long-range open views through the rural environment.

8.6.12. There is an old Roman Road crossing the A350 approximately 800 m south of Lacock. A distinctive feature in aerial views, the route is harder to distinguish at ground level though defined by a scattered line of mature trees to the east.

8.6.13. There are several watercourses that run through the study area including the River Avon (in the north), a prominent feature in the landscape often defined by dense vegetation meandering generally north-southwest across the landscape. Other watercourses include, Forest Brook, Clackers Brook east of Melksham, the Kennet and Avon Canal and Semington Brook to the south of Bowerhill.

8.6.14. High voltage pylons march in single file across the River Avon floodplain, heading north from the high voltage substation west of Beanacre and northwest of Melksham also arcing east-west north of Beanacre.

8.6.15. Settlements are a combination of isolated farmsteads, small, nucleated areas, Melksham town and Bowerhill village. These are often well screened by property vegetation. Properties along the southern part of the route potentially have more open views although, intervening field vegetation would go some way towards screening.

Designated landscapes

8.6.16. The Cotswolds Area of Outstanding Natural Beauty (AONB) is a nationally designated area of importance, recognised for its distinctive landscape with wide open views, dry stone walls, intimate valleys, flower rich grasslands, ancient woodlands, dark skies, tranquillity, archaeology, historic and cultural heritage and distinctive Cotswold stone architecture. The AONB is located approximately 8 km west of the Scheme. Although this is quite some distance, it is important to consider any visibility from the AONB of the Scheme that may detrimentally impact upon its setting and its unique and attractive qualities.

8.6.17. The North Wessex Downs AONB is a nationally designated area of importance, recognised for its distinctive landscape with wide open views, rolling chalk hills, chalk habitats, flower rich grasslands, woodland, pasture, heath, dark skies, tranquillity, archaeology, historic and cultural heritage. The AONB is located approximately 6 km east of the Scheme. Again, although this is quite some distance, it is important to consider any visibility from the AONB of the Scheme that may detrimentally impact upon its setting and its unique and attractive qualities.

8.6.18. Lacock and Bowdenhill Conservation Areas fall within the study area and are particularly sensitive to changes in landscape and visual amenity. The southern edge of Lacock is approximately 55 m north of the Scheme and Bowdenhill is approximately 1 km east of the Scheme. Lacock Abbey is a Grade II Registered Park and Garden approximately 435 m from the northern extent of the Scheme. It is described as having “extensive views to the hills in the distance to the east, and towards the fields immediately surrounding the site, which form its setting.” It is important to consider any views from the Abbey of the Scheme that may detrimentally impact upon its unique and attractive qualities.

8.6.19. Spye Park is a Grade II Registered Park and Garden as well as being a Site of Special Scientific Interest (SSSI). It is approximately 1.3 km east of the Scheme and it is important to consider any visibility from Spye Park of the Scheme that may detrimentally impact upon its unique and attractive qualities.

8.6.20. There are several instances of ancient woodland within the study area, all of which fall outside of the potential works area, with the closest being approximately 125 m away west of the Scheme. This aligns with policy 16 of the JMNP which states “*In accordance with current guidance a minimum buffer of at least 15 metres in width should be maintained between ancient woodland and any development boundary*”. A detailed tree survey is planned to be undertaken by a qualified Arboriculturalist as part of the future stages of the project.

Visual amenity

8.6.21. Visual receptors within the study area including Public Right of Way (PRoW), ancient woodland and properties (residential, business, and community receptors) are indicated on Figure 8.1, Volume 3 Landscape and Visual Constraints.

8.6.22. It should be noted that for this stage, only key receptors of high sensitivity have been considered, to identify those anticipated to experience the greatest potential adverse impacts, which could result in significant effects. PRoW, ancient woodland and property receptors are considered in a general sense and have been grouped into those likely to experience similar impacts.

Public Rights of Way

8.6.23. The study area contains an extensive network of public footpaths and bridleways, including Sustrans National Cycle routes 4 and 403.

8.6.24. The PRoWs are generally within fields, along hedged boundaries, or streams but also cross open fields. Short range views tend to be limited by intervening hedge boundaries, buildings, and the flat topography. Longer ranging views are possible of the raised land towards the eastern edge of the study area. The Scheme will cut through and obstruct some PRoW potentially causing significant landscape and visual effects.

8.6.25. Views towards the Scheme area from surrounding raised landforms, such as the open access land and PRoWs within the Cotswolds and North Wessex Downs AONBs, are possible but over very long distances.

Properties

8.6.26. There are quite distinct clusters of properties dotted within the study area, usually forming parts of the local villages and settlements including isolated farmsteads. These potential areas that could be affected by the Scheme have been identified within Figure 8, Landscape and Visual. This includes Little Marsh, Semington, Littleton, Bowerhill, Redstocks and Sandridge. There is an extensive number of listed buildings within the study area, the views of which are sensitive to change and will need careful consideration and potentially mitigating.

8.6.27. Many residential properties are also surrounded by outbuildings. Garden, boundary, and roadside vegetation often aiding screening.

8.6.28. Views vary; sometimes enclosed by property vegetation, sometimes open across quite a rural landscape, occasionally punctuated with detrimental views of pylons or road infrastructure and, particularly toward the western edge of the southern half of the Scheme, over a more urbanised landscape. The Scheme will potentially become a prominent feature in some of these views which if unmitigated may cause significant adverse effects on visual amenity.

8.7. Potential effects

8.7.1. The Scheme is located from the A350 approximately 850 m south of Lacock, crossing the River Avon on a viaduct. It then sweeps around the eastern side of Melksham approximately 1 km away, passing near a solar farm, before heading to the southwest traveling approximately 135 m away from the southern edge of Bowerhill. The Scheme has one accommodation bridge connecting Forest Lane and Lower Woodrow roads and four new, at grade roundabout junctions which are at the existing A350 south of Lacock, Sandridge Hill/A3102 near Sandridge Common, the A365 east of Bowerhill and connecting back to the existing A350 south of Bowerhill; these will all create permanent change in the landscape however, with appropriate mitigation planting it will be integrated into the surrounding landscape character.

8.7.2. The River Avon is a prominent feature in this area with the Scheme passing over at the northern section, this will be at an elevated position and as a result be visually obvious and difficult to screen completely.

8.7.3. The Scheme will affect the utilisation of many agricultural fields, potentially removing them from use as well as causing a significant amount of hedgerow and hedgerow tree boundary vegetation to be removed, this should be replaced like for like where it can contribute towards the integration of the Scheme into the landscape, mitigate the loss of mature vegetation and be of environmental and ecological benefit.

8.7.4. Mitigation measures are proposed to prevent, avoid, reduce and where possible offset, remedy and compensate for the adverse landscape and visual effects as described in Tables 9.5 and 9.6 below. These will generally fall into 3 categories:

- Primary measures that have been developed through the iterative design process, which becomes integrated and embedded into the Scheme design;
- Standard construction and operational management practices for avoiding and reducing environmental effects; and
- Secondary measures that are designed to address any residual adverse effects remaining after

the primary measures and standard construction practices have been incorporated into the Scheme.

8.7.5. While primary mitigation and standard construction mitigation measures have been adopted, their implementation may not facilitate a reduction in the impact level. This is due to the sensitivity of the receptors and the nature of the infrastructure work being constructed. Once mitigation measures have had a chance to mature, this will facilitate a reduction in the impact level for the majority of the receptors.

8.7.6. Tables 8-5 and 8-6 below present the indicative potential effects, mitigation measures and residual effects on landscape and visual amenity during construction and operation.

8.7.7. Potential mitigation measures are summarised in the tables and more details are provided in section 8.8 below.

Table 8-5 - Potential effects during construction

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures (including primary mitigation and standard construction and operational management practices)	Potential residual effects (with potential primary mitigation measures and standard construction and operational management practices)
Landscape character					
Open Clay Vale Landscape/ Local landscape (considered together for this stage)	High	The landscape is flat, low-lying (in places adjacent to the floodplain of the River Avon) ensuring the schemes visibility during construction Road corridors lined in places with mature deciduous hedgerows, will help to limit views out during construction Pylons are also visible as dominant vertical elements in certain parts of the character area and large areas of solar farms are in areas to the east. Narrow rural routeways, will be severed by the proposed works. Scattered settlement pattern, with isolated farmsteads, land parcels potentially severed by construction works Potential severance of brooks and stream	**Moderate Adverse** The landscape use will be permanently altered adjacent to the bypass. There will be an adverse effect on visual amenity due to a large amount of vegetation being removed for access and construction which will also open up views towards the construction activity.	Ensuring all trees, woodland, existing vegetation, and other landscape features are protected and retained wherever possible, particularly those identified as 'valuable' in accordance with BS5837:2012 - Trees in relation to design, demolition and construction. Advanced planting of replacement vegetation to help retain character. Careful phasing of work to be maintained. Temporary screening measures to be implemented e.g., fencing, bunding Locating the construction compound in a relatively hidden position from the wider landscape; this aids in reducing the visibility of these elements from the wider landscape and impact upon agricultural or vegetated land adjoining. Ensuring that soil structures are protected where land would be used temporarily, such as for	**Moderate Adverse** Loss of vegetation is unavoidable and cannot be fully mitigated at construction. Advanced planting would reduce the adverse effect on visual amenity.

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures (including primary mitigation and standard construction and operational management practices)	Potential residual effects (with potential primary mitigation measures and standard construction and operational management practices)
		corridors scattered across the landscape. The Scheme construction will cause closures and/or diversions to many roads and PRoW. The Scheme construction will be particularly visible through the winter period due to the deciduous nature of the local vegetation		compounds, re-grading areas etc. so that when it is returned to the existing land use, it is in a suitable condition.	
Visual amenity					
Properties along Folly Lane East, Piccadilly Caravan Park and Melksham Road, Lacock	High	The existing highway planting consists of linear belts of trees. Planting to the wider landscape consists of field edge hedgerow planting, and individual trees. The planting is predominantly mature and deciduous. This will help to screen and filter views during construction. Piccadilly Caravan park has mature, deciduous	**Moderate Adverse**	Limit vegetation removal to that strictly necessary. Advance planting of replacement vegetation where feasible. Utilisation of temporary fencing and bunding to screen the works. Existing intervening buildings and vegetation will help to aid screening. Planting of embankments with local species to aid screening and integration of the Scheme into the landscape including appropriate evergreen species.	**Moderate Adverse** Some potential views in particular from the upper storeys of properties along Folly Lane East will remain. Views will also be open through the winter period during construction

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures (including primary mitigation and standard construction and operational management practices)	Potential residual effects (with potential primary mitigation measures and standard construction and operational management practices)
		vegetation which will filter views. Properties along Folly Lane East and Melksham Road have established, mature deciduous vegetation to the front and rear gardens with some evergreen species. Views south towards the works are predominantly screened by residential ,farm buildings and associated vegetation, this consists of a mix of deciduous and evergreen planting. Potentially there are long-range views from the upper storeys and winter views. Views towards construction will predominantly affect transient receptors utilising Melksham Road and A350.			
Properties around Lower Woodrow	High	The existing landscape is generally bordered by hedgerows, hedgerow	**Moderate Adverse**	Retain, protect, and enhance existing vegetation for screening purposes.	**Moderate Adverse** Potential mid to long-range views available from upper

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures (including primary mitigation and standard construction and operational management practices)	Potential residual effects (with potential primary mitigation measures and standard construction and operational management practices)
Road, Woodrow Road and Forest Lane including farmsteads		trees, and linear belts of trees of a deciduous nature. These screen the Scheme in most areas. Views open up with mid to long-range views across the fields. Views will open up during the winter months. The farmsteads along Forest Lane and Lower Woodrow Road and properties along Woodrow Road have intervening mature vegetation of a predominantly deciduous nature. This will aid screening of construction works Several fields adjacent to the bypass will be affected by works with vegetation being removed. This will open up mid to long-range views towards the construction works from the upper storeys and through the winter	effect on visual amenity including loss of field use for farmland.	Off-site planting and advance planting recommended to enhance the screen belt. Utilisation of temporary fencing and bunding to screen the works. Existing intervening buildings and vegetation will help to aid screening. Screen planting to proposed bypass, using native planting in the pattern similar to the surrounding landscape	storeys and throughout the construction period in the winter months. Mid to long-range views available from upper storeys and due to a reduction in screening during the winter months.

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures (including primary mitigation and standard construction and operational management practices)	Potential residual effects (with potential primary mitigation measures and standard construction and operational management practices)
Properties of Sandridge Hill/A3102, Lopes Close and Sandridge Common	High	The existing landscape along Sandridge Hill consists of deciduous hedgerows and a mixed deciduous and evergreen wood to the east of the Scheme. Garden vegetation consists of a mixed deciduous and evergreen nature as well as linear belts of shrubs and field boundary hedgerows with trees to the west of the Scheme. This will limit and filter views of the construction works. Views are generally well screened to the east, opening to mid to long-range views near Sandridge Common and becoming screened by intervening buildings and deciduous vegetation near Lopes Close. Due to the predominantly deciduous nature of the vegetation winter views are possible.	**Moderate Adverse** Potential temporary route closure along A3102 for construction severing connectivity. Visual amenity for residents in Sandridge Common adversely effected. Potential mid to long-range views for properties along Sandridge Hill/A3102.	Ensuring that valued trees, woodland, existing vegetation and other landscape features are protected and retained wherever possible, in accordance with BS5837:2012Advance planting of replacement vegetation where feasible. Off-site planting to aid screening if possible. Perimeter fencing maintain a tidy site and temporary screen bunding. Existing intervening buildings and vegetation will help to aid screening. Planting of embankments with local species to aid screening and integration of the Scheme into the landscape including appropriate evergreen species. Fragmented habitats will be re-linked, and connectivity restored throughout the entirety of the Scheme.	**Moderate Adverse** Screening measures during construction will moderate the adverse effect on visual amenity, some views may still be visible from upper storeys and through the winter period. Permanent field use loss.

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures (including primary mitigation and standard construction and operational management practices)	Potential residual effects (with potential primary mitigation measures and standard construction and operational management practices)
		Vegetation removal along the Scheme route will potentially open views for the properties along Sandridge Common particularly from the upper storeys and throughout the winter period.			
Properties along the Eastern Way, east of Melksham and Carnation Lane	High	The landscape along Eastern Way, Melksham consists of grass verges, pockets of small deciduous woodland, hedgerows, individual trees, and shrubs of a deciduous nature. This will help to filter and screen construction works. The landscape of Carnation Lane is predominantly agricultural fields with field boundary hedgerows with trees, the properties also benefit from established garden vegetation albeit of a predominantly deciduous nature. Views across the patchwork of fields are	**Moderate Adverse** Reduction of visual amenity looking east towards the Scheme. Vegetation loss associated with Scheme will further open views.	Limit vegetation removal to that strictly necessary. Advance planting of replacement vegetation where feasible. Offsite planting to aid screening if possible Utilisation of temporary fencing and bunding to screen the works. To enhance visual amenity the planting will provide a variety of form, colour, texture as well as a variety of edge treatment with scallops and open areas. Existing intervening buildings and vegetation will help to aid screening. Integrate existing woodland and managed in sympathy with the adjacent and nearby woodland.	**Moderate-Adverse** Mitigation measures during construction will reduce any adverse effects, although glimpses of the Scheme may be present, particularly from upper storeys and throughout the winter period.

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures (including primary mitigation and standard construction and operational management practices)	Potential residual effects (with potential primary mitigation measures and standard construction and operational management practices)
		available along Eastern Way and Carnation Lane. Long-range views towards the Scheme will be apparent and exacerbated by the vegetation removal to enable the works. Properties benefit from mature garden vegetation and intervening field boundary hedgerows and trees. These aid screening of the Scheme works to the ground floors with potential views from the upper storeys, particularly through the winter period.		The species mix should reflect the local plant character.	
Properties around Redstocks and A365	High	The landscape around Redstocks and the A365 is primarily low-lying field boundary hedgerows and trees of a deciduous nature. The farmsteads and properties have long-range views west towards the Scheme construction works. The existing vegetation will be ineffective in screening	**Large Adverse** Loss of field use and reduction in visual amenity for the farmsteads nearby. Reduced visual amenity for properties along A365.	Protect and augment the natural vegetation around the Scheme to reduce the impact on the surrounding environment. The local habitat around the Scheme could be enhanced through planting a selection of endemic species. Advance and off-site planting of replacement vegetation where feasible.	**Large Adverse** Adverse effect on visual amenity may remain for upper storeys and throughout the winter period during construction. Loss of field use. Permanent visual intrusion from proposed infrastructure, that cannot be mitigated.

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures (including primary mitigation and standard construction and operational management practices)	Potential residual effects (with potential primary mitigation measures and standard construction and operational management practices)
		the Scheme works, particularly the aqueducts over Clackers Brook Views towards the Scheme works will be visible from the upper storeys.		Utilisation of temporary fencing and bunding to screen the works. Existing intervening buildings and vegetation will help to aid screening, particularly to the short-range views. Mitigation planting would help restore the current visual context and reduce any new visual effects.	
Properties along Bath Road/A365 and Bowerhill Lane, Bowerhill	High	The Bath Road/A365 and Bowerhill Lane generally consists of linear belts of shrubs and trees, field boundary hedgerows with trees of a deciduous nature. The landscape beyond has large scale agricultural fields. There are glimpses through to the Scheme construction where there are gaps in the vegetation and over low-lying hedgerows. period. Some properties along Bowerhill Lane benefit from additional mature vegetation in their rear	**Moderate Adverse** Reduction in visual amenity due to construction activity exacerbated by the required vegetation removal. Adverse effect on agricultural landscape use.	Limit vegetation removal to that strictly necessary. Advance and off-site planting of replacement vegetation where feasible. Utilisation of temporary fencing and bunding to screen the works. Existing intervening buildings and vegetation will help to aid screening. Replanting with local species to aid screening and integration of the Scheme into the landscape including appropriate evergreen species for all year-round screening.	**Moderate Adverse** Glimpsed views of construction works will be available from upper storeys and throughout the winter period. Planting mitigation measures will help to moderate any adverse effects during the construction period.

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures (including primary mitigation and standard construction and operational management practices)	Potential residual effects (with potential primary mitigation measures and standard construction and operational management practices)
		gardens, filtering views of the construction works The Scheme works dissected fields of several nearby farmsteads. which will have an adverse effect on the landscape use. Properties are relatively well screened by the existing vegetation and distance from the Scheme. Potential views towards the Scheme works from the upper storeys			
Properties along Church Street and Manor Close, Semington.	High	Church Street and Manor Close both benefit from intervening garden vegetation and field boundary hedgerows with trees. The majority of which is deciduous thereby potentially allowing views in the winter period and filtered views of the construction works.	**Moderate Adverse** Some vegetation removal within the highway boundary but screen vegetation to field boundary beyond that will limit views.	Limit vegetation removal to that strictly necessary adjacent to the road widening. Protect and augment retained planting where removal has been undertaken Utilisation of temporary fencing and bunding to screen the works. Existing intervening buildings and vegetation will help to aid screening. Replanting with local species to aid screening and integration of the Scheme into the landscape including appropriate evergreen	**Moderate Adverse** Glimpsed views of construction works will potentially be available from upper storeys and throughout the winter period. Planting mitigation measures and the existing vegetation to the field edges will help to curtail adverse effects.

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures (including primary mitigation and standard construction and operational management practices)	Potential residual effects (with potential primary mitigation measures and standard construction and operational management practices)
		There are potential long-range views from upper storey windows.		species for all year-round screening.	
Farmsteads and Businesses along A361 and near Littleton Roundabout	High	The A361 benefits from mature, deciduous linear belts of shrubs and trees both to the north and south. This provides screening from and to the carriageway, preserving the visual amenity for the farmsteads and businesses nearby from construction activity. Littleton Roundabout benefits from existing mature, deciduous vegetation which provides some screening with gaps potentially allowing views through during the winter and to the construction works. Directly north of the A361 and Littleton Roundabout is characterised by farm fields	**Moderate Adverse** Potential reduction in visual amenity due to construction activity and potentially exacerbated by vegetation removal if required.	Limit vegetation removal to that strictly necessary. Advance and off-site planting of replacement vegetation where feasible. Utilisation of temporary fencing and bunding to screen the works. Existing intervening vegetation will help to aid screening. Replanting with local species to aid screening and integration of the Scheme into the landscape including appropriate evergreen species for all year-round screening.	**Moderate Adverse** Glimpsed views of construction works will potentially be available from upper storeys and throughout the winter period. Planting mitigation measures will help to moderate adverse effects.
Farmsteads and businesses	High	Farmsteads and businesses nearby benefit from mature,	**Moderate Adverse**	Limit vegetation removal to that strictly necessary.	**Moderate Adverse** Views towards the construction activity will be

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures (including primary mitigation and standard construction and operational management practices)	Potential residual effects (with potential primary mitigation measures and standard construction and operational management practices)
near A342/A3102 junction.		deciduous hedgerows and garden vegetation with the views opening up towards the junction allowing views of the construction works particularly during the winter months	Temporary reduction in visual amenity during construction activity.	Utilisation of temporary fencing and bunding to screen the works. Existing intervening vegetation will help to aid screening.	available with any temporary fencing helping to moderate any adverse effects.
PRoWs	High	An extensive network of PRoW exists in and around the works area. Some sections of these will be required to be closed/diverted to allow for the Scheme construction. This will have an immediate and adverse effect on the landscape use as well as the visual amenity currently enjoyed.	**Large Adverse** Disruption to established pathways causing an adverse effect on both landscape use and visual amenity	Limit vegetation removal to that strictly necessary. Existing planting will also help to reinforce the mitigation effects Advance and off-site planting of replacement vegetation where feasible. Utilise opportunities to improve PRoWs and direct people away from the Scheme construction works. Utilisation of temporary fencing and bunding to screen the works. Planting of embankments with local species to aid screening and integration of the Scheme into the landscape including the use of appropriate evergreen species.	**Large Adverse** Disruption to the nearby PRoWs will be unavoidable. The landscape use will be adversely affected. With mitigation measure implemented the adverse effect on visual amenity may potentially be diminished but not eradicated.
Sustrans National Cycle Route 4, Kennet and	High	Due to the bypass in this area the cycle route will be adversely affected, particularly the views to	**Large Adverse** Temporary reduction in visual amenity.	Limit vegetation removal to that strictly necessary.	**Large Adverse** With mitigation measure implemented the adverse

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures (including primary mitigation and standard construction and operational management practices)	Potential residual effects (with potential primary mitigation measures and standard construction and operational management practices)
Avon Canal Route		the northern and southern side of the Kennet and Avon Canal. This will cause a temporary reduction in visual amenity for the users of the cycle route.		Identify and utilise opportunities to improve the part of the Cycle Route that will be affected. Provide a temporary alternative route. Ensure advanced notification of construction works and provision should be made to facilitate users of these routes. Utilisation of temporary fencing and to screen the works.	effect on visual amenity may potentially be diminished but not eradicated.
Sustrans National Cycle Route 403	High	The cycle route will be adversely affected where it meets the Scheme along Forest Lane and through Lower Woodrow. The Scheme will permanently divert the route and may temporarily sever it. The visual amenity will also be adversely affected during construction due to the proximity of the cycle route to the Scheme construction.	**Large Adverse** Temporary loss of use of the cycle route or diversion. Visual amenity will be adversely affected..	Limit vegetation removal to that strictly necessary. Advance and off-site planting of replacement vegetation where feasible. Identify and utilise opportunities to improve the part of the Cycle Route that will be affected and provide a temporary alternative route. Ensure advanced notification of construction works and provision should be made to facilitate users of these routes. Utilisation of temporary fencing and bunding to screen the works.	**Large Adverse** Temporary severance of the cycle route shall remain, adversely effecting landscape use. The adverse effect on visual amenity may potentially be moderated with effective mitigation strategies but not eradicated.

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures (including primary mitigation and standard construction and operational management practices)	Potential residual effects (with potential primary mitigation measures and standard construction and operational management practices)
Lacock Conservation Area	High	Lacock Conservation Area is a notable place within the study area and is particularly sensitive to change. The landscape immediately south of Lacock Conservation Area is primarily mid to large-scale agricultural fields with field boundary hedgerows and trees of a predominantly deciduous nature. The nature of which offers glimpsed views out towards the Scheme construction works through gaps and in the winter period. Receptors shall experience close, mid, and long-range views towards the Scheme construction, adversely effecting visual amenity. Use of the landscape directly south to Lacock Conservation Area may potentially be affected	**Moderate Adverse** Landscape use will potentially be adversely affected due to route disruption. Visual amenity will be adversely affected due to the proximity and nature of the Scheme construction and the deciduous nature of the landscape.	Maintain the integrity of the existing vegetation through protection and enhancement. Use the ecological appraisal to inform the specification of the replacement planting. Specify native species of local provenance within the landscape proposals, where appropriate. Consult with local wildlife groups and other stakeholders and ensure that they have been informed of the development proposals. .	**Moderate Adverse** Landscape use will be adversely affected albeit temporary in nature. Adverse effect on visual amenity may potentially be moderated but not entirely eradicated.

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures (including primary mitigation and standard construction and operational management practices)	Potential residual effects (with potential primary mitigation measures and standard construction and operational management practices)
		due to potential road closure or diversion.			
Bowden Hill Conservation Area	High	Bowden Hill Conservation Area is a notable place within the study area and is particularly sensitive to the change The landscape of Bowden Hill is predominantly agricultural fields with field boundary hedgerows with trees and a significant amount of mid to large-scale woodlands. Despite Bowden Hill Conservation Area being at a distance from the Scheme construction, its elevation and long-range views may potentially allow for views to the Scheme construction albeit glimpses at long distance and distant views of the construction activity could be visible.	**Moderate Adverse** Landscape use will be unaltered. Although quite a distance away, the long-range visual amenity will be adversely affected.	Limit vegetation damage to that strictly necessary. Advance and off-site planting of replacement vegetation where feasible. Utilisation of temporary fencing and bunding to screen the works. Existing intervening buildings and vegetation will help to aid screening. Maintain the integrity of the existing vegetation through protection and enhancement. Use the ecological appraisal to inform the specification of the replacement planting. Specify native species of local provenance within the landscape proposals, where appropriate. Consult with local wildlife groups and other stakeholders and ensure that they have been informed of the development proposals.	**Moderate Adverse** Implementing mitigation measures for the duration of construction works will help to diminish the adverse effect on visual amenity but will not eradicate it.

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures (including primary mitigation and standard construction and operational management practices)	Potential residual effects (with potential primary mitigation measures and standard construction and operational management practices)
The Cotswolds AONB	High	Although the AONB is at some distance away from the Scheme construction, its sensitivity to change in the landscape and its elevation may afford views towards the Scheme construction thereby adversely affecting the visual amenity	**Moderate Adverse** Reduction in visual amenity due to a combination of the sensitivity of the AONB and its elevation allowing long-range views to Scheme construction.	Limit vegetation removal to that strictly necessary. Advance planting of replacement vegetation where feasible. Off site and advanced planting to aid screening and direct views away from Scheme Utilisation of temporary fencing and bunding to screen the works. Identify and utilise opportunities to sensitively improve the vegetation within the AONB.	**Moderate Adverse** Mitigation measures may curtail the adverse effect on visual amenity although long-range views may still be impacted from certain areas.
The North Wessex Downs AONB	High	The North Wessex Downs has a distinctive landscape with wide open views, rolling chalk hills, chalk habitats, flower rich grasslands, woodland, pasture, heath, dark skies, tranquillity, archaeology, historic and cultural heritage Although the AONB is at some distance away from the Scheme construction, its sensitivity to change in the landscape and its elevation may afford views towards the Scheme construction	**Moderate Adverse** Reduction in visual amenity due to a combination of the sensitivity of the AONB and its elevation allowing long-range views to Scheme construction.	Limit vegetation removal to that strictly necessary. Advance and off-site planting of replacement vegetation where feasible. Early planting of woodland blocks to reduce the time adverse effects are experienced. Utilisation of temporary fencing and bunding to screen the works. Identify and utilise opportunities to sensitively improve the vegetation within the AONB. Use the ecological appraisal to inform the specification of the replacement planting.	**Moderate Adverse** Mitigation measures may moderate the adverse effect on visual amenity although long-range views may still be available from certain areas.

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures (including primary mitigation and standard construction and operational management practices)	Potential residual effects (with potential primary mitigation measures and standard construction and operational management practices)
		thereby adversely affecting the visual amenity.		Specify native species of local provenance within the landscape proposals, where appropriate. Consult with local wildlife groups and other stakeholders and ensure that they have been informed of the development proposals.	
Spye Park grade II registered park and garden and SSSI	High	Spye Park is located within an extensive tract of woodland, some of it is ancient woodland as well as mid to large-scale agricultural fields with field boundary hedgerows and trees of a deciduous nature. The view towards the Scheme construction is well screened with intervening vegetation of a deciduous nature potentially allowing long-range glimpses through particularly in the winter period.	**Moderate Adverse** Landscape use will be unchanged in the vicinity. Visual amenity will potentially be adversely affected due to long-range glimpsed views through intervening vegetation..	Limit vegetation removal to that strictly necessary. Advance planting of replacement vegetation where feasible. Offsite planting to aid screening if possible and direct views away from Scheme construction. Utilisation of temporary fencing and bunding to screen the works. Planting of embankments with local species to aid screening and integration of the Scheme into the landscape. This could include native/provenance evergreen species to facilitate all year-round screening.	**Moderate Adverse** With mitigation measures in place the adverse effect on visual amenity may potentially be moderated albeit slightly.
Lacock Abbey grade II registered	High	Lacock Abbey is approximately 435 m from the extent of the Scheme.	**Moderate Adverse** Landscape use will be unaffected.	Limit vegetation removal to that strictly necessary.	**Moderate Adverse** With mitigation measures in place the adverse effect on visual amenity may

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures (including primary mitigation and standard construction and operational management practices)	Potential residual effects (with potential primary mitigation measures and standard construction and operational management practices)
park and garden		Screening of the views towards the Scheme construction will be aided by the intervening mature vegetation within Lacock Abbey and to the fields directly south and south-west. This vegetation is primarily deciduous nature with a few instances of evergreen. Potentially mid to long-range views of the Scheme construction may be glimpsed in particular during the winter period.	Visual amenity may potentially be adversely affected particularly in the winter period with glimpsed views of the Scheme construction through the intervening vegetation.	Advance planting of replacement vegetation where feasible. On site planting to aid screening if possible and direct views away from Scheme construction. Utilisation of temporary fencing and bunding to screen the works.	potentially be diminished but not eradicated.
Ancient Woodland	High	There is a large areas of ancient woodland surrounding the study area with the majority being on the north-east side surrounding Spye Park. Also located to the north of Beanacre and one south of Sandridge Common, are some listed buildings. The majority of the landscape surrounding these is mid to large-scale agricultural fields with field boundary	**Moderate Adverse** Landscape use should remain unaffected. Visual amenity for the ancient woodlands near the Scheme construction may experience adverse effects particularly during the winter period due to the deciduous nature of the vegetation.	Limit vegetation removal to that strictly necessary. On site and advanced planting to aid screening if possible and direct views away from Scheme construction. Utilisation of temporary fencing and bunding to screen the works. Identify opportunities to improve vegetation within the ancient woodlands.	**Moderate Adverse** With mitigation measures in place the adverse effect on visual amenity may potentially be moderated but not eradicated.

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures (including primary mitigation and standard construction and operational management practices)	Potential residual effects (with potential primary mitigation measures and standard construction and operational management practices)
		hedgerows and trees. The vegetation is of a deciduous nature potentially opening views towards the Scheme during construction and in the winter period.			
Listed Buildings	High	There are several Grade II and Grade II* Listed Buildings within the study area. These are particularly sensitive to the changes in view caused by the Scheme. The Listed Buildings are predominantly within the Lacock Conservation Area to the north and Semington to the south. with a further scattering throughout the study area. Many of these benefit from intervening buildings and vegetation albeit deciduous in nature potentially allowing views in the winter period.	**Moderate Adverse** The Scheme construction may potentially cause an adverse effect on visual amenity for the listed buildings surrounding the study area.	Maintain and improve the existing vegetation Off site and advanced planting to aid screening if possible and direct views away from Scheme construction. Utilisation of temporary fencing and bunding to screen the works. Planting of embankments with local species to aid screening and integration of the Scheme into the landscape including appropriate evergreen species within the planting mix.	**Moderate Adverse** With mitigation measures in place the adverse effect on visual amenity may potentially be diminished but not eradicated.

Operation

Table 8-6 - Potential effects during operation

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation)
Landscape character					
Open Clay Vale Landscape	High	The landscape will be permanently altered, new infrastructure will be established on embankment above the flood plain and a large amount of vegetation will require removal, close to the Scheme.	**Moderate Adverse** Open views towards the Scheme including increased vehicle traffic will alter the use of landscape and have an adverse effect on the visual amenity. Adverse effects due to the sensitivity of the landscape character and the permanent alteration to the landscape.	Wildflower seeding where appropriate. Hedgerow and hedgerow tree planting along Scheme where appropriate Woodland planting at a location, size, and scale appropriate. The fencing style and appearance is to be agreed with Wiltshire Council and the relevant stakeholders Fragmented habitats to be re-linked, and connectivity restored throughout the entirety of the Scheme	**Moderate Adverse** With the establishment and maturity of appropriate mitigation planting and enhancement measures the Scheme will be integrated into the landscape visually, however, the landscape use will be permanently altered with many agricultural fields segregated. The viaduct cannot be fully integrated and will remain as a noticeable feature in the landscape.
Visual amenity					
Properties along Folly Lane East, Piccadilly Caravan Park and Melksham Road, Lacock	High	Properties off Folly Lane East, Melksham Road and Piccadilly Caravan Park may only experience mid to long-range glimpsed views towards the Scheme due to the intervening vegetation being of a deciduous nature. Mitigation measures could include screen planting to	**Moderate Adverse** Adverse effects due to the sensitivity of the visual amenity with no mitigation.	Visual amenity may be adversely affected at construction and early operation however, by year 15 the new planting will be established thereby improving the screening and integration of the Scheme, reducing the adverse effect. Retain and make best use of existing vegetation. Hedgerow and hedgerow tree planting along Scheme where	**Slight Adverse** Landscape use will be permanently altered, potentially improving the traffic flow. Some permanent field loss. Visual amenity adversely effected in the short term however, by year 15 new planting will be established

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation)
		the approach roads on the proposed roundabout.		appropriate Enhancement planting of the established roundabout. Woodland planting at a location, size, and scale appropriate.	and will integrate the Scheme into the landscape.
Properties around Lower Woodrow Road, Woodrow Road and Forest Lane including farmsteads	High	Views towards the Scheme and elevated sections from Forest Lane, Lower Woodrow and Woodrow Road will be visible due to the elevated nature of the structure. This will be an immediately apparent in the landscape in the early stages of operation due to the loss of existing vegetation	**Moderate Adverse** Visual amenity will be adversely affected in the early stages whilst the mitigation planting establishes.	Wildflower seeding where appropriate Hedgerow and hedgerow tree planting along Scheme where appropriate Woodland planting at a location, size, and scale appropriate including selected woodland planting to screen direct views Selected off site planting to aid screening of views. Include a range of local provenance evergreen species to aid screening in the winter period.	**Slight Adverse** With mitigation measures in place any adverse effects on visual amenity will be minimised however, the Scheme may still be visible due to its elevation. By year 15 any adverse effects will be mostly minimised however, glimpses may be available in the winter period due to the deciduous nature of species used.
Properties of Sandridge Hill/A3102, Lopes Close and Sandridge Common	High	Views towards the Scheme including the new roundabout will be visible from properties of Sandridge Hill/A3102, Lopes Close and Sandridge Common particularly in the early stages of operation. There may be potential glimpsed views during the winter period due to the deciduous nature of the	**Moderate Adverse** effect on visual amenity in the early stages due to immature planting. Landscape use, particularly agricultural, will have a permanent adverse effect due to the Scheme severing several the fields.	Wildflower seeding where appropriate Hedgerow and hedgerow tree planting along Scheme where appropriate Woodland planting at a location, size, and scale appropriate including selected woodland planting to screen direct views Selected off site planting to aid screening of views.	**Slight Adverse** With mitigation measures in place any adverse effects on visual amenity will be minimised however, glimpsed views may still be available in the winter period from upper storeys. By year 15 the mitigation planting will have established and will provide sufficient screening and will

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation)
		species used which will be of local provenance.		Include a range of local provenance evergreen species to aid screening in the winter period.	aid integration of the Scheme.
Properties along the Eastern Way, east of Melksham and Carnation Lane	High	The establishment of a new roundabout carriageways, and associated infrastructure with the Scheme will potentially be visible particularly in the early stages of operation. The farmsteads nearby will be adversely affected by the visual amenity due to their proximity and the Scheme Properties along Eastern Way and Carnation Lane will potentially have views before vegetation establishment however, these do benefit from established mature vegetation. .	**Moderate Adverse** Landscape use will be permanently affected for the farmsteads. Visual amenity will be adversely affected for the properties due to the Scheme being elevated and visible even at long-range.	Wildflower seeding where appropriate Hedgerow and hedgerow tree planting along Scheme where appropriate Woodland planting at a location, size, and scale appropriate including selected woodland planting to screen direct views Selected off site planting to aid screening of views. Include a range of local provenance evergreen species to aid screening in the winter period. Off-site planting to aid screening proximity of the visual receptors to the proposed infrastructure.	**Moderate Adverse** Due to the infrastructure's close proximity to the sensitive receptors and the opening up of views in the winter months.
Properties around Redstocks and A365	High	The farmsteads and properties have long-range views west towards the Scheme which will be apparent. Intervening vegetation may aid screening however, this is	**Large Adverse** Visual amenity will be affected due to the elevation and nature of the Scheme infrastructure.	Wildflower seeding where appropriate Hedgerow and hedgerow tree planting along Scheme where appropriate	**Moderate Adverse** Some of the adverse effects on visual amenity will, by year 15, be minimised through the mitigation and enhancement measures.

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation)
		of a deciduous nature and will allow views in the winter period.		Woodland planting at a location, size, and scale appropriate. . Include a range of evergreen species that are sympathetic to the local vernacular to aid screening in the winter period. Off-site planting to aid screening.	Some long-range glimpsed views potentially available particularly during the winter period. Infrastructure cannot be mitigated against.
Properties along Bath Road/A365 and Bowerhill Lane, Bowerhill	High	The Scheme runs through the agricultural fields of several nearby farmsteads Properties are relatively well screened by the existing vegetation and at a distance from the Scheme. from the ground floor level, with potential views towards the Scheme works from the upper storeys. Thereby adversely affecting the visual amenity in the operational period.	**Moderate Adverse** Adverse effect on landscape use due to the Scheme utilising the agricultural fields. Visual amenity will be affected due to vegetation loss opening views to the Scheme as well as the elevated nature of the Scheme.	Wildflower seeding on all new verges. Hedgerow planting along Scheme where appropriate, including hedgerow trees. Woodland planting at a location, size, and scale appropriate. Scrub planting on bottom of embankments. Include a range of evergreen species that are sympathetic to the local vernacular to aid screening in the winter period. Off-site planting to aid screening if possible.	**Slight Adverse** Landscape use will be permanently transformed. With the establishment of mitigation and enhancement measures any adverse effects on visual amenity will be minimised however, glimpsed views may still be available from the upper storeys of nearby properties. Some properties are already well screened by vegetation.
Properties along Church Street and Manor Close, Semington.	High	Church Street and Manor Close both benefit from intervening garden vegetation and field boundary hedgerows with trees. The majority of the	**Moderate Adverse** Potential reduction in visual amenity due to increased traffic activity and potentially	Hedgerow planting along Scheme where appropriate, including hedgerow trees. Scrub planting on bottom of embankments.	**Slight Adverse** Glimpsed views towards the operation of the carriageway will potentially be available from upper storeys and throughout the winter period.

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation)
		vegetation is deciduous thereby potentially allowing views in the winter period for those properties along the outer edges. There are potential long-range views from upper storey windows.	exacerbated by vegetation removal	Include a range of evergreen species that are sympathetic to the local vernacular to aid screening in the winter period. Off-site planting to aid screening if possible.	Planting mitigation measures will help to reduce any adverse effects. Mitigation planting offering screening once mature post year 15.
Farmsteads and Businesses along A361 and near Littleton Roundabout	High	The A361 benefits from mature, deciduous linear belts of shrubs and trees both to the north and south., This provides screening from and to the carriageway, preserving the visual amenity for the farmsteads and businesses nearby. Littleton Roundabout benefits from existing mature, deciduous vegetation which provides some screening with gaps potentially allowing views through, particularly during the winter period. - Directly north of the A361 and Littleton Roundabout is characterised by farm fields.	**Moderate Adverse** Potential reduction in visual amenity due to increased activity and potentially exacerbated by vegetation removal. The impact will be moderate-adverse due to the type and existing screening of the receptors.	Hedgerow planting along Scheme where appropriate, including hedgerow trees. Woodland planting at a location, size, and scale appropriate. Scrub planting on bottom of embankments. Include a range of evergreen species that are sympathetic to the local vernacular to aid screening in the winter period. Off-site planting to aid screening if possible.	**Slight Adverse** Glimpsed views towards the carriageway and roundabout will potentially be available from upper storeys and throughout the winter period. Planting mitigation measures will help to reduce any adverse effects. Mitigation planting only providing sufficient screening upon maturity post year 15
Farmsteads and businesses	High	Farmsteads and businesses nearby benefit from mature, deciduous	**Moderate Adverse** Reduction in visual amenity as the signalisation of the junction	Mitigation planting to reduce light glare to farmsteads and businesses. Following the	**Slight Adverse** Views of the signalised junction will remain available

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation)
near A342/A3102 junction.		hedgerows and garden vegetation with the views opening up towards the junction	will be- clearly visible. The impact will be moderate-adverse due to the type and existing screening of the receptors.	establishment of the mitigation measures the impact will be reduced.-	but will not be out of character. Visual amenity will be altered but mitigation measures will help to integrate the Scheme and reduce adverse effects. Will remain as slight-adverse due to opening up of views in the winter months.
PRoWs	High	An extensive network of PRoW exists in and around the Scheme. Some of these will have to be closed with others being diverted.	**Large Adverse** Walking routes will be permanently altered, transforming the experience of the landscape and views thereby having an adverse effect on both landscape use and visual amenity.	Provide adequate mitigation in the form of hedgerow, tree, scrub, and woodland planting. Opportunity to design and establish new walking experiences. Re-establish PRoW links where possible Advance notification of construction works, and provision should be made to facilitate users of these routes. Potentially close or reroute during works. Where possible it is recommended that reinstatement of the original route is undertaken. The impact will be reduced due to the now established screening and other mitigation works.	**Moderate Adverse** Visual amenity will be altered but enhancement and mitigation measures would help to integrate the scheme and reduce the visual effects.
Sustrans National Cycle Route 4, Kennet and	High	The bypass of the cycle route will be adversely affected, particularly the views to the northern and	**Large Adverse** Reduction in visual amenity.	Provide appropriate mitigation planting and enhancement measures to improve the experience of the route.	**Moderate Adverse** The adverse effect on visual amenity will be minimised somewhat with mitigation

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation)
Avon Canal Route		southern sides of the Kennet and Avon Canal This will cause a permanent change in visual amenity but is not out of character for the area.		Identify and utilise opportunities to improve the part of the Cycle Route that will be affected. Mitigation measures will help to soften the impact and will reduce.	planting. However, the loss of the visual amenity cannot be adequately mitigated.
Sustrans National Cycle Route 403	High	The cycle route will be adversely affected where it meets the Scheme along Forest Land and through Lower Woodrow. As the Scheme will be permanently diverted.	**Large Adverse** Cycle way route will be permanently altered, and potentially adversely effecting visual amenity.	Provide appropriate mitigation planting and enhancement measures to improve the experience of the altered route. Advance notification of construction works, and provision should be made to facilitate users of these routes. Where possible it is recommended that reinstatement of the original route is undertaken. Mitigation measures will help to soften the impact and will reduce the impact-.	**Moderate Adverse** Landscape use will be permanently altered regarding the Cycle Route and accommodating the Scheme, with appropriate mitigation and enhancement measures this may minimise any moderate adverse effects. The adverse effect on visual amenity will be minimised somewhat with mitigation planting. However, the loss of the visual amenity cannot be adequately mitigated.
Lacock Conservation Area	High	Lacock Conservation Area may experience close, mid, and long-range views towards the Scheme, adversely effecting visual amenity in the operational period due to the predominantly deciduous nature of the intervening	**Moderate Adverse** Potential beneficial effect on landscape use for transient receptors with the improved road layout, particularly the roundabout. Adverse effect on visual amenity due to the availability of views	Hedgerow and hedgerow tree planting along Scheme where appropriate Woodland planting at a location, size, and scale appropriate. Identify and utilise opportunities to improve vegetative screening within Lacock Conservation Area	**Moderate Adverse** Landscape use will be permanently altered. With appropriate mitigation and enhancement measures any adverse effect on visual amenity will be minimised somewhat.

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation)
		vegetation unable to fully screen views. Use of the landscape directly south to Lacock Conservation Area may potentially be improved with the newly established roundabout.	and the sensitivity of the receptor.	using native/local provenance species. Mitigation measures will help to soften the impact and will reduce the impact.	
Bowden Hill Conservation Area	High	Despite Bowden Hill Conservation Area being a fair distance away from the Scheme, its elevation may afford long-range views may to the Scheme. Intervening vegetation is of a predominantly deciduous nature which will further open views to the Scheme in the winter period.	**Moderate Adverse** Adverse effect on visual amenity due to the availability of views, deciduous nature of intervening vegetation and the sensitivity of the receptor.	Existing intervening buildings and vegetation will aid screening. Wildflower seeding where appropriate Hedgerow and hedgerow tree planting along Scheme where appropriate, Woodland planting at a location, size, and scale appropriate. Integrate the engineering landform sensitively within the adjoining topography Identify and utilise opportunities to improve planting and habitat creation within the Conservation Area Mitigation measures will help to soften the impact and the distance from the scheme will by Year 15 reduce the impact.	**Moderate Adverse** The visual amenity will be permanently transformed however, with the mitigation and enhancement measure set in place this will be minimised as much as is practicable.
The Cotswolds AONB	High	Due to the elevated nature of the AONB the Scheme may be visible from certain vantage points in the	**Moderate Adverse** effect on visual amenity due to long-range views towards the Scheme.	Woodland planting at a location, size, and scale appropriate.	**Slight Adverse** The Scheme may be permanently visible from

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation)
		operational period. The intervening vegetation is of a predominantly deciduous nature which will allow views during the winter period.		Integrate the engineering landform with the adjoining topography. Identify and utilise opportunities to improve planting and habitat creation within the AONB. Mitigation measures will help to soften the impact and the distance from the scheme will by Year 15 reduce the impact.	certain vantage points however, any adverse effects on visual amenity will be minimised through the integration of the Scheme into the landscape particularly from year 15.
The North Wessex Downs AONB	High	Due to the elevated nature of the AONB the Scheme may be visible from certain vantage points in the operational period. The intervening vegetation is of a predominantly deciduous nature which will allow views during the winter period.	**Moderate Adverse** effect on visual amenity due to long-range views towards the Scheme.	Existing intervening buildings and vegetation will aid screening. Woodland planting at a location, size, and scale appropriate. Integrate the engineering landform sensitively with the adjoining topography. Identify and utilise opportunities to improve planting and habitat creation within the AONB. Mitigation measures will help to soften the impact and the distance from the scheme will by Year 15 reduce the impact.	**Slight Adverse** The Scheme may be permanently visible from certain vantage points however, any adverse effects on visual amenity will be minimised through the integration of the Scheme into the landscape particularly from year 15.
Spye Park grade II registered park and garden and SSSI	High	Visitors of Spye Park is approx. 140 m away from the extent of the Scheme and will have views towards the Scheme and its traffic.	**Moderate Adverse** effect on visual amenity over long distance.	Existing intervening buildings and vegetation will aid screening. Wildflower seeding where appropriate. Seeding to be respective of soil type and adjacent habitats.	**Moderate Adverse** With the implementation of mitigation and enhancement measures some of the adverse effects will be reduced through screening.

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation)
		Intervening buildings and vegetation may aid screening although this is of a predominantly deciduous nature.		Hedgerow and hedgerow tree planting along Scheme where appropriate Woodland planting at a location, size, and scale appropriate. Integrate the engineering landform sensitively within the adjoining topography. Mitigation measures once established will reduce the impact.	
Lacock Abbey grade II registered park and garden	High	Lacock Abbey is approx. 365 m away from the Scheme and will have mid to long-range views towards the Scheme and its traffic. Intervening buildings and vegetation will aid screening although this is of a deciduous nature thereby opening views in the winter period.	**Moderate Adverse** effect on visual amenity over mid to long-range distances.	Existing intervening buildings and vegetation will aid screening. Wildflower seeding where appropriate. Hedgerow planting along Scheme where appropriate, including hedgerow trees. Woodland planting at a location, size, and scale appropriate. Integrate the engineering landform sensitivity with the adjoining topography. Impact will be reduced due to distance and successful implementation of buffer mitigation measures as specified.	**Slight Adverse**. With the implementation of mitigation and enhancement measures any adverse effects of visual amenity will be minimised.
Ancient Woodland	High	An increase of views towards the Scheme may become available due to the required vegetation	**Moderate Adverse** effect on visual amenity over mid to long-range distances.	Existing intervening buildings and vegetation will aid screening. Wildflower seeding mix to be planted where appropriate. Seed mix to consider adjacent habitats.	**Slight Adverse** With the mitigation and enhancement measures put in place and matured the adverse effect on visual

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation)
		removal and the elevated nature of the Scheme. The Scheme area aligns with policy 16 of the JMNP which states “In accordance with current guidance a minimum buffer of at least 15 metres in width should be maintained between ancient woodland and any development boundary” therefore landscape use should be unaffected.		Hedgerow and hedgerow tree planting along Scheme where appropriate Woodland planting at a location, size, and scale appropriate. Integrate the engineering landform with the adjoining topography. Protect the vegetation within the ancient woodlands. Impact will be reduced to slight adverse due to distance and successful implementation of buffer mitigation measures as specified.	amenity will be reduced however, not completely eradicated due to the Scheme transforming the area permanently.
Listed Buildings	High	There are many Grade II and Grade II* Listed Buildings within the area. These will be particularly sensitive to the changes in view caused by the Scheme. The Listed Buildings are predominantly clustered around Lacock Conservation Area to the north and Semington to the south with a scattering throughout the study area.	**Moderate Adverse** Visual amenity shall be high-adverse affected for many, if not all, listed	The existing intervening buildings and vegetation will aid screening. Wildflower seeding where appropriate. Hedgerow and hedgerow tree planting along Scheme where appropriate Woodland planting at a location, size, and scale appropriate. Selected off-site planting to aid screening for listed buildings Integrate the engineering landform sensitively with the adjoining topography. Impact will be reduced following the implementation of mitigation	**Moderate Adverse** When the mitigation and enhancement measures matured any adverse effect on visual amenity shall be minimised. Potentially there are some glimpsed views particularly in the winter period and from the upper storeys.

Receptor	Value/ Sensitivity	Impacts (including receptor specific baseline information)	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation)
				measures, in particular strategic screening	

8.8. Potential mitigation measures

8.8.1. Detailed mitigation measures will be developed as part of the next stage of the Scheme design to ensure significant effects are avoided as far as practicably possible. General considerations are as follows:

- Vegetation removal should be kept to that necessary for the works and, where possible, new road alignments should be adjusted during design development to avoid mature trees and hedgerows.
- Vegetation removed should be replaced on a like for like basis where possible, suitable alternatives should be proposed in the case that the species cannot be matched.
- Good quality junction, road, viaduct, and associated infrastructure is essential to embed these features into the landscape and ensure that they do not dominate any view or appear out of place.
- Species rich grass mix to be planted on the embankments and any proposed verges along the route of the road.
- Well considered mitigation planting is important to provide adequate screening in appropriately sized banks of planting and avoid the introduction of uncharacteristic large blocks of woodland.
- Enhancement of the environment along the Scheme to improve the experience for residents, pedestrians, cyclists, and vehicle users.
- Ensure that that any proposed security fencing is low key and as unobtrusive as possible.
- Ensure that new hedgerows and tree-planting respect the historic grain of the landscape.
- Conserve the rural character of the footpaths and bridleways.
- Retain and make best use of existing vegetation.
- Prioritise the early re-establishment of vegetation within the highway boundary.
- Integrate the engineering landform with the adjoining topography.
- Design for maintenance, giving due consideration to the maintenance costs and implications, liabilities, and access arrangements for all landscape areas.
- Avoid loss or damage to landscape features (e.g., hedges, hedgerows, individual trees) where possible within the constraints of the design.
- Use native species of local provenance wherever possible; and when used, these species help to maintain the distinctive local types of vegetation. As well as choosing species that occur naturally in the soil type adjacent to the road.
- Plant species should be chosen so that they benefited local conservation benefits, integration with the landscape and provided driver interest.
- The planting should comply with and support landscape management strategies set by the local authority for the landscape character areas; and
- Proposed planting should provide visual interest and diversity.
- However, there is the potential for beneficial shaping of the proposed earthworks to integrate the Scheme into the existing terrain, which will entail the use of flowing slopes at a range of gradients, depending on the space available and the design intentions.

8.9. Further work

8.9.1. A photographic survey that aligns with current guidelines found in the GLVIA3 and Landscape Institute advice on visual representation “Visual Representation of Development Proposals” implemented on 17 September 2019 should be conducted as part of a full Landscape and Visual Impact Assessment.

8.9.2. A tree survey should be conducted by a qualified Arboriculturalist to identify all trees that are under Tree Preservation Orders (TPO) and those that should be protected including the proposal of protection measures.

8.9.3. Further consultation with relevant council officers and stakeholders will be undertaken at a later stage. This stakeholder consultation will seek to agree key viewpoints, requirements for visual representation and environmental design measures, as well as finalising appropriate study area extents. Sensitive receptors and viewpoints should be agreed with the appropriate Wiltshire Council Officers beforehand.

8.9.4. The Scheme has been assessed to this level in preparation for the Landscape and Visual Impact Assessment (LVIA) to be undertaken at a later stage.

8.10. Summary

8.10.1. The Melksham Bypass viaduct, and accommodation bridge will potentially be a noticeable feature in the landscape. The Scheme is aiming to replicate the existing character of roads in the area.

8.10.2. Due to the topography of the landscape, which is flat and low lying, this will ensure visibility of the Scheme during construction. While mitigation measures establish, they will reduce and soften the impact on the landscape which is likely be will be reduced to moderate adverse by operational Year 15 for the majority of the areas. Although mitigation will facilitate the ability of the Scheme to integrate there will be a permanent alteration to the landscape character. In addition, some of the structural elements will never be fully mitigated and will remain noticeable within the wider landscape character.

8.10.3. The severance and the rerouting of the PRoW will have a negative impact on the landscape. Mitigation measures will look at rerouting and screening sensitive views to help to facilitate their incorporation back into the landscape and reduce the visual effects. It is likely that this would be reduced to moderate adverse by Year 15, provided adequate mitigation and enhancement measures are adopted and implemented.

8.10.4. The impact on the Sustrans cycle route will likely be large adverse particularly to the northern and southern sides of the Kennet and Avon canal and where the Scheme meets Forest Lane. Enhancement measures will soften the impacts and the visual amenity is likely to reduce to moderate adverse by Year 15, as the loss of visual amenity cannot be adequately mitigated.

8.10.5. The conservation areas of Lacock and Bowerhill will also be impacted on by the construction works. Lacock benefits from intervening vegetation which partially screens views. Bowerhill will experience long range views as it is at a distance from the Scheme. Both areas are likely to remain moderate adverse at Year 15 due to the sensitivity of the landscape and the potential for glimpse views impacting on the sensitive receptors.

8.10.6. The AONB is elevated but at a distance from the Scheme. The Scheme will sever pockets of agricultural land and reduce the ability of the land to be used for agricultural purposes. The Scheme may be permanently visible from certain vantage points but due to the distance, combined with intervening screen vegetation the impact will reduce the impacts on the AONB to slight adverse by Year 15.

8.10.7. Impacts on Spye Park, Lacock Abbey and ancient woodland are likely to range from moderate to slight adverse by Year 15 due to the distance from the Scheme and the intervening screening from both vegetation and buildings.

8.10.8. The Scheme has the potential to cause slight to moderate adverse impacts by Year 15, with visual impacts for property receptors including, the southern edge of Lacock and Bowerhill, the eastern edge of Melksham, and nucleated settlements as well as isolated farmsteads surrounding the Scheme. Careful design and mitigation would be essential to avoid negative effects for these properties.

8.10.9. Overall, the impact on Landscape Character is expected to be moderate adverse at construction stage. Due to the nature and height of the construction work the impact will remain adverse following construction mitigation measures. The mature screen vegetation will help to integrate the Scheme into the landscape, but the impact will remain as moderate adverse at Year 15 as the Scheme has permanently altered the structure of the agricultural land. Infrastructure features such as the viaducts and bridges cannot be adequately mitigated due to their height, and will remain a noticeable feature within this low-lying landscape.

9. Geology and Soils

9.1. Introduction

9.1.1. This chapter discusses the potential impact and likely effects of the Scheme on geology and soils. It identifies the geology and soil study area, sets out the assessment methodologies, presents the baseline conditions and describes the likely impacts and effects. Design and mitigation measures which can be used to mitigate potential impacts are also provided.

9.1.2. This chapter assesses the following topics in accordance with the methodology set out in the Design Manual for Roads and Bridges (DMRB) series of LA guidance documents, in particular LA104: Environmental assessment and monitoring[117] and LA 109: Geology and Soils[118]:

- Effects on bedrock geology and superficial deposits, including geological designations and sensitive/valuable non-designated features;
- Effects on soil resources and potential loss of Best and Most Versatile (BMV) agricultural land and on soil resources; and
- Effects from contamination on human health, surface water and groundwater.

9.1.3. Effects on mineral deposits as a resource are provided in Chapter 12 (Materials and Waste). Effects associated with water quality are provided in Chapter 7 (Water Environment) and effects associated with landform are reported in Chapter 8 (Landscape and Visual). Impacts on commercial farming activities utilising the agricultural land are discussed in Chapter 13 (Population and Human Health).

9.2. Planning policy

9.2.1. This geology and soils assessment has been undertaken in accordance with the following policy, legislation and guidance.

National policy

National Planning Policy Framework 2021

9.2.2. Paragraph 174 of the National Planning Policy Framework (NPPF)[119] is of particular relevance to geological and soil conservation, stating that policies and decisions should contribute to and enhance the natural and local environment by 'protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan)' as well as recognising the 'economic and other benefits of the BMV agricultural land, and of trees and woodland.'

9.2.3. Paragraph 174 also states that plans should prevent new and existing development from contributing to, being put at an unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise polluting or land instability. Where significant development of agricultural land is demonstrated to be necessary, local planning authorities should seek to use areas of poorer quality land in preference to that of higher quality.

9.2.4. Paragraph 183 of the NPPF states that policies and decisions should ensure that a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination.

[117] DMRB, "Sustainability & Environment Appraisal LA104 Environmental assessment and monitoring," 2019.

[118] DMRB, "Sustainability & Environment Appraisal LA109 Geology and soils," 2019. [Online]. Available: https://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3/LA%20109%20Geology%20and%20soils-web.pdf. [Accessed 02 11 2020].

[119] Ministry of Housing, Communities and Local Government, "National Planning Policy Framework," 2021.

9.2.5. Building on the NPPF, Planning Practice Guidance (PPG) first published in 2014 and updated in 2021, provides the guiding principles on how planning can deal with contaminated land[120].

Local policy

Wiltshire Council – Wiltshire Core Strategy (Adopted 2015)

9.2.6. Core Policy 50: Biodiversity and Geodiversity[121]: The policy states that development proposals must demonstrate how they protect features of nature conservation and geological value as part of the design rationale. There is an expectation that such features shall be retained, buffered, and managed favourably in order to maintain their ecological value, connectivity and functionality in the long-term. Where it has been demonstrated that such features cannot be retained, removal or damage shall only be acceptable in circumstances where the anticipated impacts have been mitigated as far as possible and appropriate compensatory measures can be secured. .

Legislation

Environmental Protection Act 1990

9.2.7. Part 2A of the Environmental Protection Act (EPA) 1990[122] introduced a statutory regime for the identification and remediation of 'Contaminated Land'. It provides a statutory definition of 'Contaminated Land' based on significant harm or the likelihood of significant harm or significant pollution or significant possibility of such pollution of controlled waters (all groundwater, inland waters and estuaries, excluding water perched above the zone of saturation).

9.2.8. Local authorities are the primary regulators under the Part 2A regime, with a duty to identify whether the land in their area is 'Contaminated Land', although provision is made for consultation and co-ordination with the Environment Agency in situations when pollution of controlled waters is an issue.

The Water Resources Act 1991 (as amended)

9.2.9. The Water Resources Act[123] sets controls of pollution of water sources in Section III. It contains information about water quality objectives, powers to prevent and control pollution, and pollution offences.

Water Framework Directive 2015

9.2.10. The purpose of the WFD[124], as enacted by the Water Resources (Water Framework Directive) (England and Wales) Regulations[125], is to establish a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater. It requires that:

9.2.11. Environmental objectives should be set to ensure that good status of groundwater is achieved and that its deterioration is avoided. This includes that any upward sustaining trend in the concentration of a pollutant must be identified and reversed;

9.2.12. A good status of groundwater requires early action and stable long-term planning of protective measures, owing to the natural time lag in its formation and renewal; and

9.2.13. Monitoring programmes should cover monitoring of the chemical and quantitative status of groundwater.

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[120] Government UK, “Planning practice guidance,” 2016. [Online]. Available: https://www.gov.uk/government/collections/planning-practice-guidance.
[121] Wiltshire Council, “Wiltshire Core Strategy,” 2015.
[122] United Kingdom Government, “Environmental Protection Act,” 1990.
[123] United Kingdom Govenment Legislation, “The Water Resources Act,” 1991.
[124] DEFRA, “"Water Framework Directive",” 2015.
[125] United Kingdom Government, “Water Resources (Water Framework Directive) (England and Wales) Regulations,” 2017.

Guidance documents

Contaminated Land Statutory Guidance 2012

9.2.14. The principal objectives of the Part 2A regime are described in the Department for Environment, Food and Rural Affairs (DEFRA) Contaminated Land Statutory Guidance 2012[126], as follows:

- Identify and remove unacceptable risks to human health and the environment;
- Seek to ensure that contaminated land is made suitable for its current use; and
- Ensure that the burdens faced by individuals, companies and society as a whole are proportionate, manageable and compatible with the principles of sustainable development.

9.2.15. These three objectives underlie the 'suitable for use' approach to the assessment and remediation of 'land contamination'. This approach recognises that the risks presented by any given level of land contamination will vary greatly according to the use of the land and a wide range of other factors, such as the sensitivity of the underlying geology and the receptors which may be affected. The 'suitable for use' approach consists of three elements:

- Ensuring that land is suitable for its current use;
- Ensuring that land is made suitable for any new use; and
- Limiting requirements for remediation to the work necessary to prevent unacceptable risks to human health or the environment in relation to the current use or future use of the land.

DEFRA's Safeguarding our Soil – A Strategy for England 2009

9.2.16. Safeguarding our Soils – A Strategy for England[127] states that by 2030, DEFRA's vision is that all of England's soils will be managed sustainably and degradation threats are tackled successfully. Chapter 6 of the strategy states objectives for effective soil protection during construction and development are to:

- Ensure soil ecosystems services are fully valued in the planning process;
- Ensure appropriate consideration is given to the protection of good quality agricultural soils from development; and
- Encourage better management of soils through all stages of the construction process.

River Basin Management Plan 2015

9.2.17. The River Basin Management Plan (RBMP)[128] is designed to protect and improve the quality of the water environment. It includes consideration of the following topics:

9.2.18. Plans for the protection and improvement of the water environment;

- Future plans that may affect the infrastructure sector and its obligations;
- Development proposal considerations regarding the requirements of the RBMP; and
- Environmental permit applications.

Other guidance documents

9.2.19. The following guidance documents have been considered:

- British Standards (BS) BS8485+A1:2019 – Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings[129];

[126] DEFRA, "Contaminated Land Statutory Guidance," 2012.
[127] DEFRA, "Safeguarding our Soils – A Strategy for England," Defra, London, 2009.
[100] Environment Agency, "Part 1: Severn river basin district River basin management plan," 2015.
[129] British Standards, "BS 8485+A1:2019 – Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings," 2015.

- BS5930+A1:2020 – Code of practice for ground investigations[130];
- BS10175:2011+A2:2017 – Code of Practice for Investigation of Potentially Contaminated Sites[131];
- Construction Industry Research and Information Association (CIRIA) C681 Unexploded Ordnance (UXO) – A Guide for the Construction Industry[132];
- CIRIA C733 Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks[133];
- CIRIA C682 The Volatile Organic Contaminants Handbook[134];
- CIRIA C552 Contaminated Land Risk Assessment – A Guide to Good Practice[135];
- CIRIA C665 Assessing Risks Posed by Hazardous Ground Gases to Buildings[136];
- Contaminated Land: Applications in Real Environments – The Definition of Waste: Development Industry Code of Practice (DoWCoP)[137];
- DEFRA's Code of Practice for the Sustainable Use of Soils on Construction Sites[138];
- DEFRA's Safeguarding our Soils – A Strategy for England[12];
- Department of the Environment (DoE) Industry Profiles for previously developed land, Environment Agency[139];
- DMRB LA 104 Environmental Assessment and Monitoring[1];
- DMRB, LA 109 Geology and Soils[2];
- DMRB, LA 113 Road Drainage and the Water Environment[140];
- Environment Agency Report R&D66[141];
- Guiding Principles for Land Contamination (GPLC)[142];
- Land Contamination: Risk Management (LCRM)[143]; and
- Natural England's Technical Information Note 049 Agricultural Land Classification: protecting the best and most versatile agricultural land (TIN049)[144]

9.3. Study area and PEAR methodology

Study area

9.3.1. The Scheme includes the proposed route and the design extent encompassing anticipated land take for construction.

9.3.2. The study area for land contamination includes the Scheme footprint and land immediately beyond it to a distance of 500 m (off-site). This is considered appropriate for a linear road scheme for identifying historical and current potentially contaminative land uses, which may have resulted in contamination within the Scheme option, and the location of sensitive off-site receptors, which may be affected by the Scheme.

[130] British Standards, "BS 5930+A1:2020 – Code of practice for ground investigations," 2015.
[131] British Standards, "BS 10175:2011+A2:2017 – Code of Practice for Investigation of Potentially Contaminated Sites," 2017.
[132] CIRIA, "C681 Unexploded Ordnance (UXO) – A Guide for the Construction Industry," 2009.
[133] CIRIA , "C733 Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks," 2014.
[134] CIRIA , "C682 The Volatile Organic Contaminants Handbook," 2009.
[135] CIRIA, "Contaminated Land Risk Assessment – A Guide to Good Practice," 2001.
[136] CIRIA , "C665 Assessing Risks Posed by Hazardous Ground Gases to Buildings," 2007.
[137] CL:AIRE, "The Definition of Waste: Development Industry Code of Practice," 2011.
[138] DEFRA, "Construction Code of Practice for the Sustainable Use of Soils on Construction Sites," Defra, London, 2009a.
[139] Environment Agency, "DoE Industry Profiles for previously developed land," 1995.
[140] DMRB, "Sustainability & Environment Appraisal - LA 113 - Road drainage and the water environment," 2020.
[141] Environment Agency and NHBC, "Guidance for the Safe Development of Housing on Land Affected by Contamination," 2008.
[142] Environment Agency, "Guiding Principles for Land Contamination," 2010.
[143] Environment Agency, "Land Contamination: Risk Managment," Environment Agency, 05 June 2019. [Online]. Available: https://www.gov.uk/guidance/land-contamination-how-to-manage-the-risks.
[144] Natural England, "Technical Information Note 049. Agricultural Land Classification: protecting the best and most versatile agricultural land," 2012. [Online]. Available: http://publications.naturalengland.org.uk/publication/35012. [Accessed 09 03 2020].

9.3.3. The study area for agricultural land comprises that within the Scheme boundary, taking into account future dualling and ponds. This comprises approximately 140 ha of agricultural land and as the design is still developing, not all this land may be required for the Scheme.

9.3.4. The amount and location of additional temporary land-take, which will include compounds, haul roads and the creation of flood compensation areas (FCAs) is not known at this stage. Some of this temporary land acquisition, particularly for the FCAs, will be outside the Scheme.

Methodology

Agricultural land and soil

9.3.5. The assessment of agricultural land and soil will follow DMRB LA109 guidance for assessing impacts to agricultural soils. Section 3.6.1 of DMRB LA109 states that a soil resource and/or Agricultural Land Classification (ALC) survey should be undertaken to inform the EIA where data is incomplete. This will be carried out at a later stage.

9.3.6. Table 9-1 and Table 9-2 below are taken from DMRB guidance document LA 109[2].

9.3.7. Table 9-1 describes how to assign value (sensitivity) to soil receptors. An agricultural soil receptor can be assigned a sensitivity value based on its ALC grade. Best and Most Versatile (BMV) agricultural land comprises soils classified in the ALC system as Grade 1, 2 and Subgrade 3a.

9.3.8. Soils not within BMV agricultural land, nor within an area of recognised environmental/ ecological interest, can be allocated a higher sensitivity value where particular agricultural practices contribute to the quality and character of the environment or local economy. The applicability of his exception is not known at this stage as a site visit and/ or soil survey would be required to inform it.

9.3.9. Other potentially sensitive soils to be considered in the assessment include those supporting recognised sites of environmental/ecological interest.

Table 9-1 – Assigning receptor value (sensitivity) – agricultural land and soil

Assigning receptor value (sensitivity) Receptor value (sensitivity)	Description
Very high	Land in ALC Grades 1 & 2.
High	ALC Subgrade 3a.
Medium	ALC Subgrade 3b.
Low	ALC Grades 4 & 5.
Negligible	Previously developed land formerly in hard uses with little potential to return to agriculture.

9.3.10. Table 9-2 provides guidance on how to assign magnitude of impact to soils in the study area.

Table 9-2 – Assigning magnitude of impact – agricultural land and soil

Magnitude of impact	Typical description
Major	Physical removal or permanent sealing of >20ha of agricultural land.
Moderate	Physical removal or permanent sealing of 1ha - 20ha of agricultural land. Permanent loss/reduction of one or more soil function(s) and restriction to current or approved future use (e.g. through degradation, compaction, erosion of soil resource).

Magnitude of impact	Typical description
Minor	Temporary loss/reduction of one or more soil function(s) and restriction to current or approved future use (e.g. through degradation, compaction, erosion of soil resource).
Negligible	No discernible loss/reduction of soil function(s) that restrict current or approved future use or permanent sealing of <1ha.
No change	No changes are anticipated for the area.

9.3.11. The significance of effect on the agricultural soil is determined by a combination of the magnitude of the impact and the value (sensitivity) of each receptor. Table 9-3 below is a reproduction of Table 3.8.1 from DMRB LA104 [1] and presents the matrix for determining the significance of an effect. Consideration will be given in the assessment to influential factors which are listed below.

Table 9-3 – Assigning significance of effect – agricultural land and soil

	Magnitude of impact (degree of change)					
Value/ sensitivity		No change	Negligible	Minor	Moderate	Major
	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

9.3.12. The assessment of the significance of residual effects will consider possible mitigation measures.

9.3.13. In alignment with DMRB guidance, where two potential values of significance of effect are identified using the matrix in Table 9-3, professional judgement will be used to assign the value based on understanding of details of both the magnitude of impact and value of the receptor. For example, where a minor impact is identified in relation to a receptor of high sensitivity, professional judgement will be used to determine whether this results in a slight or moderate effect.

9.3.14. In general, moderate to very large effects are to be considered significant in terms of the EIA regulations.

Land contamination

9.3.15. The land contamination assessment has been undertaken using the methodology below and has been informed by the Preliminary Conceptual Site Model (PCSM) developed for the site in Section 9.4.49 to 9.4.50.

9.3.16. A risk rating has been provided for each potential contaminant linkage identified in the PCSM. The risk rating is informed by the definitions for classification of probability and consequence provided in

9.3.17. Table 9-4 and Table 9-5 based on guidance in CIRIA 552 Contaminated land risk assessment: a guide to good practice[145]. Note that this is not an impact assessment.

[145] CIRIA, “Contaminated land risk assessment: a guide to good practice, C552,” 2001b.

Table 9-4 - Risk estimation - classification of probability (CIRIA 552)

Classification	Definition of the probability of harm / pollution occurring
High Likelihood	The contaminant linkage exists and it is very likely to result in harm / pollution in the short term, and/or will almost inevitably result in harm / pollution in the long term, and/or there is current evidence of harm/pollution. Likelihood is defined as more likely than not and meets the definition of 'significant possibility' within Part 2A Contaminated Land Statutory Guidance.
Likely	The source, pathway and receptor exist for the contaminant linkage and it is probable that harm / pollution will occur. Circumstances are such that harm / pollution is not inevitable, but possible in the short term and likely over the long term. Likelihood is defined as reasonably possible and meets the definition of 'significant possibility' within Part 2A Contaminated Land Statutory Guidance.
Low Likelihood	The source, pathway and receptor exist and it is possible that harm / pollution could occur. Circumstances are such that harm/pollution is by no means certain in the long term and less likely in the short term.
Unlikely	The source, pathway and receptor exist for the contaminant linkage but it is improbable that harm / pollution will occur even in the long term.

Table 9-5 - Risk estimation - classification of consequence (CIRIA 552)

Classification	Definition of consequence
Human Health Receptors – Site end user or other sensitive receptor	
Severe	Acute damage to human health based on the effects on the critical human receptor. Concentrations of contaminants above appropriate site specific assessment criteria. Harm meets definition of 'significant harm' within Part 2A Contaminated Land Statutory Guidance.
Medium	Chronic damage to human health based on the effects on the critical human receptor. Concentrations of contaminants above appropriate site specific assessment criteria. Harm meets definition of 'significant harm' within Part 2A Contaminated Land Statutory Guidance.
Mild	No appreciable impact on human health based on the potential effects on the critical human receptor. Concentrations of contaminants above generic assessment criteria but below appropriate site specific assessment criteria.
Minor	No appreciable impact on human health based on the effects on the critical human receptor. Concentrations of contaminants below appropriate generic assessment criteria.
Human Health Receptors – Site construction workers	
Severe	Exposure to hazardous substances resulting in a reportable death, major injury, 3-day injury or illness/disease under RIDDOR.
Medium	Exposure to hazardous substances resulting in a dangerous occurrence reportable under RIDDOR. Exposure to hazardous substances resulting in exceedance of a workplace exposure limit.
Mild	Exposure to hazardous substances resulting in limited effects such as headache, dizziness, nausea. Exposures below the workplace exposure limits. Not reportable under RIDDOR.
Minor	Minor exposure to hazardous substance resulting in no appreciable ill health effects.
Controlled Water Receptors	
Severe	Pollution of a Principal Aquifer within a source protection zone or potable supply characterised by a breach of drinking water standards. Pollution of a

Classification	Definition of consequence
	surface water course characterised by a breach of an Environmental Quality Standard (EQS) at a statutory monitoring location or resulting in a change in General Quality Assessment (GQA) grade of river reach. Discharge of a List I or List II substance to groundwater. Pollution meets Part 2A Contaminated Land Statutory Guidance definition.
Medium	Pollution of a Principal Aquifer outside a source protection zone or a Secondary A Aquifer characterised by a breach of drinking water standards. Pollution of an industrial groundwater abstraction or irrigation supply that impairs its function. Substantial pollution but insufficient to result in a change in the GQA grade of river reach Pollution meets Part 2A Contaminated Land Statutory Guidance definition.
Mild	Low levels of pollution of a Principal Aquifer outside a source protection zone or an industrial abstraction, or pollution of a Secondary Aquifer. Low levels of pollution insufficient to result in a change in the GQA grade of river reach, pollution of a surface water course without a quality classification.
Minor	No appreciable pollution, or pollution of a low sensitivity receptor such as a non-aquifer or a surface water course without a quality classification

9.3.18. A sensitivity/value has been assigned to each receptor using the criteria detailed in Table 9-4 below. For human health receptors, DMRB guidance document LA 109[2] has been used to define the receptor value. To assess surface water and groundwater receptors, DMRB guidance document LA 113[25] for road drainage and the water environment has been applied.

Table 9-6 – Assigning receptor value (sensitivity) – land contamination

Receptor value (Sensitivity)	Description
Human Health	
Very High	Very high sensitivity land use such as residential or allotments.
High	High sensitivity land use such as public open space.
Medium	Medium sensitivity land use such as commercial or industrial.
Low	Low sensitivity land use such as highways and rail.
Negligible	Undeveloped surplus land / no sensitive land use proposed.
Groundwater	
Very High	Principal aquifer providing a regionally important resource and/or supporting a site protected under EC and UK legislation LA 113[25]. Groundwater locally supports Groundwater Dependant Terrestrial Ecosystems (GWDTE). Source Protection Zone (SPZ) 1.
High	Principal aquifer providing locally important resource or supporting a river ecosystem. Groundwater supports a GWDTE. SPZ 2.
Medium	Aquifer providing water for agricultural or industrial use with limited connection to surface water. SPZ 3.
Low	Unproductive strata.
Negligible	N/A

Receptor value (Sensitivity)	Description
Surface Water	
Very High	Watercourse having a Water Framework Directive (WFD) classification shown in a River Basin Management Plan (RBMP) and Q95 ≥ 1.0 m^3/s. Site protected/designated under European Commission (EC) or UK legislation (Special Area of Conservation, Special Protection Area (SPA), Site of Specific Scientific Interest (SSSI) Ramsar site, salmonid water) / Species protected by EC legislation LA 108[146].
High	Watercourse having a WFD classification shown in a RBMP and Q95 <1.0 m^3/s. Species protected under EC or UK legislation LA 108[31].
Medium	Watercourses not having a WFD classification shown in a RBMP and Q95 >0.001 m^3/s.
Low	Watercourses not having a WFD classification shown in a RBMP and Q95 ≤0.001 m^3/s.
Negligible	N/A

9.3.19. Following determination of the value/sensitivity of the receptors, the magnitude of potential impacts has been determined. The criteria for the assessment of impact magnitude is set out in Table 9-5. below, which is based on LA109[2].

Table 9-7 – Assigning magnitude of impact – land contamination

Magnitude of impact (change)	Description
Human Health	
Major	Significant contamination identified. Contamination levels significantly exceed background levels and relevant screening criteria with potential for significant harm to human health. Contamination heavily restricts future use of land.
Moderate	Contaminant concentrations exceed background levels and are in line with limits of relevant screening criteria. Significant contamination can be present. Control / remediation measures are required to reduce risks to human health / make land suitable for intended use.
Minor	Contaminant concentrations are below relevant screening. Significant contamination is unlikely with a low risk to human health. Best practice measures can be required to minimise risks to human health.
Negligible	Contaminant concentrations substantially below levels outlined in relevant screening criteria. No requirement for control measures to reduce risks to human health / make land suitable for intended use.
No change	Reported contaminant concentrations below background levels.
Groundwater	
Major adverse	Loss of, or extensive change to, an aquifer. Loss of regionally important water supply. Potential high risk of pollution to groundwater from routine runoff - risk score >250 (groundwater quality and runoff assessment).

[146] DMRB, "Sustainability & Environment Appraisal - Biodiversity LA 108," 2020.

Magnitude of impact (change)	Description
	Calculated risk of pollution from spillages ≥2% annually (spillage assessment). Loss of, or extensive change to GWDTE or baseflow contribution to protected surface water bodies. Reduction in water body WFD classification. Loss or significant damage to major structures through subsidence or similar effects.
Moderate adverse	Partial loss or change to an aquifer. Degradation of regionally important public water supply or loss of significant commercial/ industrial/ agricultural supplies. Potential medium risk of pollution to groundwater from routine runoff - risk score 150-250. Calculated risk of pollution from spillages ≥1% annually and <2% annually. Partial loss of the integrity of GWDTE. Contribution to reduction in water body WFD classification. Damage to major structures through subsidence or similar effects or loss of minor structures.
Minor adverse	Potential low risk of pollution to groundwater from routine runoff - risk score <150. Calculated risk of pollution from spillages ≥0.5% annually and <1% annually. Minor effects on an aquifer, GWDTEs, abstractions and structures.
Negligible	No measurable impact upon an aquifer and/or groundwater receptors and risk of pollution from spillages <0.5%.
Minor beneficial	Calculated reduction in existing spillage risk by 50% or more to an aquifer (when existing spillage risk <1% annually). Reduction of groundwater hazards to existing structures. Reductions in waterlogging and groundwater flooding.
Moderate beneficial	Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is >1% annually). Contribution to improvement in water body WFD classification. Improvement in water body catchment abstraction management Strategy (CAMS) (or equivalent) classification. Support to significant improvements in damaged GWDTE.
Major beneficial	Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring. Recharge of an aquifer. Improvement in water body WFD classification.
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.
Surface Water	
Major adverse	Failure of both acute-soluble and chronic-sediment related pollutants in the Highways England Water Risk Assessment Tool (HEWRAT) and compliance failure with Environmental Quality Standard (EQS) values. Calculated risk of pollution from a spillage ≥2% annually (spillage assessment). Loss or extensive change to a fishery. Loss of regionally important public water supply.

Magnitude of impact (change)	Description
	Loss or extensive change to a designated nature conservation site. Reduction in water body WFD classification.
Moderate adverse	Failure of both acute-soluble and chronic-sediment related pollutants in HEWRAT but compliance with EQS values. Calculated risk of pollution from spillages ≥1% annually and <2% annually. Partial loss in productivity of a fishery. Degradation of regionally important public water supply or loss of major commercial/industrial/agricultural supplies. Contribution to reduction in water body WFD classification.
Minor adverse	Failure of either acute soluble or chronic sediment related pollutants in HEWRAT. Calculated risk of pollution from spillages ≥0.5% annually and <1% annually. Minor effects on water supplies.
Negligible	No risk identified by HEWRAT (pass both acute-soluble and chronic-sediment related pollutants). Risk of pollution from spillages <0.5%.
Minor beneficial	HEWRAT assessment of either acute soluble or chronic-sediment related pollutants becomes pass from an existing site where the baseline was a fair condition. Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is <1% annually).
Moderate beneficial	HEWRAT assessment of both acute-soluble and chronic-sediment related pollutants becomes pass from an existing site where the baseline was a fair condition. Calculated reduction in existing spillage by 50% or more (when existing spillage risk >1% annually). Contribution to improvement in water body WFD classification.
Major beneficial	Removal of existing polluting discharge or removing the likelihood of polluting discharges occurring to a watercourse. Improvement in water body WFD classification.
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

9.3.20. The overall significance of land contamination effects is defined using the matrix presented in Table 9-6, as per LA 104[2], which describes the relationship between the value/sensitivity of the receptor and the magnitude (change) of the impact.

Table 9-8 – Assigning significance of effect – land contamination

		Magnitude of impact (degree of change)				
		No change	**Negligible**	**Minor**	**Moderate**	**Major**
Value/ sensitivity	**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

9.3.21. In alignment with DMRB guidance, where two potential values of significance of effect are identified using the matrix in Table 9-6, professional judgement has been used to assign the value based on understanding of details of both the magnitude of impact and value of the receptor. For example, where a minor impact is identified in relation to a receptor of high sensitivity, professional judgement has been used to determine whether this results in a slight or moderate effect.

9.3.22. Following the classification of an effect, a clear statement is made as to whether the effect is 'significant' or 'not significant'. As a general rule, moderate to very large effects are considered to be significant.

9.4. Assumptions and limitations

Agricultural land and soil

9.4.1. This is a preliminary assessment for the purposes of consultation based on the following data gathered to date:

- Information on soil types and ALC, from published maps and reports; and
- Extrapolation of likely ALC in unmapped areas, using published mapping.

9.4.2. The main limitation, at this stage, is lack of certainty of the likely ALC grade in unmapped areas. This can only be established by detailed soil survey which will be carried out at a later stage.

9.4.3. The final assessment will be reported within the Environmental Statement, taking into account consultation comments, further design details and the completion of soil/ALC land surveys.

Land contamination

9.4.4. A realistic assumption on ground conditions and impacts has been made, based on the data available at the time of reporting comprising information obtained from an Envirocheck Report and publicly available desk based/website data. Ground investigation has not been undertaken at this stage.

9.4.5. The detailed design will not be finalised until post consent, the likely ‘reasonably likely worse case’ impact from the route options has been assumed in the assessment and is sought to be mitigated.

9.4.6. For the assessment of effects associated with ground conditions and land contamination, the following assumptions have been made:

- Contamination is assumed to be present at all locations where potential sources have been identified in the study area;
- All contamination embedded mitigation has been implemented;
- Ground disturbance during the construction phase could occur anywhere within the Scheme;
- The assessment provides an initial indication of acute – short-term risks to construction and maintenance workers. Control measures to mitigate the risk of adverse health impacts to construction workers will be identified by risk assessments and will be incorporated into the CEMP; and,
- There will be areas used for the storage of materials, waste and containers during the construction and operational phase. Where storage/stockpiling of materials occurs, the material will stay within the Scheme boundary.

9.4.7. The final assessment will be reported within the Environmental Statement taking into account consultation comments, further design details and the further assessments detailed in section 9.9.

9.5. Consultation

9.5.1. No consultation has been undertaken to date. However, consultation with the following stakeholders will be undertaken in the next stage of the Scheme:

- Environmental Agency;
- Local Authority;
- Wiltshire Council; and
- Land owners.

9.6. Baseline conditions

9.6.1. This section provides a summary of the baseline soil and geology characteristics for the study area.

9.6.2. Baseline data has been obtained from publicly available sources and a site specific report obtained from Landmark, including:

- British Geological Survey (BGS) GeoIndex Onshore[147];
- MAGIC mapping database[148];
- Zetica online Unexploded Ordnance (UXO) risk map[149];
- The Coal Authority Interactive Map[150];
- The Environment Agency Flood Map for Planning[151];
- Envirocheck Report, Melksham[152];
- Soils of the Southern Cotswolds and surrounding country. Soil Survey of England and Wales, 1976[153];
- Met Office agro-climatic data[154]; and,

[147] British Geological Survey, “GeoIndex Onshore,” 2021. [Online]. Available: https://mapapps2.bgs.ac.uk/geoindex/home.html. [Accessed 02 11 2020].
[148] DEFRA, “Magic map application,” 2021. [Online]. Available: https://magic.defra.gov.uk/. [Accessed 02 11 2020].
[149] Zetica, “Zetica Unexploded Ordnance Risk Maps,” 2021. [Online]. Available: https://zeticauxo.com/downloads-and-resources/risk-maps/.
[150] The Coal Authority, “The Coal Authority Interactive Map,” 2020. [Online]. Available: https://mapapps2.bgs.ac.uk/coalauthority/home.html.
[151] Environment Agency, “Flood Map for Planning,” 2021. [Online]. Available: https://flood-map-for-planning.service.gov.uk/.
[152] Landmark Information Group, “Envirocheck Report, Site at Melksham, Ref: 5197936 - Melksham,” 2020.
[153] D. Findlay, “Soils of the Southern Cotswolds and surrounding country. Soil Survey of England and Wales.,” Harpenden, 1976.
[154] Met Office, “Climatological Data for Agricultural Land Classification,” 2021. [Online]. Available: http://publications.naturalengland.org.uk/category/5954148537204736.

- Provisional Agricultural Map of South West England[155].

Site history

9.6.3. The historical development of the study area has been determined using historical Ordnance Survey maps obtained as part of the Envirocheck report[37]. A summary of the historical development of the study area within 500 m is provided in Table 9-7. All on-site features are located within the Scheme design extent. All off-site features are those located within the study area defined as a 500 m buffer from the design extent.

Table 9-9 – Summary of historical development

Map date and scale	On site features	Off-site features
1888-1889 OS 1:10,560	The site predominantly comprises farmland. Forest Brook crosses the site at approximate chainage 6450 within the north-east of the site. The River Avon crosses the site at approximate chainage 8320 located within the north of the study area. The site of a Roman Road crosses the site at approximate chainage 8240. An earthwork is located on-site at approximate chainage 8200. A historical canal crosses the site within the north east of the study area at approximate chainage 7400. In the north-east, a road (present day Lower Woodrow Road) crosses the site at approximate chainage 6700. In the east a road (present day A3102 Sandridge Common) crosses the site orientated east/west at approximate chainage 5100. Clacker Brook crosses the site, flowing east to west within the south east of the study area at approximate chainages 3545 and 3190. A road, orientated east/west (present day A365), crosses the site at approximate chainage 2310 located within the south east of the study area. The Great Western Railway crosses the site at approximate	The study area predominantly comprises farmland and farm buildings. A road orientated approximately north/south, is located adjacent to the northern extent of the site (present day A350). Surface water drains within the north-east of the study area flow through farmland towards the River Avon. The farmstead of Queensfield is located 375 m south-west of the study area (south-west of approximate chainage 3700) located within the north-east of the study area. Several farms are located within the north-east of the study area including Frogditch Farm (70m west of approximate chainage 6800), Rotteridge Farm (10m west of approximate chainage 6550) and Hack Farm (35m west of approximate chainage 6330). Within the east of the study area, situated along the present day A3102, Manor Farm is located 80 m west (approximate chainage 5150) and Blackmore Farm is located 400 m west (approximate chainage 5000). Sandridge Park Estate and gardens are located adjacent to the east of the site along the present day A3102. A brickyard and plantation are located to the south of the road. Home Farm is located 300 m east at the northern extent of the estate. Several farms are located within the south-east of the study area including Snarlton Farm 440 m west of approximate chainage 5000, Loves Farm 135 m west of approximate

[155] DEFRA, "Agricultural Land Classification of England and Wales: Revised criteria for grading the quality of agricultural land.," 2021. [Online]. Available: http://publications.naturalengland.org.uk/publication/6257050620264448?category=5954148537204736.

Map date and scale	On site features	Off-site features
	chainage 1700 located within the south-east of the study area. The site is crossed by an unnamed east/west orientated road at chainage -350 in the north which leads to Newtown Farm, 140 m east. The Kennet and Avon Canal crosses the site at chainage -450, orientated east/west. The Semington Brook crosses the site at chainage -750, orientated east/west.	chainage 2300, Soho Farm 90 west of chainage 1500. Redstock Lane is located approximately 45 m east of the study area (east of approximate chainage 3300). The Great Western Railway continues east and west within the south/south east of the study area. A canal (Kennet and Avon Canal), orientated east/ west is located adjacent to the study area (south east of approximate chainage 1600). Within the south of the study area the Wiltshire and Berkshire Canal is located 400 m west of the study area (west of approximate chainage 0). The canal is orientated in a north/south direction. A road (present day High Street/old A350) is located 430 m west of the study area (west of approximate chainage 0), orientated in a north/south direction. Newtown Farm is located within the study area, 140 m east of the site at chainage -350. The town of Semington is located within the study area, 350 m west of the site. Manor Farm and Church Farm are located within the study area, 250 m west at chainage -800 in the town of Semington. Littleton Green Farm and Littleton Wood Farm are located within the study area, 400 m east of chainage -1000. Stranger's Corner Brickworks are located within the study area, 250 m south of chainage -1190.
1901 OS 1:10,560	No significant change.	An isolated pond is located 45 m west of the study area at approximate chainage 4750. Church Farm, 250 m west, is not present
1925/1926 OS 1:10,560	No significant change.	Allotments are located at the northern extent of the study area.
1942 1:10,560	No significant change.	The Wiltshire and Berkshire Canal is shown as disused.
1947 Aerial 1:10,560	No significant change.	Within the south of the study an area at Bowerhill warehouses and a hospital are located approximately 150 m to 350

Map date and scale	On site features	Off-site features
		m north / west / north-west of the study area.
1961 1:10,000	No significant change.	The Wiltshire and Berkshire Canal is marked as “old canal” and is partially infilled.
1975 1:10,000	The Great Western Railway is dismantled. The A361 road, orientated east/west is located at the southern extent of the site at chainage -1190.	A sewage works is located approximately 90 m north of the study area (west of chainage 2700 within the north of the study area). A covered reservoir is located approximately 145 m east of site at Sandridge Park. Manor Farm, 80 m west, has expanded. The Great Western Railway to the east and west is dismantled. The warehouses and hospital at Bowerhill are partially dismantled. The southern section of the Wiltshire and Berkshire Canal, directly west of the study area) is indicated to remain open and water bearing. The A361 road, continues to the east and west of the site at chainage -1190.
1988 OS 1:10000 (No coverage for the north of the option)	No significant change.	Manor Farm, 80 m west, has expanded further. Residential development has occurred at Bowerhill; the previous hospital is not present.
2000 1:10,000	No significant change.	Further residential development at Bowerhill located adjacent to the north of the study area; partially developed over the route of the former railway.
2006 1:10,000	The present day A350 road, orientated north/south is present at the south-western extent of the site. A bridge carries the Kennet and Avon Canal over the road at chainage -350; the road is situated within a cutting at this point. A bridge crosses the Semington Brook at chainage 750; the A350 is on embankment between the river and the junction with the A361 at the southern extent.	The former GWR railway is labelled as a track. The present day A350 road to the west of the study area continues north/south from the site and is constructed on an embankment. Factories and warehouses are present adjacent to the north-west of the site, adjacent to the A350.
2020 1:10,000	No significant change.	Further warehouses are present adjacent to the north west of the site, adjacent to the A350. A helicopter station and airfield are located 70 m west of the site.

Geology

9.6.4. The BGS GeoIndex[32] indicates that there are no known areas of mapped artificial ground present within the study area. However artificial ground is anticipated to be present associated with the historical development of the study area including the construction of roads, former railways and canals.

9.6.5. According to the BGS GeoIndex, superficial deposits are present across the majority of the Scheme associated but are not present within sections of the Scheme between chainage 500 to 1000 and 3500 to 640. Alluvium comprising clay, silt, sand and gravel is located within the north of the Scheme and study area, within the vicinity of the River Avon and the south-east of the study area within the area surrounding Clackers Brook.

9.6.6. River Terrace Deposits, typically comprising sand and gravel, are located within the south of the Scheme and study area, generally to the north-west of the A350, and within the north of the study area within the vicinity of Queenfield Farm (375m west). The River Terrace Deposits are located adjacent to areas of Alluvium associated with the River Avon.

9.6.7. Head Deposits comprising clay and silt are located within the north-east of the Scheme and study area to the north-east and south of Forest Farm. Head Deposits are also located within the south-east of the study area, to the north-east and east of Bowerhill (100m north) and east of Redstocks (140m south east). Within the south of the study area Head Deposits are located to the east and west of the A350.

9.6.8. The bedrock geology underlying the study area comprises the Kellaways Formation and Oxford Clay Formation (undifferentiated), typically consisting of mudstone, siltstone and sandstone.

Mining activity and quarrying

9.6.9. The Coal Authority interactive map[35] indicates that the study area is not located within an area affected by historical, current or future coal mining.

9.6.10. The Envirocheck Report[37] indicates that there are no BGS recorded mineral sites, or other mining related features, within 500m of the Scheme.

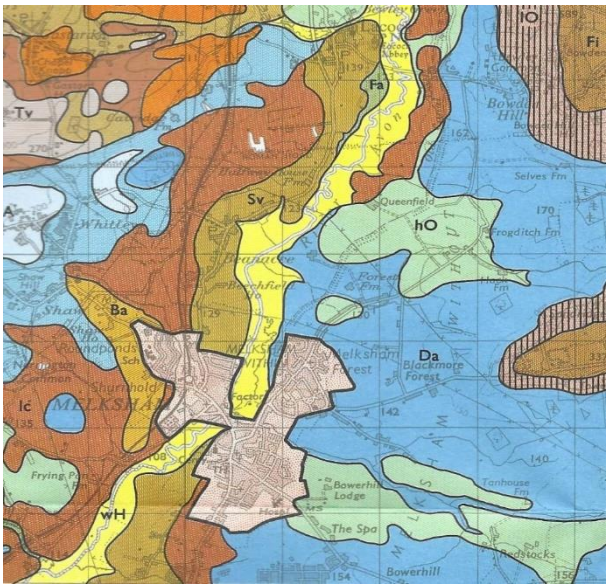
Soils

9.6.11. There is a close and predictable relationship between geology, soil and ALC in the study area.

9.6.12. Geological information is taken from the BGS GeoIndex[32]. Most of the land within the Scheme and Study Area is underlain by mudstone of the Oxford Clay Formation which is locally overlain by more loamy, locally derived drift deposits, or Head. Above the floodplain of the River Avon there are sand and gravel River Terrace Deposits, while the floodplain itself consists of clayey and silty clay loam alluvium.

The soils of the study area are shown on the 1:630,360 scale map of the Southern Cotswolds[38], reproduced in part, under licence, in Figure 9-1. This map has been used to produce the soils summary in the sections below.

Figure 9-1 - Soils of the study area



9.6.13. The majority of the land contains the Denchworth series of slowly permeable, seasonally waterlogged clay soils passing to Oxford Clay at depth. Where there are Head Deposits there is the Holwell series (now renamed Wickham series) of slowly permeable, seasonally waterlogged clay loam over clay soils passing to Oxford Clay at depth.

9.6.14. On the gravel terraces there are the Sutton and Isle Abbotts series. Both of these are permeable and free draining in the upper horizons, but in the Isle Abbotts the underlying Oxford Clay is close enough to the surface to cause slight seasonal waterlogging.

9.6.15. The Alluvium of the Avon floodplain is variable in texture and degree of waterlogging, ranging from seasonally waterlogged silty clay of the Fladbury series to the clay loam textured Wyre series which has only slight seasonal waterlogging. The floodplain is in Flood Zone 3 and frequently floods, mainly in winter.

Climate

9.6.16. The Met Office agro-climatic data[39] gives the average annual rainfall of the study area as around 700 mm. The number of field capacity days (FCD) when the soil is fully charged with moisture is 165 to 170.

9.6.17. The moisture deficit under the ALC reference crops is 107 mm for wheat and 100 mm for potatoes.

Agricultural land classification

9.6.18. The Provisional Agricultural Map of South West England[40] shows most of the study area to be in Grade 3 (good to moderate quality) with Grade 2 (very good) on the terraces and Grade 4 (poor) on the Avon's floodplain. This "provisional" map uses the pre 1988 ALC system which did not subdivide Grade 3 into Subgrades 3a (good quality) and 3b (moderate quality). Land is Subgrades 3a and better is defined as best and most versatile (BMV).

9.6.19. Much of the area around Melksham has undergone a detailed soil survey and ALC assessment using Defra's post-1988 classification[40] and this is available on the MAGIC map application website[33] and reproduced in Figure 9.1, Volume 3.

9.6.20. The existing detailed post-1988 ALC maps show a clear relationship between ALC grade and soils. The Denchworth series is in 3b and the Holwell (Wickham) series is in 3a. The terrace soils are in Grade 2 and the floodplain is in 3b.

9.6.21. On the basis of this relationship, it is possible to extrapolate the ALC grading to the unmapped areas, using the Southern Cotswolds soil map.

9.6.22. Denchworth soils, being seasonally waterlogged (Wetness Class III to IV), with clay or heavy clay loam topsoils, cannot be better than Subgrade 3b, where the number of FCD is 165 to 170.

9.6.23. For the Holwell (Wickham) series there is an analysed soil profile close to the study area at Queenfield Farm (ST921666) with a medium clay loam topsoil, which for a soil in Wetness Class III, puts it in Subgrade 3a.

9.6.24. The Sutton and Isle Abbotts soils on the terraces carry sufficient available water through the growing season (typically 125 mm for winter wheat and 105 mm for potatoes), for drought not to restrict yields of these reference crops. This confirms the Grade 2 classification of these soils.

9.6.25. On the floodplain, detailed flood records are not available but the Flood Zone 3 classification, archived news reports of flooding and the dominance of permanent grass indicate that this land is not better than Subgrade 3b.

9.6.26. The published and extrapolated ALC of the study area is illustrated in Figure 9.1, Volume 3. This shows that within the study area, approximately 80 ha (57%) are Subgrade 3b, 46 ha (32%) are Subgrade 3a and 14 ha (11%) are Grade 2.

9.6.27. Therefore, 60 ha (43%) of the land within the study area is assessed as BMV quality, which exceeds the 20 ha threshold and Natural England will be required to be a consultee for the Scheme.

Hydrogeology

9.6.28. The MAGIC online environmental database[33] indicates the superficial Alluvium and River Terrace Deposits are both classified as secondary A aquifers. The superficial Head Deposits are classified as a secondary undifferentiated aquifer. The bedrock Kellaways Formation and Oxford Clay Formation are both classified as unproductive strata.

9.6.29. The study area is not located within a groundwater Source Protection Zone (SPZ).

9.6.30. The Envirocheck Report[37] indicates that there are two active licensed groundwater abstractions located within the study area.

9.6.31. The first groundwater abstraction is located adjacent to the west of the site (west of approximate chainage 8550) within the north of the study area. The groundwater abstraction is operated by A M Burnett-Brown for general farming and domestic purposes. The permit start date is listed as the 24 March 1966. No further details are provided.

9.6.32. The second groundwater abstraction is located within the north of the study area approximately 310 m west of the Scheme at chainage 9000. The groundwater abstraction is operated by Mr A F Williams for horticulture and nurseries direct spray irrigation purposes. The permit start date is listed as the 24 March 1966. No further details are provided.

9.6.33. Private unlicenced groundwater abstractions may be present within the study area. The local authority will be consulted in the next stage of the Scheme to obtain records on private abstractions within the Study Area.

Hydrology

9.6.34. The River Avon crosses the site at approximate chainage 8320 located within the north of the study area. Forest Brook crosses the site at approximate chainage 6450 within the north-east of the study area.

9.6.35. Clackers Brook crosses the site, flowing east to west within the south-east of the study area at approximate chainages 3545 and 3190.

9.6.36. A canal (Kennet and Avon Canal), orientated east/ west is located on the site at chainage -450 and continues parallel to the site, 500 m south, between chainages 0 and 2000. The canal is within 150 m south of the site between chainages 1500 and 1700.

9.6.37. The Semington Brook crosses the site east/west at chainage -750.

9.6.38. The Envirocheck Report[37] indicates that there is one active licensed surface water abstraction located within the study area. The abstraction is located within the east of the study area (approximately 370m east of the Scheme at chainage 5900). The abstraction is operated for the conservation / rearing of wildfowl. The source of the abstraction is from an unnamed tributary of the River Avon. No further details are provided.

9.6.39. Private unlicensed surface water abstractions may be present within the study area.

Flood risk

9.6.40. The Environment Agency Flood Map for Planning[36] indicates that the majority of the study area is located within Flood Zone 1 (>0.1% chance of flooding within any given year).

9.6.41. A Flood Zone 2 (0.1-1% chance of flooding within any given year) and a Flood Zone 3 (>1% chance of flooding within any given year) are located within the north and north-east of the site associated with the River Avon and its tributaries. Flood Zones 2 and 3 are also located within the south-east of the site associated with Clackers Brook.

Discharge consents

9.6.42. The Envirocheck Report indicates that there are 18 active discharge consents located within the study area. The nearest discharge consent is located on-site within the east of the study area (east of Forest) at Hack Farm for agricultural and surface trade discharge purposes. Discharge consent details are provided in Table 9-10.

Table 9-10 – Summary of discharge consents

Distance anddDirection	Operator and location	Discharge type	Receiving water	Effective date
On-site	Hack Farm	Trade discharge – agricultural and surface	Tributary of River Avon	16/08/1993
Adjacent to the west	Mr F P J Watts	Sewage discharges – final/treated effluent	Un-named stream	05/07/1991
Adjacent to the east	Hack Farm	Sewage discharges – final/treated effluent	Forest Brook	16/08/1993
40m south east	Carnation Lane	Sewage discharges – final/treated effluent	Tributary of the Clackers Brook	14/05/2019
70m south east	Vernons Farm	Sewage discharges – final/treated effluent	Tributary of Semington Brook	31/05/1967
100 m south-west	Greenacre Caravan Park	Sewage discharges –	Tributary of the	02/07/2009

Distance anddDirection	Operator and location	Discharge type	Receiving water	Effective date
		final/treated effluent	Semington Brook	
110 m east	Wessex Water Services Ltd, Thingley waste water treatment works, Coppershell Lane	Sewage discharges – sewage treatment works storm overflow / storm tank	Byde Mill Brook / River Avon	01/01/2017
110 m east	Wessex Water Services Ltd, Thingley waste water treatment works, Coppershell Lane	Sewage discharges – final/treated effluent	Byde Mill Brook	23/10/1992
140 m west	416b Devizes Road	Sewage discharges – final/treated effluent	Land / soakaway	24/06/1992
140m west	450 Bowerhill Lane	Sewage discharges – final/treated effluent	Tributary of the Clackers Brook	03/06/2005
190m east	The Old Chapel	Sewage discharges – final/treated effluent	Soakaway and tributary of the Clackers Brook	Issued 16/08/1995
200 m east	Messrs P W Doel & Sons, Hack Farm	Trade discharge – agricultural and surface	Tributary of River Avon	16/08/1993
210 m east	Wessex Water Services Ltd, Lacock waste water treatment works, Lacock.	Sewage discharges – final/treated effluent	River Avon	01/01/2017
210 m east	Wessex Water Services Ltd, Lacock waste water treatment works, Lacock	Sewage discharges – sewage treatment works storm overflow / storm tank	River Avon	01/01/2017
230 m north	Gwf Nutrition Limited, Bowerhill Industrial Estate	Trade effluent discharge – site drainage	Berrfield Stream	11/10/1993
300m west	Wessex Water Services Ltd, Hampton Meadows Pumping Station	Sewage discharges, pumping station	Tributary of the Clackers Brook	30/11/2009
300 m south-west	Westerleigh Group	Sewage discharges – final/treated effluent	trade treated sewage to soakaway	04/02/2007
410 m west	Esse Quam Videri Limited, 541 Outmarsh, Semington	Sewage discharges –	Groundwaters via soakaway	14/12/2008

Distance anddDirection	Operator and location	Discharge type	Receiving water	Effective date
		final/treated effluent		

Ecologically important sites

9.6.43. The MAGIC dataset[33] indicates that there are no statutory environmental designations within the study area.

Contaminated land

Landfills and waste management sites

9.6.44. The Envirocheck Report[37] indicates that there are two historical landfills located within the study area. The Brickyard Plantation landfill is located 170 m east of the Scheme at chainage 5100, adjacent to the south of the A3102, west of Sandridge Common). Old Brickfield Strangers Corner Farm landfill is located 380 m south of the Scheme at chainage -1190.

9.6.45. The Brickyard Plantation landfill was operational between the 1 January 1977 and the 1 January 1984 with deposited waste including inert, industrial and commercial waste. The licence holder is listed as the Bath Waste Disposal Services Limited.

9.6.46. Old Brickfield Strangers Corner Farm's first recorded input was 1962 and it received household, commercial and industrial non-hazardous waste; the closure date is not available.

9.6.47. There is one active licensed waste management facility within the study area[37]. The waste management facility is located within the south of the study area (approximately 100m north east of the site) and is listed as a household, commercial and industrial transfer station operated by Ringway Infrastructure Services Limited. The license status is listed as issued.

Fuel stations

9.6.48. According to the Envirocheck Report[37] there is one fuel station located within the study area. The fuel station (Turnpike Garage) is located off the A365 260 m east of the Scheme at chainage 2300.

Pollution incidents

9.6.49. The Envirocheck Report[37] indicates that there is one recorded historical pollution incident located within the study area. There are no recorded pollution incidents within 500 m of the Scheme.

Unexploded ordnance

9.6.50. The Zetica online map[34] provides a preliminary indication of the likely risk of air dropped World War 2 unexploded ordnance to be present on the site based on historical bomb survey records and historical targets. The map indicates that the study area has a low risk of encountering unexploded ordnance (UXO). A low risk is defined by Zetica as having a '1 bomb impact per acre or less'.

Preliminary conceptual site model

9.6.51. A preliminary conceptual site model (PCSM) has been prepared for the Scheme. The PCSM identifies the potential or known sources of contamination, receptors and pathways between the two. Where all three are present or are considered likely to be present (source-pathway-receptor linkage), they are called a potential contaminant linkage (PCL).

9.6.52. A summary of potential contamination sources in provided in Table 9-11. Potential pathways and receptors, including receptor value identified, are provided in Table 9-12 and are based on LA109 guidance [2].

9.6.53. Definitions for the classification of probability and consequence in relation to contamination are provided in Table 9-4 and Table 9-5 above based on guidance in CIRIA 552[30]. The PCSM and contamination risk assessment are provided in Table 9-11 and have been used to inform the impact assessment.

Potential sources of contamination

Table 9-11 – Potential contamination sources

Location	Potential source of contamination	Contaminants of concern
On-site	Made Ground comprising localised residual contamination from construction of existing roads (including Lower Woodrow Road, the A3102, A365 and A350) and associated infrastructure.	A range of inorganic and organic contaminants within Made Ground including asbestos. Fuels and oils attributed to spills from vehicles on the roads included within the site boundary, plus exhaust particulates.
	Made Ground of unknown provenance used to infill the former historical canal at approximate chainage 7400 and the historical earthwork at approximate chainage 8200.	Range of inorganic and organic contaminants including metals, hydrocarbons, PAHs and asbestos.
	Made Ground associated with the former Great Western Railway at approximate chainage 1700.	Range of inorganic and organic contaminants including metals, hydrocarbons, PAHs and asbestos.
	Agricultural activities including localised spills/leaks of oils from farm machinery, borrow pits and animal burial.	Contamination risk from herbicides, pesticides, silage, effluent, and fuel oils. Risk of inorganic and organic contamination including metals and hydrocarbons, asbestos, etc.
	Made Ground associated with the construction of the Kennet and Avon Canal	Range of inorganic and organic contaminants including metals, hydrocarbons, PAHs and asbestos.
Off-site	Made Ground comprising localised residual contamination from construction of existing roads (including Lower Woodrow Road, the A3102, A365 and A350) and associated infrastructure.	A range of inorganic and organic contaminants within Made Ground including asbestos. Fuels and oils attributed to spills from vehicles on the roads included within the study area, plus exhaust particulates.
	Made Ground associated with the adjacent sections of the former Great Western Railway.	Range of inorganic and organic contaminants including metals, hydrocarbons, PAHs and asbestos.
	Made Ground associated with the adjacent off-site historical landfills: Brickyard Plantation landfill located 170m east of chainage 5100; Old Brickfield Strangers Corner Farm located 380 m south of chainage -1190	Range of inorganic and organic contaminants including metals, hydrocarbons, PAHs, asbestos and ground gases.

Location	Potential source of contamination	Contaminants of concern
	Made Ground of unknown provenance used to partly infill the former Wiltshire and Berkshire Canal located 400m west of the site.	Range of inorganic and organic contaminants including metals, hydrocarbons, PAHs, asbestos and ground gases.
	Made Ground associated with the construction of the Kennet and Avon Canal located adjacent to the south east of the site.	Range of inorganic and organic contaminants including metals, hydrocarbons, PAHs and asbestos.
	Sewage works located 90m west of the site.	Potential contamination may comprise metals, inorganic contaminants, fuels and oils, PCBs, treatment chemicals, and a potential for hazard gas generation from sludges (as well as sanitary waste).
	Potentially contaminated groundwater associated with off-site historical industry (farming).	A range of contaminants including ammonia, inorganics, pesticides, herbicides, metals, hydrocarbons and PAHs.
	Surface water and road run-off from existing roads (including Lower Woodrow Road, the A3102, A365 and A350).	Range of inorganic and organic contaminants including metals, hydrocarbons and PAHs.
	Agricultural activities including localised spills/leaks of oils from farm machinery, borrow pits and animal burial	Contamination risk from herbicides, pesticides, silage, effluent, and fuel oils. Risk of inorganic and organic contamination including ammonia, nitrates, metals and hydrocarbons, asbestos, etc.
	Turnpike Garage petrol station located 260 m east of the Scheme at chainage 2300	A range of contaminants including heavy metals, hydrocarbons and PAHs.

Potential receptors and pathways

Table 9-12 – Potential receptors, receptor value and exposure pathways

Receptor Group	Receptor	Receptor Value (sensitivity)	Principal Contaminant Migration Pathways
Human Health (on-site)	Scheme workers and Construction and maintenance workers of current roads	Low	Dermal contact with and ingestion of contaminants in soils, soil-derived dusts and water; and Inhalation of soil-derived dust, fibres, gas and vapours.
	Pedestrians accessing existing roads, footpaths, canal towpath and public rights of way	Low	
	Current road users	Low	
	Users of the new road Scheme	Low	

Receptor Group	Receptor	Receptor Value (sensitivity)	Principal Contaminant Migration Pathways
	Farmers and workers on agricultural land	Medium	
Human Health (off-site)	Residents in adjacent properties and users of adjacent commercial / industrial premises	Very high	Dermal contact with and ingestion of contaminants in soil-derived dusts and water that may have migrated off-site; and Inhalation of soil-derived dust, fibres, gas and vapours which may have migrated off-site.
	Pedestrians accessing surrounding roads, footpaths and public rights of way	Low	
	Farmers and workers on agricultural land	Medium	
Controlled Waters: Groundwater (on-site and off-site)	Groundwater in secondary A superficial aquifers (Alluvium and River Terrace Deposits)	Medium	Leaching of contaminants in soil to groundwater in underlying aquifers; and Migration of contaminated water through preferential pathways such as underground services, pipes and granular material to groundwater in underlying aquifers.
	Groundwater in secondary superficial undifferentiated aquifer (Head Deposits)	Low	
Controlled Waters: Surface waters (on-site)	River Avon, Forest Brook, Clacker Brook and surface water drains	High	Lateral migration of contaminated groundwater with discharge to surface watercourses; and Discharge of contaminants entrained in groundwater and, or surface water run-off followed by overland flow and discharge.
Controlled Waters: Surface waters (off-site)	River Avon, Forest Brook, Clacker Brook, the Kennet and Avon Canal, the Semington Brook and surface water drains	High	Lateral migration of contaminated groundwater with discharge to surface watercourses as base flow; and Discharge of contaminants entrained in groundwater and/or surface water run-off followed by overland flow and discharge.

Table 9-13 - Conceptual site model

Source	Receptor		Pathway	Potential Consequence	Probability	Risk	Comment
On-site: Made Ground comprising localised residual contamination from construction of existing roads and spills/leaks from vehicles on existing roads (including Lower Woodrow Road, the A3102, A365 and A350) and associated infrastructure. Made Ground of unknown provenance used to infill former historical canal and the historical earthwork. Made Ground associated with the construction of the Kennet and Avon Canal. Made Ground associated with the former Great Western Railway.	Human health: On-site	Scheme workers and Construction and maintenance workers of current roads	Dermal contact with and ingestion of contaminants in soils, soil-derived dusts and water. Inhalation of contaminants in soil, soil-derived dust, fibres, gas and vapours.	Medium	Unlikely	Low	The site is predominantly rural. Review of historical plans indicates that there has not been significant historical industrial activity on the site. There will be short term exposure of soils during construction although best practice site management procedures are likely to be implemented which will minimise short term exposure risk. It is assumed that users of the existing roads are likely to be transient. Post construction works, the site will comprise hardstanding road surfaces minimising potential for end users to come into direct contact with soils or for dust to be generated. Ground gases are unlikely to be a significant concern as no potential sources of ground gas have been identified and enclosed or habitable structures are not proposed as part of the Scheme. Infrastructure, such as drainage channels, is likely to be vented. Future maintenance of the Scheme may require localised excavation with potential for workers to come into direct contact with soils or inhale soil derived dusts. This work is likely to be short term and infrequent. Works will be risk assessed and best practice controls are likely to be used (e.g. gloves, and
		Pedestrians accessing existing roads, footpaths and public rights of way		Medium	Unlikely	Low	
		Current road users		Medium	Unlikely	Low	
		Users of the new road Scheme		Medium	Unlikely	Low	
		Farmers and workers on agricultural land		Medium	Unlikely	Low	

Source	Receptor		Pathway	Potential Consequence	Probability	Risk	Comment
Agricultural activities including localised spills/leaks of oils from farm machinery, borrow pits, animal burial pits and infilling of land, ponds and depressions for drainage improvement works. *A range of inorganic and organic contaminants including ammonia, metals, hydrocarbons, PAHs, herbicides, pesticides and asbestos.*							protective clothing) minimising potential for exposure.
	Human health: Off-site	Residents in adjacent properties and users of adjacent commercial / industrial premises	Dermal contact with and ingestion of contaminants in soil-derived dusts and water that may have migrated off-site Inhalation of soil-derived dust, fibres, gas and vapours which may have migrated off-site.	Medium	Unlikely	Low	The current study area condition is predominantly rural with soils bound beneath grass / vegetation / crops. Following the construction of the Scheme ground cover at the site will comprise hardstanding with grassed verges and areas of landscaping. There will be minimal areas of exposed bare soil. Therefore it is unlikely that off-site human receptors will be come into direct contact / ingest potential contaminants in soil that has been blown off-site. Ground gas, if present within the Scheme boundary, will migrate laterally beneath hardstanding before likely dissipating to atmosphere through adjacent landscaped areas such as verges. Therefore, it is unlikely that lateral migration to off-site residential and commercial properties would occur.
		Pedestrians accessing surrounding roads, footpaths and public rights of way		Medium	Unlikely	Low	
		Farmers and workers on agricultural land		Medium	Unlikely	Low	
	Controlled Waters: ground-water	Groundwater in secondary A superficial aquifers (Alluvium and River Terrace Deposits)	Leaching of contaminants in soil to groundwater in underlying aquifers	Medium	Low Likelihood	Moderate /Low	The Scheme and study area is underlain by superficial strata comprising Alluvium, River Terrace Deposits and / or Glacial Head Deposits. These units are generally present in the vicinity of watercourses. Superficial strata are absent across the majority of the remainder of the study area.
			Migration of contaminated water through preferential pathways such as underground	Medium	Low Likelihood	Moderate /Low	

Source	Receptor		Pathway	Potential Consequence	Probability	Risk	Comment
		Groundwater in secondary superficial undifferent-iated aquifer (Head Deposits)	services, pipes and granular material to groundwater in underlying aquifers.				The bedrock is classified as unproductive strata. The works are likely to result in disturbance of soils during excavation and construction which may result in the release of contaminants in unsaturated Made Ground soils with potential migration to the underlying groundwater. The potential for contaminants to migrate in groundwater is limited due to the isolated spatial distribution of permeable superficial strata adjacent to watercourses. There is a plausible pathway for migration within the superficial strata. However, across the majority of the site there is not a potential contaminant linkage due to the low permeability of the unproductive bedrock stratum.. Superficial Deposits are absent across the central area of the Scheme
	Controlled Waters: Surface waters (on-site)	River Avon, Forest Brook, Clacker Brook and surface water drains	Lateral migration of contaminated groundwater with discharge to surface watercourses	Medium	Likely	Moderate	The construction works are likely to result in disturbance of shallow unsaturated soils which may result in the release of contaminants in unsaturated Made Ground soils with potential migration to surface water. Best practice procedures require implementation to minimise leaching of unsaturated soils in excavations and stockpiles.
			Discharge of contaminants entrained in groundwater and/ or surface water run-off	Medium	Likely	Moderate	

Source	Receptor		Pathway	Potential Consequence	Probability	Risk	Comment
			followed by overland flow and discharge.				The construction works are likely to result in disturbance of shallow unsaturated soils which may result in the release of contaminants in unsaturated Made Ground soils with potential migration to surface water. Best practice procedures require implementation to minimise leaching of unsaturated soils in excavations and stockpiles. Shallow groundwater in superficial strata is isolated in the vicinity of watercourses and is generally absent elsewhere across the site. The bedrock is classified as unproductive. There is a plausible pathway for migration of potentially contaminated groundwater in the superficial strata to surface water. On completion of the Scheme the site will be covered in hardstanding and surface water run-off would be collected and removed by site drainage, minimising the potential for leaching of contaminants in soils.
	Controlled Waters: Surface waters (off-site)	River Avon, Forest Brook, Clacker Brook, the Kennet and Avon Canal, the Semington Brook and surface water drains	Lateral migration of contaminated groundwater with discharge to surface watercourses as base flow	Medium	Low Likelihood	Moderate /Low	
			Discharge of contaminants entrained in groundwater and/or surface water run-off followed by overland flow and discharge.	Medium	Low Likelihood	Moderate /Low	
Off-site: Made Ground associated with the adjacent off-site historical landfills (Brickyard Plantation landfill, 170m east and Old	Human health: On-site	Scheme workers and Construction and maintenance workers of current roads	Dermal contact with and ingestion of contaminants in soils, soil-derived dusts and water.	Medium	Unlikely	Low	Potentially contaminated groundwater may migrate to the site from off-site sources with the potential for direct contact in excavations. Historical landfills are present adjacent to the site (Brickyard Plantation landfill and Brickfield Strangers Corner Farm) there is the potential for landfill leachate

Source	Receptor		Pathway	Potential Consequence	Probability	Risk	Comment
Brickfield Strangers Corner Farm located 380 m south). Made Ground comprising localised residual contamination from construction of existing roads (including Lower Woodrow Road, the A3102, A365 and A350) and associated infrastructure. Made Ground associated with the adjacent former Great Western Railway. Made Ground of unknown provenance used to partly infill the former Wiltshire and Berkshire Canal located 400m west of the site. Sewage works located 90m west of the site.		Pedestrians accessing existing roads, footpaths and public rights of way	Inhalation of contaminants in soil, soil-derived dust, fibres, gas and vapours.	Medium	Unlikely	Low	to migrate to site in groundwater. However no superficial strata is present underlying the landfills which will limit the migration of landfill leachate migrating on-site. There is also the potential for ground gases from the adjacent historical landfills to migrate on-site. However no enclosed structures are proposed as part of the Scheme therefore the accumulation of ground gases on-site is unlikely to occur. Maintenance work is likely to be short term and infrequent. Works will be risk assessed and best practice controls are likely to be used (e.g. gloves, and protective clothing) minimising potential for exposure.
		Current road users		Medium	Unlikely	Low	
		Users of the new road Scheme		Medium	Unlikely	Low	
		Farmers and workers on agricultural land		Medium	Unlikely	Low	
	Controlled Waters: groundwater	Groundwater in secondary A superficial aquifers (Alluvium and River Terrace Deposits) Groundwater in secondary superficial undifferentiated aquifer	Leaching of contaminants in soil to groundwater in underlying aquifers.	Medium	Low Likelihood	Moderate /Low	Potentially contaminated groundwater may migrate to the site from off-site sources. Historical landfills are present adjacent to the site (Brickyard Plantation landfill and Brickfield Strangers Corner Farm) there is the potential for landfill leachate to migrate to site in groundwater. However no superficial strata is present underlying the landfills which will limit the migration of landfill leachate migrating on-site. Where working in proximity to landfills, methodology should be implemented to ensure and capping layer which may be present is
			Migration of contaminated water through preferential pathways such as underground services, pipes and granular material to groundwater in underlying aquifers.	Medium	Low Likelihood	Moderate /Low	

Source	Receptor		Pathway	Potential Consequence	Probability	Risk	Comment
Potentially contaminated groundwater associated with off-site farming. Surface water and road run-off from existing roads (including Lower Woodrow Road, the A3102, A365 and A350). Agricultural activities including localised spills/leaks of oils from farm machinery, borrow pits, animal burial pits and infilling of land for drainage improvement works. Turnpike Garage petrol station *A range of inorganic and organic contaminants including ammonia, metals, hydrocarbons, PAHs, herbicides, pesticides, ground*		(Head Deposits)					not damaged and that preferential pathways are not created. The potential for contaminants to migrate in groundwater is limited due to the isolated spatial distribution of permeable superficial strata. There is a plausible pathway for migration within the superficial strata. However, across the majority of the site there is not a potential contaminant linkage due to the low permeability of the unproductive bedrock stratum.
	Controlled Waters: Surface waters (on-site)	River Avon, Forest Brook, Clacker Brook and surface water drains	Lateral migration of contaminated groundwater with discharge to surface watercourses.	Medium	Low Likelihood	Moderate /Low	Potentially contaminated groundwater may migrate to the site from off-site sources. However the potential for contaminants to migrate in groundwater is limited due to the isolated spatial distribution of permeable superficial strata within the study area.
			Discharge of contaminants entrained in groundwater and/or surface water run-off followed by overland flow and discharge.	Medium	Low Likelihood	Moderate /Low	

Source	Receptor		Pathway	Potential Consequence	Probability	Risk	Comment
gases and asbestos.							

9.7. Potential effects

Agricultural land and soil

Construction

9.7.1. Permanent land-take by the Melksham bypass will likely be up to 140 ha within the study area, to include cuttings, embankments and balancing ponds. Loss of BMV land is potentially as much as 60 ha comprising 14 ha of very high value Grade 2 land and 46 ha of high value Subgrade 3a. The impact of this loss is major so that the significance of effect is very large adverse.

9.7.2. For the loss of 80 ha of land in Subgrade 3b the impact is major on this resource of medium value and significance of effect is large adverse.

9.7.3. Temporary land-take will include haul roads, stockpiles and construction compounds but their locations are unknown at this stage.

9.7.4. Flood compensation areas (FCAs) if required, will be created by lowering their ground level before they are returned to agriculture. The quality of this land will be reduced by one or two ALC grades and best suited to permanent grassland.

9.7.5. Table 9-14 presents the potential impacts, mitigation measures and residual effects on agricultural land during construction,

9.7.6. Potential mitigation measures are summarised in the tables and more details are provided in Section 9.8 below.

Table 9-14 – Potential effects during construction on agricultural land and soil

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
Grade 2 land	Very high	Loss of 14 ha	Very large adverse	None possible	Very large adverse (significant)
Subgrade 3a land	High	Loss of 46 ha	Very large adverse	None possible	Very large adverse (significant)
Subgrade 3b land	Medium	Loss of 80 ha	Large	None possible	Large (Significant)
Temporarily acquired land	Unknown	Temporary disturbance	Unknown	Restore to original capability	Neutral
Flood compensation	Unknown	Reduction in quality	Unknown	None possible	Potentially moderate to large (significant)

Operation phase

9.7.7. There will be no additional impacts on agricultural soils after construction.

Land contamination

Construction phase

9.7.8. The land contamination impact assessment has been completed based on the relationship between the value/sensitivity of the receptor and the magnitude of the impact in accordance with DMRB guidance documents LA109[2] and LA113[25]. The PCSMs included in Table 9-15 have been used to inform the potential magnitude of the impact.

9.7.9. Construction activities could potentially introduce new sources of contamination (i.e. from spillages and leaks) and disturb and mobilise existing sources of contamination, which may present a risk to human health and controlled waters receptors.

9.7.10. Construction activities, such as earthworks, piling, installation of drainage and other below ground services may introduce new pathways for migration of existing contamination and exposure of contaminated soil, remobilisation of contaminants through soil disturbance and the creation of preferential pathways for surface water run-off and ground gas migration. The construction work activities could potentially generate contaminated dust and vapours.

9.7.11. With the implementation of mitigation measures through design and through the construction phase, potential land contamination effects during construction have been assessed as neutral to slight which are classed as not significant. The land contamination impact assessment is presented in Table 9-15.

Table 9-15 - Potential effects during construction on land contamination

Receptor group	Receptor	Value / Sensitivity	Impact	Potential effect (without mitigation)	Potential mitigation	Potential residual effects (with mitigation)
Human health: On-site	Construction and maintenance workers of current roads	Low	Minor Construction activities may create new pathways for between contaminants in soil and human receptors	Slight*	Obtain information on ground conditions through ground investigation. Implementation of best practice construction methodology.	Neutral* Not Significant
	Pedestrians accessing existing roads, footpaths and public rights of way	Low	Minor Removal of vegetation and hardstanding may allow generation of soil derived dusts which could be inhaled by pedestrians	Slight*		Neutral * Not Significant
	Current road users	Low		Slight*		Neutral * Not Significant
	Users of the new road Scheme	Low		Slight*		Neutral * Not Significant
	Farmers and workers on agricultural land	Medium		Slight		Slight Not Significant
Human health: Off-site	Residents in adjacent properties and users of adjacent commercial / industrial premises	Very high	Negligible Removal of vegetation and hardstanding may allow generation of soil derived dusts which could migrate off-site to be inhaled by off-site human receptors in properties	Slight		Slight Not Significant
	Pedestrians accessing surrounding roads,	Low	Minor	Slight*		Neutral * Not Significant

Receptor group	Receptor	Value / Sensitivity	Impact	Potential effect (without mitigation)	Potential mitigation	Potential residual effects (with mitigation)
	footpaths and public rights of way		Removal of vegetation and hardstanding may allow generation of soil derived dusts which could migrate off-site to be inhaled by off-site human receptors in outside air			
	Farmers and workers on agricultural land	Medium		Slight		Slight Not Significant
Controlled Waters: groundwater	Groundwater in secondary A superficial aquifers (Alluvium and River Terrace Deposits)	Medium	Minor adverse Construction activities may expose and mobilise contaminants in soils which may leach to the underlying groundwater	Slight		Slight Not Significant
	Groundwater in secondary superficial undifferentiated aquifer (Head Deposits)	Low		Slight*		Neutral * Not Significant
Controlled Waters: Surface waters (on-site)	River Avon, Forest Brook, Clacker Brook and surface water drains	High	Minor adverse Construction activities may expose and mobilise contaminants in soils which may migrate to watercourses in surface water	Moderate*		Slight* Not Significant
Controlled Waters: Surface waters (off-site)	River Avon, Forest Brook, Clacker Brook, the Kennet and Avon Canal, the Semington Brook and surface water drains	High		Slight*		Slight* Not Significant

* In alignment with DMRB guidance professional judgement has been used to assign the effect as slight based on understanding of details of both the magnitude of impact and value of receptor.

Operation phase

9.7.12. Environmental impacts are likely to be greatest during construction, with reduced impacts likely during operation. The operation of the Scheme may potentially introduce new sources of contamination i.e. spillages and leaks from vehicles and below ground services could create additional potential pathways for the migration of potential contamination which were not present at baseline. However, it is assumed that the Scheme will be operated in accordance with the relevant regulations and best practice guidance in applying Best Available Techniques and pollution prevention.

9.7.13. With the implementation of mitigation measures through design and through the construction phase, as summarised in Section 9.8, potential land contamination effects during operation have been assessed as neutral to slight which are classed as not significant. The land contamination impact assessment is presented in Table 9.16.

Table 9-16 - Potential effects during operation on land contamination

Receptor group	Receptor	Value / Sensitivity	Impact	Potential effect (without mitigation)	Potential Mitigation	Potential residual effects (with mitigation)
Human health: On-site	Construction and maintenance workers of current roads	Low	Negligible On completion of the Scheme, soils will be encapsulated beneath hardstanding and vegetation, removing pathways for contact to human receptors.	Slight*	Operation and maintenance of the Scheme in accordance with best practice.	Neutral* Not Significant
	Pedestrians accessing existing roads, footpaths and public rights of way	Low		Slight*		Neutral* Not Significant
	Current road users	Low		Slight*		Neutral* Not Significant
	Users of the new road Scheme	Low		Slight*		Neutral* Not Significant
	Farmers and workers on agricultural land	Medium		Slight*		Neutral* Not Significant
Human health: Off-site	Residents in adjacent properties and users of adjacent commercial / industrial premises	Very high	Negligible On completion of the Scheme, soils will be encapsulated beneath hardstanding and vegetation, removing pathways for contact to human receptors.	Slight		Slight Not Significant
	Pedestrians accessing surrounding roads, footpaths and public rights of way	Low		Slight*		Neutral* Not Significant
	Farmers and workers on agricultural land	Medium		Slight*		Neutral* Not Significant
Controlled Waters: groundwater	Groundwater in secondary A superficial aquifers (Alluvium and River Terrace Deposits)	Medium	Negligible On completion of the Scheme, soils will be encapsulated beneath hardstanding and vegetation,	Slight*		Neutral* Not Significant
	Groundwater in secondary superficial undifferentiated aquifer (Head Deposits)	Low		Slight*		Neutral* Not Significant

Receptor group	Receptor	Value / Sensitivity	Impact	Potential effect (without mitigation)	Potential Mitigation	Potential residual effects (with mitigation)
Controlled Waters: Surface waters (on-site)	River Avon, Forest Brook, Clacker Brook and surface water drains	High	reducing potential for leaching and migration of contaminants to surface water and groundwater receptors.	Slight		Slight Not Significant
Controlled Waters: Surface waters (off-site)	River Avon, Forest Brook, Clacker Brook, the Kennet and Avon Canal, the Semington Brook and surface water drains	High		Slight		Slight Not Significant

* In alignment with DMRB guidance professional judgement has been used to assign the effect as slight based on understanding of details of both the magnitude of impact and value of receptor.

9.8. Potential mitigation measures

Agricultural land and soil

Construction phase

9.8.1. There is no environmental mitigation for permanent land-take and financial compensation is outside the scope of an environmental assessment. Therefore, the residual effect of loss of 60 ha of BMV land is very large adverse and large adverse for the loss of 80 ha Subgrade 3b land.

9.8.2. Land temporarily acquired during construction will be restored to its original capability through the implementation of a Soil Handling and Management Plan.

Land contamination

Environmental design

9.8.3. A summary of the proposed mitigation measures to be incorporated into the design of the Scheme in relation to soils and geology are likely to include:

9.8.4. A ground investigation and appropriate level of risk assessments will be undertaken to inform the Scheme design and confirm the ground conditions and contamination status of the site; and

9.8.5. Remediation of soil and groundwater would be undertaken prior to construction if investigation and risk assessments deem necessary.

Construction phase

9.8.6. Potential construction mitigation measures to be included within the CEMP are likely to include:

- Health and safety risk assessments, method statements (RAMS) and appropriate Personal Protective Equipment (PPE) for the protection of construction workers in accordance with the Control of Substances Hazardous to Health (COSHH) Regulations[156];
- Implementation of appropriate dust suppression measures to prevent migration of contaminated dust and fibres as appropriate, as set out in Chapter 4 Air Quality;
- Preparation of piling risk assessments as required in accordance with Environment Agency guidance to assess and manage potential risks to controlled waters;
- Working methods during construction to manage groundwater and surface water appropriately and ensure that there is no run-off from the works, any material / waste stockpiles, and storage containers into adjacent surface watercourses in accordance with DEFRA and Environment Agency guidance;
- Stockpile management (such as water spraying and avoiding over stockpiling to reduce compaction of soil and loss of integrity) and timely removal of stockpiled soil to prevent generation of windblown dust and surface water run-off;
- Implementation of an appropriate materials management plan (MMP) and Site Waste Management Plan (SWMP) to manage materials during the construction works. Further information can be found in Chapter 12 (Materials and Waste);
- Limiting the area of earthworks at any one time to reduce temporary effects on topography, soil compaction and erosion;
- Limiting the duration of soil exposure and timely reinstatement of vegetation or hardstanding to prevent soil erosion;
- Implementing appropriate pollution incident control e.g. plant drip trays and spill kits;
- Implementing appropriate and safe storage of fuel, oils and equipment during construction; and

[156] Health and Safety Executive, “Control of Substances Hazardous to Health,” 17 January 2020. [Online]. Available: https://www.hse.gov.uk/coshh/.

- If unexpected contamination is encountered during proposed earthworks, further assessment will be required. Following assessment further mitigation measures such as remediation or removal of contamination may be required.

9.8.7. It is assumed that hardstanding will be placed across the majority of the proposed works associated with the carriageway, except for soft landscaping along embankments and cuttings, which will minimise the generation of dust, direct contact and ingestion pathways and minimise infiltration during the operational phase. If soil contamination is identified, laying of a clean capping layer may be required in areas of proposed soft landscaping.

9.8.8. Drainage design will consider the risks from residual contamination and designers may be required to use lined drainage systems in areas of contamination that may be required to be left in situ. If soil and/or groundwater contamination is identified during the ground investigation which poses a risk to sensitive receptors, appropriate remediation will be undertaken.

9.8.9. Design of the road and the selection of construction materials would be in accordance with DMRB, British Standards and best practice guidance at the time of the design. The design would be required to take into account the ground conditions including the potential for ground gas and ground aggressivity.

Operational phase

9.8.10. The Scheme will be operated in accordance with the relevant regulations and best practice guidance in applying Best Available Techniques and pollution prevention.

9.8.11. Furthermore, pollution prevention measures incorporated within drainage design will mitigate the risk of contamination to controlled waters.

9.9. Further work

9.9.1. In line with LA109 and the requirement to consult Natural England for developments that involve the loss of 20 ha or more BMV land, it will be necessary to undertake a detailed soil/ALC survey of the land within the study area and FCAs (if required) that has not yet been surveyed.

9.10. Summary

9.10.1. Permanent land-take within the study area will be up to 140 ha, of which 60 ha (43%) is BMV land in grades 2 and 3a. The remaining 80 ha is non-BMV land in Subgrade 3b. There is no mitigation for permanent land-take and the residual effect of the loss of this BMV land is very large adverse which is significant.

9.10.2. There will be temporary acquisition of land for haul roads, compounds and FCAs (if required), but the amount and locations are unknown at this stage. The land used for compounds and haul roads will be returned to its original capability and so the residual effect will be neutral. FCAs will be returned to the land owner (unless agreed otherwise), but will be of poorer agricultural quality.

9.10.3. With respect to land contamination, following consideration of the sensitivity of the receptor and the magnitude of the potential impact (change), the potential effects of the Scheme have been assessed as not significant.

10. Cultural Heritage

10.1. Introduction

10.1.1. This chapter provides the preliminary environmental assessment for cultural heritage of likely significant effects arising from the construction and operation of the Scheme upon cultural heritage assets. It describes the methodology; the baseline conditions currently existing within the Scheme and in the surrounding area; the likely significant environmental effects; the likely mitigation measures required to prevent, reduce or offset any significant adverse effects; and outlines further assessment still to be carried out.

10.2. Planning policy

National

10.2.1. This chapter has been, and the on-going Environmental Impact Assessment (EIA) work will be undertaken within the context of the following national legislation, planning policies and guidance documents:

- **National Planning Policy Framework (NPPF) (2021):** Section 16 (Conserving and enhancing the historic environment) and in particular paragraphs 189, 194, 195, 196, 197, 199, 200 and 201 (Considering potential impacts): While the NPPF is to be read as a whole in the context of archaeology, the NPPF states at Section 16 (paragraph 189), that the Government's objective is 'to conserve heritage assets in a manner appropriate to their significance, so that they can be enjoyed for their contribution to the quality of life of this and future generations'. Paragraph 194 states that, in determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets' importance and no more that is sufficient to understand the potential impact of the proposal on their significance.
- **Planning Practice Guidance (PPG) (2019):** 'Historic Environment': The PPG offers advice on planning procedure and offers an assessment of significance as something archaeological, architectural, artistic or historic that has value of because of its heritage interest.
- **Ancient Monuments and Archaeological Areas Act 1979**: Additional controls are placed upon works affecting scheduled monuments and areas of archaeological importance under the Act. The consent of the Secretary of State (DCMS), as advised by Historic England, is required for certain works affecting Scheduled Monuments. Section 61(12) defines sites that warrant protection due to their being of national importance as 'ancient monuments' defined as: 'any building, structure or work above or below the surface of the land, any cave or excavation; any site comprising the remains of any such building, structure or work or any cave or excavation; and any site comprising or comprising the remains of any vehicle, vessel or aircraft or other movable structure or part thereof...' Section 61(7).
- **Historic Buildings and Ancient Monuments Act 1953:** makes provision for the compilation of a register of gardens and other land (parks and gardens, and battlefields).
- **Hedgerow Regulations 1997 (amended 2003)** protection :for hedgerows of more than 20 metres in length or which join other hedgerows provided they adjoin agricultural land, forestry, paddocks, common land, village greens, a site of special scientific interest or a local nature reserve. When removal is proposed as part of a planning application then its impact on the heritage significance of the area and its impact on the setting of any heritage assets will be taken into account.

Local

10.2.2. This chapter has been, and the on-going Environmental Impact Assessment (EIA) work will be undertaken within the context of the following local planning policies and guidance documents:

- **Wiltshire Core Strategy Core Policy 58**: aims to ensure that Wiltshire's important monuments, sites and landscapes and areas of historic and built heritage significance are protected and

enhanced in order that they continue to make an important contribution to Wiltshire's environment and quality of life.
- **Lacock Conservation Management Plan 2012**: this plan examines the various layers of significance including historic, ecological and community. It considers what is important and why and sets out how Lacock will be looked after in the future.

Professional Guidance

10.2.3. This assessment is being carried out in accordance with the following standards and guidance:

- Design Manual for Roads and Bridges (DMRB) Environmental Assessment and Monitoring (LA104) (Highways England, 2020);
- Design Manual for Roads and Bridges (DMRB) Cultural Heritage Assessment (LA106) (Highways England, 2020);
- Chartered Institute for Archaeologists (CIfA) Standards and Guidance for Historic Environment Desk-based Assessment (as revised 2017);
- DEFRA The Hedgerow Regulations: A Guide to the Law and Good Practice (1997);
- Historic England's Managing Significance in Decision-Taking in the Historic Environment (2015);
- Historic England's The Setting of Heritage Assets (Historic Environment Good Practice Advice in Planning Note 3 (Second Edition) (2017); and
- Historic England's Statements of Heritage Significance: Analysing Significance in Heritage Assets (2019).

10.3. Study area and PEAR methodology

Study area

10.3.1. The spatial scope for the detailed cultural heritage baseline was defined by a 1 km study area around the Scheme to assess designated heritage assets that may be affected by the Scheme, while a 500 m buffer around the Scheme was defined to characterise and assess non-designated heritage assets and the potential for as-yet unknown buried archaeological remains.

10.3.2. In order to the produce the assessment of designated and non-designated assets and their significance, the below sources were utilised:

- The Wiltshire and Swindon Historic Environment Record (HER);
- National Heritage List England (NHLE) - data on nationally designated heritage assets (Scheduled Monuments, Listed Buildings, Registered Parks and Gardens, Registered Battlefields); and
- Heritage Gateway – online resource collating heritage data from various resources including HER data, NMR data, and Pastscape sources.

Methodology

10.3.3. The significance of a heritage asset lies in its value to current and future generations due to its heritage interest, be it archaeological, architectural, artistic, or historic. The determination of the significance of an asset, whether it is designated or non-designated, is based on one or more of its values as outlined in Historic England's Conservation Principles, policies and guidance. The four principal values are:

- Evidential value: the potential of the physical remains to yield evidence of past human activity. This might take into account date; rarity; state of preservation; diversity/complexity; contribution to published priorities; supporting documentation; collective value and comparative potential;
- Aesthetic value: this derives from the ways in which people draw sensory and intellectual stimulation from the heritage asset, taking into account what other people have said or written;
- Historical value: the ways in which past people, events and aspects of life can be connected through a heritage asset to the present, such a connection often being illustrative or associative;

and

- ommunal value: this derives from the meanings of a heritage asset for the people who know about it, or for whom it figures in their collective experience or memory; communal values are closely bound up with historical, particularly associative, and aesthetic values, along with educational, social or economic values.

10.3.4. Where known heritage assets are identified, the heritage significance of such assets is determined by reference to existing designations where available. For previously unidentified sites where no designation has been assigned, an estimate has been made of the likely historic, artistic or archaeological importance of that resource based on professional knowledge and judgement.

10.3.5. The DMRB methodology assigns a value to each type of heritage asset, whether individual or collective in the DMRB Volume 11, Section 2, LA104. The value criteria for this assessment is based on this methodology, but has been altered for the purposes of this report. See Table 10-1 below

Table 10-1 – Value of heritage assets

Significance	Description	Example
Very High	Internationally important or significant heritage assets	World Heritage Sites, or buildings recognised as being of international importance.
High	Nationally important heritage assets generally recognised through designation as being of exceptional interest and value.	Grade I and II* Listed Buildings, Grade I and II* Registered Parks and Gardens, Scheduled Monuments, Protected Wreck Sites, Registered Historic Battlefields, Conservation Areas with notable concentrations of heritage assets and non-designated assets of national or international importance.
Medium	Nationally or regionally important heritage assets recognised as being of special interest, generally designated.	Grade II Listed Buildings, Grade II Registered Parks and Gardens, Conservation Areas and non-designated assets of regional or national importance, including archaeological remains, which relate to regional research objectives or can provide important information relating to particular historic events or trends that are of importance to the region.
Low	Assets that are of interest at a local level primarily for the contribution to the local historic environment.	Non-designated heritage assets such as locally Listed Buildings, non-designated archaeological sites, non-designated historic parks and gardens etc. Can also include degraded designated assets that no longer warrant designation.
Negligible	Elements of the historic environment which are of insufficient significance to merit consideration in planning decisions and hence be classed as heritage assets.	Non-designated features with very limited or no historic interest. Can also include highly degraded designated assets that no longer warrant designation.
Unknown	The importance of an asset has not been ascertained.	

10.3.6. The impacts upon the cultural heritage resources have been assessed based on DMRB criteria shown in Table 10-2 below. The magnitude of the impact or change that the Scheme has on the heritage asset is evaluated against the value of the heritage asset.

Table 10-2– Magnitude of impact

Impact magnitude	Criteria (positive and negative)
Major adverse	Substantial harm to, or loss of an asset's significance as a result of changes to its physical form or setting. For example, this would include demolition, removal of physical attributes critical to an asset, loss of all archaeological interest or the transformation of an asset's setting in a way that fundamentally compromises its ability to be understood or appreciated. The scale of change would be such that it could result in a designated asset being undesignated or having its level of designation lowered.
Moderate adverse	Less than substantial harm to an asset's significance as a result of changes to its physical form or setting. For example, this could include: physical alterations that remove or alter some elements of significance, but do not substantially alter the overall significance of the asset; notable alterations to the setting of an asset that affect our appreciation of it and its significance; or the unrecorded loss of archaeological interest.
Minor adverse	Limited harm to an asset's significance as a result of changes to its physical form or setting. For example, this could include: physical changes that alter some elements of significance but do not noticeably alter the overall significance of the asset; and small-scale alterations to the setting of an asset that hardly affect its significance.
Negligible	Very minor changes to archaeological materials or setting.
No Change/ Neutral	No appreciable change to an asset's significance.
Minor Beneficial	Limited improvement of an asset's significance as a result of changes to its physical form or setting. For example, this could include: physical changes that reveal or conserve some elements of significance but do not noticeably alter the overall significance of the asset; or small-scale alterations to the setting of an asset that improve our ability to appreciate it.
Moderate Beneficial	Notable enhancement of an asset's significance as a result of changes to its physical form or setting. For example, this could include: physical alterations that conserve or restore elements of significance; notable alterations to the setting of an asset that improve our appreciation of it and its significance; or changes in use that help safeguard an asset.
Major Beneficial	Substantial enhancement of an asset's significance as a result of changes to its physical form or setting. For example, this could include: major changes that conserve or restore elements of high significance; alterations to the setting of an asset that very substantially improve our appreciation of it and its significance; or changes in use that safeguard an asset, e.g. by taking it off the At Risk Register.

10.3.7. Buried archaeology is often an unknown quantity which can be difficult to fully identify during a desk-based assessment. The assessed potential is based on available evidence, but the physical nature and extent of any archaeological resource surviving within the Scheme's footprint cannot be confirmed without detailed information on the below ground deposits or results of on-site fieldwork, typically through non-intrusive (e.g. geophysical, LiDAR), and intrusive (archaeological, geoarchaeological evaluation) survey.

10.3.8. A site's archaeological potential is identified using professional judgement and knowledge, based on evidence of known archaeology in the study area and what it tells us about what is likely to be found on the site. This assessment of potential also takes into consideration the level of existing impact upon the site from modern and historic developments. The potential for surviving archaeological evidence of past activity within the Scheme boundary is expressed in the report as being:

- High: The available evidence suggests a high likelihood for past activity within the Scheme boundary and a strong potential for archaeological evidence to survive intact or reasonably intact;
- Medium: The available evidence suggests a reasonable likelihood for past activity within the Scheme boundary and consequently there is a potential that archaeological evidence could survive;
- Low: The available evidence suggests archaeological evidence of activity is unlikely to survive within the Scheme boundary, although some minor land-use may have occurred; and
- Uncertain: Insufficient information to assess.

10.4. Assumptions and limitations

10.4.1. This is a preliminary assessment for the purposes of consultation based on the data gathered to date.

10.4.2. The information presented in this chapter is based on the information available at the time of writing the report and is based on the emerging design. The findings reported in this PEAR may be subject to change as the design of the Scheme is developed and refined through the EIA and consultation process, to be reported in the ES. Data used to compile this chapter consists of secondary information derived from a variety of sources. The assumption is made that this data, as well as that derived from other secondary sources, is reasonably accurate.

10.4.3. The final assessment will be reported within the ES taking into account consultation comments, further design details and the further assessments detailed in section 10.9.

10.5. Consultation

10.5.1. Consultations with the local planning authority archaeologist at Wiltshire Council and Historic England were undertaken 19th November 2020, 19th March 2021 and 4th August 2021.

10.5.2. These consultations highlighted the vulnerability of the Medieval Settlement of South East of Snarlton Farm (MWI3621), and the Scheme's design has been amended to avoid this asset. Further consideration focused on the village of Lacock, which is a conservation area to the north of the Scheme. Recommendations focused on screening of the new bypass to avoid setting impacts to this asset. There may also be opportunities to introduce heritage benefit by improving access to the village of Lacock from the A350.

10.6. Baseline conditions

10.6.1. The underlying geology of the study area comprises mudstone of the Jurassic Oxford Clay Formation, which is overlain by Quaternary River Terrace Deposits of sand and gravel (British Geological Survey). River terrace deposits have the potential to yield both Palaeolithic and Mesolithic archaeology, and palaeoenvironmental and sedimentological data relevant to the evolution of the landscape particularly from the River Avon.

10.6.2. The study area rises gradually from west to east, with the River Avon located approximately 100m to the west and is located at an elevation of approximately 35m above Ordnance Datum (aOD).

Designated heritage assets

10.6.3. There are no Scheduled Monuments, Registered Park and Gardens, Registered Battlefields, Conservation Areas or listed buildings within the Scheme extent.

10.6.4. There are no Scheduled Monuments, Registered Park and Gardens, Registered Battlefields in the Study Area. Lacock village, approximately 180m north from the Scheme, is part of a conservation area and encompasses most of the listed buildings within the study area. Within the conservation area is the Grade I listed Abbey (1022132), founded in the 13th century. The village is a rare surviving example of a medieval town which developed through the 14th, 15th and 18th centuries due to its role in the wool trade.

10.6.5. There are nine heritage assets that may be affected by the Scheme, see Figure 10.1 for location detail. These include Lacock Conservation Area, and eight Grade II listed Buildings, comprising:

- The Folly (1022167);
- Rhotterridge Farmhouse (1194730);
- Tanhouse Farmhouse (1194746);
- Old Loves Farmhouse (1194682);
- Blackmore House (1364118),
- The Old Coach House (1194747)
- Queenfield House (1364117); and
- Old Railway House (1194743).

Non-designated heritage assets

10.6.6. There are approximately 309 non-designated heritage assets within the study area, see Figure 10.1, and 11 findspots. The following section describes assets that will be affected by the Scheme. The rest of the assets have been scoped out on this basis. Most of the assets are related to medieval and post-medieval agricultural features. There is a significant medieval settlement known as Medieval Settlement, Southeast of Snarlton Farm (MWI3621) on the Historic Environment Record directly west from the Scheme. The settlement comprises building platforms, hollow ways, field boundaries, a possible pond, ridge and furrow and plough headlands. Many elements appear to be no longer extant on the latest LiDAR and vertical photography. The medieval settlement of Redstocks (MWI3625) is located within the scheme extent. Analysis of aerial photography shows evidence of below ground archaeology.

10.6.7. There is also a strong Romano-British potential related to the Roman Road (MWI1687) which cuts through the Scheme at its crossing of the River Avon. The road is visible as either a bank, or on the slopes as a hollow way and may well be associated with settlement activity, particularly on the bluff line of the Avon valley. The remains are fragmentary and the course of the road across Bowden Hill has been obscured due to natural slumping. The Romano-British evidence is also represented by a shrine (MWI76045) approximately 180m west from the Scheme at the most southernly point of the Scheme.

10.6.8. An undated earthwork enclosure (MWI4827) is located in the northern section of the Scheme. Other remains of settlements can be found within the extent of the Scheme. Medieval settlement recorded as Settlement, East of Loves Farm (MWI3622) is located in the southern part of the Scheme close to A365. The Settlement comprises building, platforms, hollow ways, field boundaries and ponds and is visible as earthworks on air photographs and LiDAR.

10.6.9. The post-medieval period is represented by Settlement, South of Brabazon Way (MWI73938). The settlement comprises a number of networked hollow ways and a building platform. However, most elements appear to be no longer extant on the latest LiDAR and vertical photography. Further evidence of this period comes from an historic parkland known as Sandridge Park (MWI4969) shown on the 1885 Ordnance Survey County Series map. The park still has wooded areas,

specimen trees and a walled kitchen garden. The park is located within the boundary of Sandridge Common. The Wiltshire and Berkshire Canal (MWI9472) dissects the middle portion of the Scheme. There is fragmentary evidence of it surviving at Westleaze near Swindon and at Pewsham near Chippenham.

10.6.10. There is a strong presence of the modern period attributed mostly to military assets including RAF Bowerhill camp (MWI4954), approximately 100m west from the Scheme. This closed in 1965, but the hangars remain in use for commercial purposes and the gymnasium as a sports centre. Most of the buildings have disappeared and the Officers' Married Quarters have been sold off. A Portland Stone memorial stands outside the original gymnasium of RAF Melksham. The military presence is also represented by four small associated military camps (MWI73883) visible as structures, buildings and earthworks on aerial photography. To the south of the scheme, close to the Littleton Roundabout, anti-tank ditches (MWI44975; MWI44976) are recorded on the Historic Environment Record. Semington was a centre of resistance and part of the GHQ defences. It was well defended and an important strongpoint on the western flank of GHQ Line Blue. In 1941 it had a nominal garrison of four officers and 100 other ranks to be drawn from a training battalion of the Royal Signals based at Trowbridge. The demolished foundations of a handful of buildings and one upstanding building are visible on the latest 2008 and 2009 vertical photography. Additionally, the internal concrete structures of two air raid shelters, with the earthwork mound removed are also extant. Other evidence is represented by pillboxes, part of The Stop Line Green, a line of defensive structures built in England during World War II. It was part of a wider network of defences including other Stop Lines and the General Headquarters Line.

Unknown archaeological remains

10.6.11. There is a high potential for archaeological remains within the extent of the scheme. Evidence comes from predominantly the Bronze Age, Roman and Medieval periods. Findspots such as a Bronze Age weapon (MWI4926) and Bronze Age axehead (MWI4751) indicate that there is the potential for prehistoric evidence to be within the extent of the scheme. An extensive amount of Roman pottery (MWI4932; MWI4934; MWI4935; MWI4766) and coins (MWI4760; MWI4768; MWI4769) has been recovered throughout the study area, suggesting settlement activity during this period. Furthermore, the Scheme's close proximity to the River Avon also has the likelihood of palaeoenvironmental remains being present within the scheme extent. The table below provides a breakdown of the archaeological potential by period within the scheme.

Table 10-3 - Table showing archaeological potential and significance for divided by periods

Period	Potential	Features	Potential significance
Palaeoenvironmental	High	Environmental remains within alluvial deposits	Low to high
Prehistoric	High	Lithics, metal works, butchery sites, settlement sites, field systems, ceremonial monuments (i.e. barrows)	Low to high
Roman	High	Pottery, coins, cut features, e.g. pits, ditches. Structures such as shrines, villas, military sites	Low to high
Early Medieval	High	Cut features, e.g. pits, ditches. Structures associated with the settlements and of agricultural nature within the Scheme	Low to high
Later Medieval	High	Cut features, e.g. pits, ditches Farmsteads	Low to medium
	High	Remains associated with settlement structures	Low to high

Period	Potential	Features	Potential significance
Post-medieval	Moderate	Remains associated with settlement structures and military structures	Low to medium

Historic landscape characterisation

10.6.12. There are 76 historic landscape characters (HLCs) within the scheme extent. These are made of mostly amalgamated fields, farmsteads, plantations and planned enclosures, and reorganised fields. These HLCs are mostly legible and derive from the medieval and post-medieval periods.

10.6.13. There are 76 historic landscape characters (HLCs) within the scheme extent. These are made of mostly amalgamated fields, farmsteads, plantations and planned enclosures, and reorganised fields. These HLCs are mostly legible and derive from the medieval and post-medieval periods.

10.7. Potential effects

10.7.1. Tables 10-2 and 10-3 above present the potential effects, mitigation measures and residual effects on the historic environment during construction and operation.

10.7.2. The operation of the Scheme will not physically affect any listed or non-listed historic building within the 1km study area, although there is the potential for non-physical effects from changes to the setting of some listed buildings and conservation area.

10.7.3. No impacts are expected from the signalisation of the A342/A3102 junction.

10.7.4. The operation of the Scheme will largely be screened in views from all other conservation areas and listed buildings within the 1km study area and will not impact upon elements of their setting or how their value is experienced and appreciated. Therefore, at this stage, it is expected that the operation of the Scheme is likely to have a magnitude of impact of no change and result in a permanent neutral effect, although this will be reviewed in ongoing EIA work and reported in the ES.

10.7.5. Potential mitigation measures are summarised in the tables and more details are provided in section 10.8 below.

Construction

10.7.6. It is likely that a number of listed buildings within the study area will experience change in setting due to the presence of construction equipment and noise from construction, albeit temporary in nature.

10.7.7. The construction phase of the proposed works has the potential to impact a number of archaeological assets within the study area. The most notable of these is the Medieval Settlement of Redstocks (MWI3625), and the Medieval Settlement of Snarlton Farm (MWI3621). There is high density of ridge and furrow within the study area, and any preserved ridge and furrow within the footprint of the Scheme will be removed for the bypass.

10.7.8. The dualling of the A350 to Littleton Roundabout has the potential to impact anti-tank ditches (MWI44975; MWI44976), which are recorded on the HER. However, it is likely that both have been levelled.

10.7.9. Due to the presence of medieval settlements, and agricultural features in the study area it is likely that there is a high potential for archaeological remains to survive from the prehistoric period and onwards. Any archaeological remains would be of low to high significance. Any remains within the extant of the Scheme will be truncated depending on the depths of intrusive works.

Operation

10.7.10. No further physical impacts to buried archaeology will occur during operation of the scheme as it is predicted that design and mitigation will already have been applied to either prevent impact, or to record before removal.

10.7.11. Operation of the scheme will have the potential to permanently cause changes within the settings of listed buildings, the Lacock Conservation Area and Lacock Abbey Scheduled Monument. These will largely result from changes to the local visual envelope and soundscape.

Table 10-4 - Potential effects during construction

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
Conservation Area and Listed buildings	High	Presence of construction and related noise and dust would affect the settings of the Conservation Area and Listed buildings	Major adverse	Screening and good construction practices	Minor adverse
Roman Road (MWI1687)	High	Truncation of archaeological remains and removing the established route of the Roman Road as well as potential impact on related roadside activities	Major adverse	Avoid physical impacts of the Roman Road through design process	Neutral
Various Ridge and Furrow	Medium	Truncation of established ridge and furrow	Minor Adverse	Full recording of ridge and furrow	Neutral
Medieval Settlement, Southeast of Snarlton Farm (MWI3621)	High	Removal of below archaeological remains associated with the settlement	Major adverse	Designed to avoid significant archaeological remains	Minor adverse
Medieval settlement of Redstocks (MWI3625)	Medium	Removal of below archaeological remains associated with the settlement	Major adverse	Full excavation of the area to record any archaeological remains associated with the settlement	Minor adverse
Anti-tank ditches (MWI44975; MWI44976)	Low	Removal of anti-tank ditches	Major adverse	If established that they are still in-situ, recording before work commences	Minor adverse

Table 10-5 - Potential effects during operation

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
Lacock Conservation Area	High	Presence of additional road affecting the setting of the conservation area.	Minor Adverse	Add screening of the road to avoid visual impacts	Minor adverse
Rhotterridge Farmhouse	Medium	Presence of additional road affecting the setting of the listing building.	Minor Adverse	Add screening of the road to avoid visual impacts	Minor Adverse
Tanhouse Farmhouse	Medium	Presence of additional road affecting the setting of the listing building.	Minor Adverse	Add screening of the road to avoid visual impacts	Minor Adverse
The Folly	Medium	Presence of additional road affecting the setting of the listing building.	Minor Adverse	Add screening of the road to avoid visual impacts	Minor Adverse
Blackmore House	Medium	Presence of additional road affecting the setting of the listing building.	Minor Adverse	Add screening of the road to avoid visual impacts	Minor Adverse
Old Loves Farmhouse	Medium	Presence of additional road affecting the setting of the listing building.	Minor Adverse	Add screening of the road to avoid visual impacts	Minor Adverse
Queenfield Farmhouse	Medium	Presence of additional road affecting the setting of the listing building.	Minor Adverse	Add screening of the road to avoid visual impacts	Minor Adverse
Old Railway House	Medium	Presence of additional road affecting the setting of the listing building.	Minor Adverse	Add screening of the road to avoid visual impacts	Minor Adverse

10.8. Potential mitigation measures

10.8.1. Screening of the road could be a potential mitigation measure as it will help offset the degree of effect on the significance of listed buildings and conservation area by reducing the influence of noise and visual impacts on their settings.

10.8.2. It is proposed that an archaeological management strategy will be developed in order to deliver an appropriate programme of archaeological evaluation and subsequent mitigation. Archaeological mitigation could range from influencing scheme design to avoid impacts to significant archaeology entirely through to a programme of archaeological excavation, recording and publication.

10.9. Further work

10.9.1. A desk-based assessment is recommended to establish the significance of the assets affected by the Scheme as well an understanding of the historic development of the area.

10.9.2. Further setting assessment of the affected listed buildings is recommended before construction works to establish their significance.

10.9.3. Archaeological evaluation is recommended for the entirety of the Scheme. This might include geoarchaeological assessment, targeted geophysical survey and trial trenching especially in areas of significant archaeological potential. Depending on the results of the archaeological evaluation it is likely that further archaeological works will be required.

10.9.4. All archaeological works must be carried out in accordance with a Written Scheme of Investigation (WSI) approved by the local planning authority Archaeologist.

10.10. Summary

10.10.1. This report has established a high potential for archaeological remains and identified a number of designated and non-designated heritage assets that will be affected by the Scheme. The Scheme has the potential to impact archaeological remains of potentially up to national significance such as the Medieval Settlement of Redstocks (MWI3625), and the Medieval Settlement of Southeast of Snarlton Farm (MWI3621). To establish the level of harm on known archaeological remains further assessment is required in the form of a desk-based assessment. The Scheme also has the potential to affect the settings of Lacock Conservation Area and a number of listed buildings; a setting assessment would establish at to what degree. Archaeological evaluation is recommended for the entirety of the Scheme. This might include, geoarchaeological assessment, targeted geophysical survey and trial trenching especially in areas of significant archaeological potential. Depending on the results of the archaeological evaluation it is likely that further archaeological works will be required.

11. Materials and Waste

11.1. Introduction

11.1.1. This chapter provides the preliminary environmental assessment for material assets and waste associated with the Scheme, during construction, demolition and excavation (CD&E). The chapter has been written in accordance with the standard Design Manual for Roads and Bridges (DMRB) LA 110 Material Assets and Waste.

11.1.2. It is anticipated that, during operation (stated as the opening year in DMRB LA 110) of the Scheme, negligible material assets would be required for maintenance and negligible quantities of waste would be produced. Material assets and waste during operation has therefore been scoped out of further assessment. This decision is based on discussions with design engineers (for materials) and road maintainers (for waste) on previous projects. Scoping out material assets and waste is in line with requirements stated in Section 3.2 of DMRB LA 110, which sets out the need to do further assessment only where a scheme would generate large quantities of waste.

11.1.3. Materials are defined in DMRB LA 110 as “primary, recycled / secondary and renewable sources of materials required for constructing a project”.

11.1.4. Waste is defined as per the Waste Framework Directive (2008/98/EC) as “any substance or object which the holder discards or intends or is required to discard."….

11.2. Planning policy

11.2.1. A summary of legislative requirements in relation to material assets and waste and how they apply to the Scheme is presented below.

11.2.2. Many of the relevant UK acts and regulations relating to waste incorporate European Union (EU) directives into UK Law. These include:

- EU Revised Waste Framework Directive (2008/98/EC);
- EU Landfill Directive (1993/31/EC), as amended by the EU Directive (2003/33/EC);
- EU Hazardous Waste Directive (1991/689/EEC); and
- EU Regulation 1272/2008 on classification, labelling and packaging of substances and mixtures (including revisions).

National

National Planning Policy Framework (NPPF) 2021

11.2.3. The NPPF’s goal of supporting sustainable development identifies the importance of using natural resources prudently and minimising waste. It identifies that strategic policies should make provision for minerals and waste management. Section 17 focuses on “Facilitating the sustainable use of minerals”, and states planning policies should include consideration of the following points:

- Provide for the extraction of mineral resources of local and national importance, except for peat Take account of the contribution that recycled materials and minerals waste can make to supply of materials; and
- Safeguard mineral resources by defining Mineral Safeguarding Areas (MSA).

Waste Planning Practice Guidance 2015

11.2.4. The Planning Practice Guidance website details how to adhere to the National Planning Policy for Waste 2014. The guidance should be followed to satisfy the local planning authority that impacts introduced by a proposed development on the existing waste management facilities are acceptable

and do not prejudice the implementation of the waste hierarchy.

Resources and Waste Strategy for England 2018

11.2.5. The strategy sets out national policy for minimising waste, promoting resource efficiency and moving towards a circular economy. The strategy focuses on the importance of driving waste management up the waste hierarchy and states the importance of considering the Government's ambition of achieving zero avoidable waste.

11.2.6. The strategy is based around two overarching objectives which aim to maximise the value of resource use and to minimise waste and its impact on the environment.

11.2.7. The strategy puts a strong emphasis on waste prevention through making products using fewer natural resources. The strategy references the UK statistics on waste which show that over 90% of non-hazardous construction and demolition waste was recovered in 2016.

Waste Management Plan 2021

11.2.8. The Waste Management Plan for England focuses on waste arisings and their management. Its core aim is to bring current waste management policies under the umbrella of one national plan.

11.2.9. It is a high-level, non-site specific document that provides an analysis of the current waste management situation in England and evaluates how implementation of the objectives and provisions of the Waste (England and Wales) Regulations 2011 will be undertaken.

11.2.10. It references the critical issues of proximity principle and the circular economy which should enable the repair, remanufacture and reuse items to reduce waste generation.

The Environmental Protection Act 1990

11.2.11. The Environmental Protection Act (EPA) implements integrated pollution control for the disposal of waste to air, land and water, including solid waste disposal.

11.2.12. As part of this, under Section 34, the Act imposes Duty of Care on anyone who produces, imports, keeps, stores, transports, treats or disposes of waste.

11.2.13. This would mean that the applicant and all contractors must take all reasonably practical steps to ensure that:

- Waste is consigned only to a registered waste carrier, licensed waste contractor, local authority waste collector or person dealing with waste in ways that are exempt from licensing;
- Waste that is disposed of is accompanied by a detailed written description of the waste to ensure its safe handling, treatment and disposal (waste transfer notes are to be kept for a minimum of two years and hazardous waste consignment notes are to be kept for a minimum of three years);
- Waste is securely contained to prevent it escaping to the environment;
- Appropriate measures are taken to ensure that others involved in the handling and disposal of waste do so in accordance with all applicable Regulations;
- Copies of registration certificates should be obtained for all waste contractors and waste carriers used as part of the Scheme and it should be ensured that they are on the Environment Agency's (EA) 'Public Register of Waste Carriers, Brokers and Dealers'; and
- Checks should be made on the destination of each waste, ensuring that each waste management facility is licensed to accept the waste. Duty of Care audits of carriers and waste management facilities are advisable.

Clean Neighbourhoods and Environment Act 2005

11.2.14. Chapter 16 of the Clean Neighbourhoods and Environment Act 2005 (c.16) prescribes the correct transportation, collection, disposal and management of waste and prohibits fly tipping.

Waste (England and Wales) Regulations 2011 (SI 2011/988)

11.2.15. The Regulations transpose the Revised EU Waste Framework Directive (2008/98/EC) into English law and require organisations to manage waste in accordance with the waste hierarchy, to prevent waste going to landfill.

11.2.16. Waste management contractors working on the Scheme would be required to provide evidence that the waste hierarchy has been applied. This evidence can be in the form of waste transfer notes and hazardous waste consignment notes, which themselves must be kept for two and three years, respectively.

The Hazardous Waste (England and Wales) Regulations 2005 (SI 2005/894) (as amended in 2016)

11.2.17. The Regulations transpose the Revised EU Waste Framework Directive (2008/98/EC), providing a definition of hazardous waste and require a hazardous waste consignment note to be produced for movement of hazardous waste.

Waste Electrical and Electronic Equipment (WEEE) Regulations 2013 (SI 2013/3113)

11.2.18. The Regulations have a key objective to reduce the amount of WEEE that goes to landfill. This is to be achieved by making producers responsible for the collection, treatment and recovery of WEEE, including the associated costs.

11.2.19. For the Scheme, all WEEE produced in the construction, demolition and excavation (CD&E) and operational phases must be segregated and managed separately from other wastes, with relevant paperwork provided as described above.

The Waste Batteries and Accumulators Regulations 2015 (SI 2015/1935)

11.2.20. The Regulations main requirements are that producers of batteries and accumulators must either take back waste batteries and accumulators or fund the collection and recycling of them. The 2015 amendment removed several additional requirements, inclusive of the provision of operational plans and independent audit reports.

11.2.21. All batteries produced in the CD&E and operational phases must be segregated and managed separately from other wastes.

The Environmental Permitting (England and Wales) Regulations 2016 (SI 2016/1154)

11.2.22. The Regulations put in place requirements to ensure that sites that produce certain materials and undertake certain activities (such as the storage, use or treatment of waste) have a permit or exemption from the regulator (specifically the EA).

11.2.23. Permit or exemption details of all sites that manage waste from the Scheme would be checked to ensure waste is being managed in accordance with all applicable legislation and policies and in accordance with good practice.

Local

Wiltshire and Swindon Waste Core Strategy 2006 - 2026

11.2.24. The Waste Core Strategy sets out the strategic planning policy framework for waste management and forms one element of the Wiltshire and Swindon Minerals and Waste Development Framework.

11.2.25. The strategy outlines the current characteristics of waste management activities in Wiltshire and Swindon and identifies important issues such as the lack of waste management facilities in certain areas.

11.2.26. It sets out four strategic objectives and six policies, including ones to promote the movement of waste up the waste hierarchy and the need and potential locations for future waste facilities.

11.2.27. At the time the strategy was written, there were four landfill sites located in the north of the area that received inert waste, three located in west Wiltshire and one in south Wiltshire. It was estimated that three additional landfill sites would be required to meet demand over the plan period.

11.2.28. At the time the strategy was written there was limited capacity for the recycling and transfer of inert waste. There was one site located in the north and two sites in west of Wiltshire that recycled inert waste. In addition, there were two transfer sites in the plan area for the management of inert waste. It is noted that there were sufficient inert waste recycling facilities in the local area to meet the sub-regional apportionments over the plan period. However, four additional transfer facilities would be required for the management of inert waste to meet demand over the plan period.

11.2.29. In relation to the Scheme this highlights that design decisions and construction stage actions must ensure the maximum amount of waste is reduced, reused or recycled, focusing on the higher part of the waste hierarchy. Consideration to the use of waste audits and Waste Management Plans to aid in identifying waste minimisation and recycling opportunities is also advised.

Wiltshire and Swindon Minerals Core Strategy Development Plan Document 2006 – 2026

11.2.30. The Minerals Core Strategy is intended to manage the availability, extraction and use of primary, secondary and recycled mineral resources whilst seeking to protect the interests of local communities and the wider environment through a series of strategic policies.

11.2.31. The Strategy sets out a context for sustainable minerals development and forms one element of the overall Minerals and Waste Development Framework.

11.2.32. The main mineral types worked in Wiltshire and Swindon include sand and gravel, chalk, clay and various high quality limestones.

11.2.33. The Strategy sets out five strategic objectives and ten policies including maximising the use of secondary and recycled aggregates and ensuring that development proposals utilise the most sustainable option for the transportation of minerals.

11.2.34. At the time the strategy was written the Upper Thames Valley, in combination with existing permitted reserves, could provide sufficient land to meet demand until 2016. In the longer term (2016 - 2026), confidence in the availability and deliverability of sites to meet projected aggregates demand becomes much less certain.

11.2.35. Wiltshire and Swindon cannot continue to supply aggregates infinitely and so the use of alternative construction materials, along with maximising the availability and use of recycled and secondary resources will have to be encouraged.

11.2.36. In relation to the Scheme, this highlights that design decisions and construction stage actions must consider the use of recycled aggregates and that development proposals should utilise the most sustainable option for the transportation of minerals.

11.3. Study area and PEAR methodology

Study area

11.3.1. Two study areas have been defined for the assessment, as per DMRB LA 110. These are:

- First Study Area - the Scheme boundary and temporary construction areas (such as construction compounds and storage) where construction materials will be consumed, and waste generated.
- Second Study Area - this will cover the feasible sources and availability of construction materials required to construct the main elements of the Scheme and suitable recovery and waste management infrastructure that could accept waste generated by the Scheme.

11.3.2. Based on the DMRB LA 110 the second study area will be the South West region of England for materials and Wiltshire for waste. The second study area takes into account the proximity principle which should ensure that the most appropriate material sources and waste management facilities are utilised, while balancing other issues such as logistics, cost and environmental impacts of sourcing materials and managing waste at greater distance.

Methodology

11.3.3. An environmental assessment, as defined in DMRB LA 110, has been carried out to assess the impacts of material assets and waste from the Scheme during construction. The assessment process was comprised of the following tasks:

- Review of relevant legislation and guidance to identify materials and waste management objectives and targets;
- Establish the baseline demand for materials and the capacity of waste management infrastructure in the study areas;
- Review of the Bill of Quantities (BoQ) to establish the quantities and types of materials to be used and wastes to be generated during construction;
- Identify mitigation measures to reduce, re-use, recycle and/or recover materials and wastes from the Scheme; and
- Identify and assess the preliminary impacts of the Scheme by comparing the information in the BoQ against the baseline data.

Assessment criteria

11.3.4. An assessment of the level of environmental effect from the use of material assets and generation of waste has been made using the criteria in Table 11-1 below, which are set out in DMRB LA 110.

Table 11-1: Criteria for classifying the environmental effects

Significance category	Description
Very Large	Material Assets 1) no criteria: use criteria for large categories. Waste 1) >1% reduction or alteration in national capacity of landfill, as a result of accommodating waste from a project; or 2) construction of new (permanent) waste infrastructure is required to accommodate waste from a project.
Large	Material Assets 1) project achieves <70% overall material recovery / recycling (by weight) of non-hazardous Construction and Demolition Waste (CDW) to substitute use of primary materials; and 2) aggregates required to be imported to site comprise <1% re-used /recycled content; and 3) project sterilises ≥1 mineral safeguarding site and/or peat resource. Waste 1) >1% reduction in the regional capacity of landfill as a result of accommodating waste from a project; and 2) >50% of project waste for disposal outside of the region.
Moderate	Material Assets

Significance category	Description
	1) project achieves less than 70% overall material recovery / recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and 2) aggregates required to be imported to site comprise re-used/recycled content below the relevant regional percentage target. Waste 1) >1% reduction or alteration in the regional capacity of landfill as a result of accommodating waste from a project; and 2) 1-50% of project waste for disposal outside of the region.
Slight	Material Assets 1) project achieves 70-99% overall material recovery / recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and 2) aggregates required to be imported to site comprise re-used/recycled content in line with the relevant regional percentage target. Waste 1) ≤1% reduction or alteration in the regional capacity of landfill; and 2) waste infrastructure has sufficient capacity to accommodate waste from a project, without compromising integrity of the receiving infrastructure (design life or capacity) within the region.
Neutral	Material Assets 1) project achieves >99% overall material recovery / recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and 2) aggregates required to be imported to site comprise >99% re-used /recycled content. Waste no reduction or alteration in the capacity of waste infrastructure within the region.

Table Source: DMRB LA 110, Table 3.13

11.3.5. Table 11-1 defines ‘neutral’ to ‘very large’ environmental effects for both material assets and waste. The Schemes impact can then be defined as significant or not significant, as shown in Table 11-2 below.

Table 11-2: Significance criteria for material assets and waste

Significance	Description
Significant (one or more criteria met)	Material Assets: 1) category description met for moderate or large effect. Waste: 1) category description met for moderate, large or very large effect.
Not significant	Material Assets: 1) category description met for neutral or slight effect. Waste: 1) category description met for neutral or slight effect.

Table Source: LA 110, Table 3.14

Data sources

11.3.6. The baseline has been established through a desk-based review of data from the following sources:

- The Mineral Products Association's Profile of the UK Mineral Products Industry[157];
- South West Aggregates Working Party Annual Report: 2018[158];
- National Association of Steel Service Centres Annual Report 2018-2019 – Appendix V, Domestic Supply[159];
- Environment Agency, Remaining Landfill Capacity, 2020[160];
- Environment Agency, Waste Data Interrogator, 2020[161];
- Wilshire & Swindon Minerals Core Strategy Development Plan Document Key Diagram[162].
- Department of Food and Environment Multi-Agency Geographical Information for the Countryside (MAGIC) online mapping[163].

11.3.7. The assessment itself uses information from the Schemes Bill of Quantities (BoQ).

11.4. Assumptions and limitations

11.4.1. This is a preliminary assessment for the purposes of consultation based on the following data gathered to date:

- Volumes of excavated soil provided in the BoQ by the design team (dated September 2021) which are based on the emerging Scheme.

11.4.2. The final assessment will be reported within the ES taking into account consultation comments, further design details and the further assessments detailed in section 11.9.

11.4.3. The assumptions applicable to the assessment methodology are outlined, as follows:

- All excavated material will be reused onsite; and
- No hazardous waste has been identified at this stage, but this will be updated following any Ground Investigations.

11.4.4. The following limitations have been identified for the assessment:

- The waste generated through construction of the Scheme has been estimated from the available design information. These volumes will be updated at further design stages as the design and construction programme becomes more advanced. As such, a worst-case scenario has been used at this stage;
- The baselines presented in this chapter use publicly available data;
- The baselines use the most recently published data; however, this is sometimes two to three years old so doesn't reflect the exact current quantities; and
- Indirect impacts, such as those from the offsite manufacture of products or extraction of minerals, are outside the scope of the assessment, as it is not possible at this stage to determine where products will be manufactured, or minerals extracted etc.

11.4.5. Impacts associated with the transport of materials and waste are considered in their respective

[157] Mineral Products Association, 2020, Profile of the UK Mineral Products Industry: https://www.mineralproducts.org/MPA/media/root/Publications/2021/Profile_of_the_UK_Mineral_Products_Industry_2020_Spread.pdf
[158] https://www.cornwall.gov.uk/media/0mhnhvqe/south-west-aggregates-working-party-annual-report-2018.pdf
[159] National Association of Steel Service Centres, 2019. Annual Report 2018-2019. https://nass.org.uk/Publications/Publication4536/Annual%20Report%202018-2019.pdf
[160] https://environment.data.gov.uk/portalstg/home/item.html?id=23e73243c2da494f9370897173221885
[161] https://data.gov.uk/dataset/d409b2ba-796c-4436-82c7-eb1831a9ef25/2019-waste-data-interrogator
[162] Wiltshire & Swindon Minerals Core Strategy Development Plan Document 2006 – 2026, June 2009
[163] https://magic.defra.gov.uk/

chapters, including air quality (Chapter 4), noise and vibration (Chapter 5), population and human health (Chapter 12) and climate (Chapter 13).

11.5. Consultation

11.5.1. No consultation has occurred and is unlikely to take place in future for this chapter.

11.6. Baseline conditions

11.6.1. The baseline information presented in the following sections has been used to assess the Scheme's impact and determine the significance of the effect.

First study area – Material assets and waste current state

11.6.2. The current volumes (in the absence of the Scheme) of material asset use and waste generation are both assumed to be none as the Scheme will go through greenfield land.

11.6.3. A Ground Investigation Report (GIR) which provides a summary of the geological baseline will be produced at a later stage and will define ground conditions and identify any potential areas/sources of contamination which can then be dealt with through the design process with appropriate mitigation measures recommended.

First study area – Mineral safeguarding areas and peat resource current state

11.6.4. Mineral Safeguarding Areas (MSAs) are within the first study area as shown on Figure 11.1 in Volume 3. There are no peat resources identified within the first study area.

Second study area – Material assets current state

11.6.5. The baseline for the current availability of material assets required to construct the main elements of the Scheme is presented below.

11.6.6. Table 11-3 provides a breakdown of annual sales of material assets in South West England and the UK.

Table 11-3: Availability of material assets in South West England

Material assets	Annual sales in South West England (million tonnes)	Annual sales in UK (million tonnes)
Aggregate (crushed rock and sand & gravel)	30	179.9
Recycled & secondary Aggregate	2.7	71.0
Asphalt	2.2	25.4
Concrete (ready-mixed)*	3.1	54.2
Steel (finished steel products)	Not available	4.2

* cubic metres have been converted to tonnes using densities from Atkins Carbon Knowledgebase.

Table Source: Mineral Products Association: Profile of the UK Mineral Products Industry 2020, South West Aggregates Working Party Annual Report: 2018 and National Association of Steel Service Centres, 2019. Annual Report 2018-2019.

11.6.7. Table 11-4 presents the targets for use of recycled or secondary aggregates in construction of the Scheme. The target for South West England is 22% and will be used to assess the Scheme's

aggregate use.

Table 11-4: Recycled aggregate targets

Region	Recycled content target (alternative materials)	Total aggregate provision (million tonnes)
South West	22%	656
England	25%	3,908

Table Source: Design Manual for Roads and Bridges LA 110 material assets and waste (2019).

Second study area – Waste current state

11.6.8. The baselines to assess against for the Scheme's generation of wastes during construction are presented below.

11.6.9. The remaining landfill capacity data for the second study area, Wiltshire, is calculated by the Environment Agency and is presented in Table -11-5.

Table -11-5: Estimated remaining landfill capacity

Waste classification	Estimated remaining landfill capacity (m^3)
Non-hazardous	4,723,781
Hazardous	300,000

Table Source: Environment Agency Remaining Landfill Capacity 2020

11.6.10. The capacity of waste management infrastructure has been estimated from waste received at facilities within the second study area, Wiltshire. This data comes from Environment Agency and is presented in Table 11-6.

Table 11-6: Estimated waste management infrastructure capacity

Waste type (classification)	Estimated annual capacity (tonnes)
Non-Hazardous	881,151
Hazardous	189

Table Source: Environment Agency Waste Data Interrogator (2020) – based on 17 coded waste received at facilities in Wiltshire.

Second study area – Mineral safeguarding areas and peat resource

11.6.11. There are MSAs and habitats which could provide conditions for peat resources within the second study area. See Figure 11.1 and Figure 11.2 in Volume 3 for detail.

First study area – Mineral safeguarding areas and peat resource likely future state

11.6.12. The likely future state (in the absence of the Scheme) of MSAs and peat resources within the first study area are expected to remain the same due to the protection provided to them largely preventing development on or within them.

Second study area – Material assets likely future state

11.6.13. The likely future state of material asset use is expected to be very similar to the current state, potentially dropping slightly as fewer overall materials are used as aspects of the circular economy are embraced and more recycled materials are used.

Second study area – Waste likely future state

11.6.14. The likely future remaining landfill and management infrastructure capacity is shown in Figure 11-1 to Figure 11-4 below, for Wiltshire. The estimates use historic and current Environment Agency data and extrapolates it forward to 2028, the opening year of the Scheme.

Figure 11-1 - Estimated future remaining landfill capacity (non-hazardous and inert)

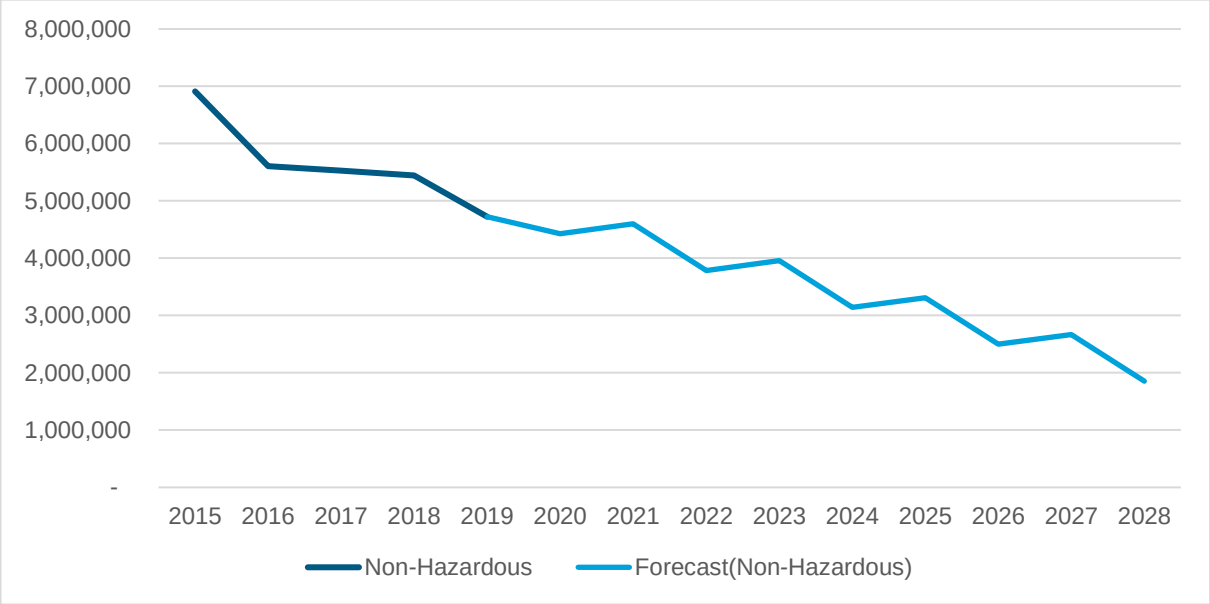


Figure 11-2 - Estimated future remaining landfill capacity

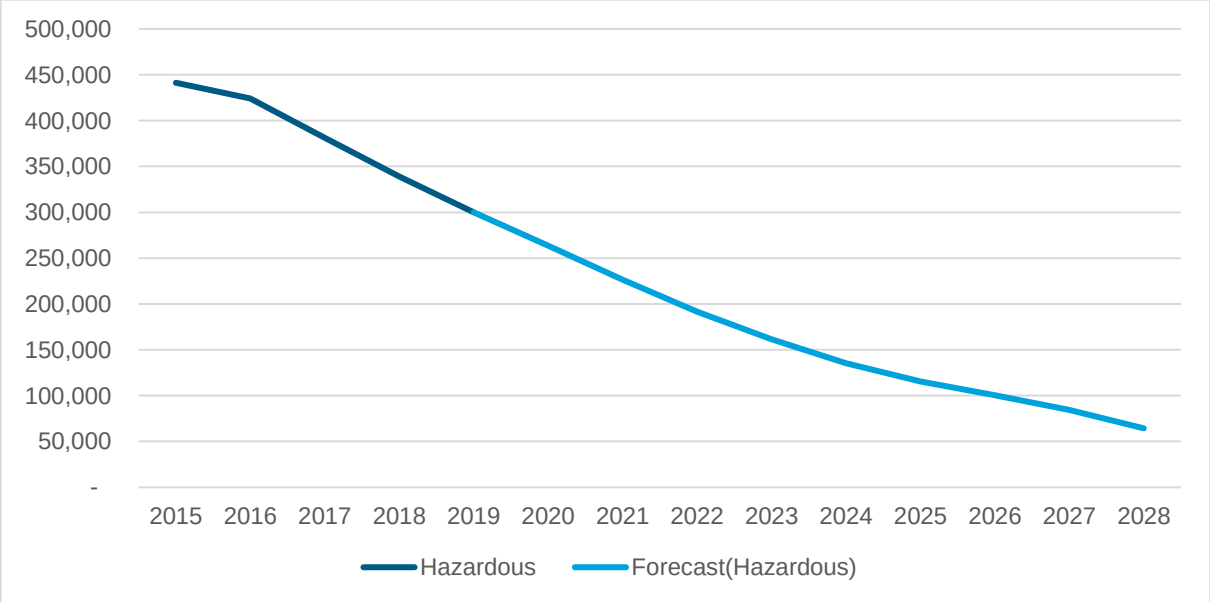


Figure 11-3 - Estimated future waste management infrastructure capacity (non-hazardous and inert)

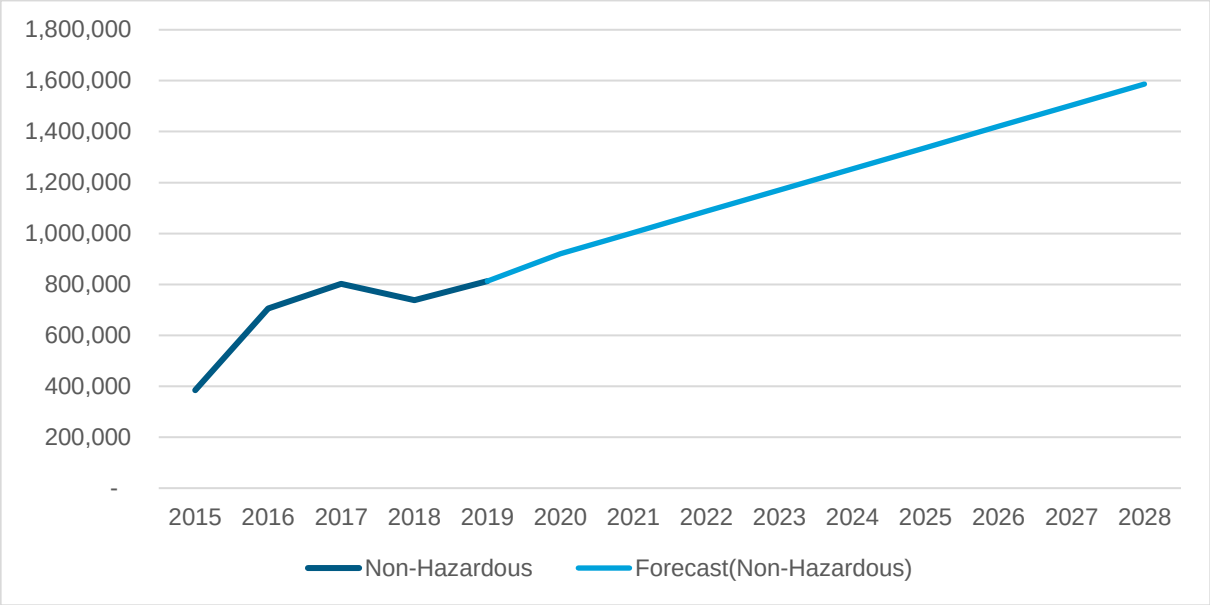
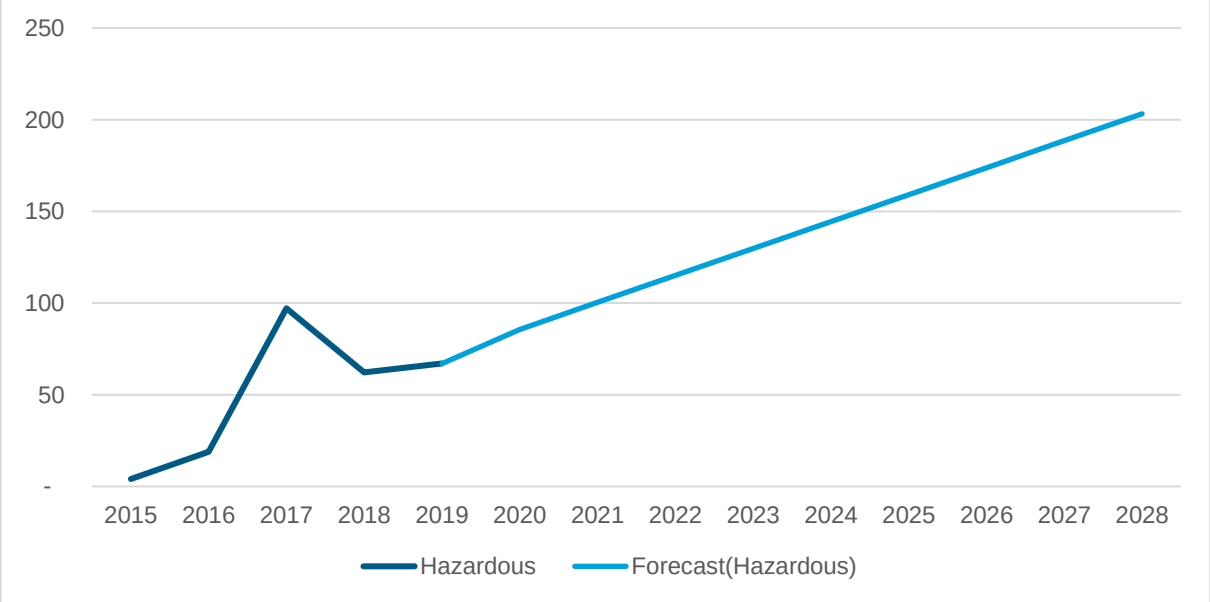


Figure 11-4 - Estimated future waste management infrastructure capacity (hazardous)



Second study area – Mineral safeguarding areas and peat resource likely future state

11.6.15. The likely future state (in the absence of the Scheme) of MSAs and peat resources within the second study area are expected to remain the same due to the protection provided to them largely preventing development on or within them.

11.7. Potential effects

11.7.1. Table 11-7 and Table 11-8 below present the potential effects, mitigation measures and residual effects on material assets and wastes during construction and operation.

11.7.2. Potential mitigation measures are summarised in the tables and more details are provided in section 11.8 below.

Construction

Table 11-7: Potential effects during construction

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
Regional material availability	Low	Consumption of resources to construct the Scheme.	Large	Implementation of a Material Management Plan Use recycled content in materials and components Use of off-site manufacture and modular construction Use reusable packaging and take back schemes for unused materials Set targets for landfill diversion and recycling Separate hazardous wastes from non-hazardous and inert waste	The construction of the Scheme is set to have a slight effect which is not significant on material assets. This is because the Scheme is likely to achieve 70-99% overall material recovery of non-hazardous CDW to substitute use of primary materials and is likely that aggregates required to be imported to site will comprise recycled content in line with the regional percentage target. This effect will be short-term, in that the demand will last the duration of the construction phase, but permanent, in that the result will be the loss of non-renewable resources. The Scheme does go through a mineral safeguarding area; however it is not likely to sterilise it, due to the extent of the MSA.
The regional waste infrastructure capacity	Low	Generation and disposal of waste to construct the Scheme (372,513 tonnes/ 255,146 m^3 of soil)	Moderate		The construction of the Scheme is set to have a neutral effect on waste. This is because at this stage the only construction waste identified, from excavation, is all to be reused on site, therefore no waste will require management or disposal off site.
The regional landfill void capacity	Low		Large		

Operation

Table 11-8: Potential effects during operation

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
Regional material availability	N/A – scoped out	N/A – scoped out	N/A – scoped out	N/A – scoped out	N/A – scoped out
The regional waste infrastructure capacity	N/A – scoped out	N/A – scoped out	N/A – scoped out	N/A – scoped out	N/A – scoped out
The regional landfill void capacity	N/A – scoped out	N/A – scoped out	N/A – scoped out	N/A – scoped out	N/A – scoped out

11.8. Potential mitigation measures

11.8.1. Mitigation measures suggested follow the waste hierarchy to reduce, reuse, recycle and recover.

Figure 11-5 - Waste Hierarchy

Embedded mitigation

11.8.2. The assessment has been undertaken with consideration of embedded mitigation and good practice which could be used during construction.

11.8.3. Reduction and reuse can be achieved on the Scheme through the implementation of a Material Management Plan which would be produced under the CL:AIRE Definition of Waste: Code of Practice (DoWCoP) for the reuse of soils within the Scheme boundary. A MMP would be produced in conjunction with the Principal Contractor and a declaration submitted by a Qualified Person registered with CL:AIRE. A tracking system would be established and used to track the movement, storage and placement of excavated materials within the Scheme. Upon completion of the works, a verification report would be submitted to CL:AIRE. A MMP can allow the Scheme to achieve a cut/fill balance.

11.8.4. The Principal Contractor can reduce primary material use through a commitment to achieve, at minimum, the 22% recycled content target for the region (as set out in Table E/1.2 of DMRB LA 110).

11.8.5. Actions that can also be taken by the Principal Contractor include off-site manufacture of components and use of modular construction and other modern methods of construction. These methods of construction aid material optimisation and waste reduction on site during construction as well as assisting de-constructability and de-mountability of elements (in the case of modular construction) at the end of first life.

11.8.6. Discussions can also take place with the supply chain to use reusable packaging and take back unused materials, instead of them being disposed of.

11.8.7. To support the recycling and recovery aspect of the waste hierarchy, the Principal Contractor can set a target to recycle or recover at least 70% (by weight) of wastes that leave site in accordance with the Waste Framework Directive, therefore diverting them from landfill. When wastes are removed they would be managed as close as possible to site to support the proximity principle.

11.8.8. Waste that cannot be recycled or recovered, such as hazardous wastes (if any is generated), including any contaminated soil, would be identified, removed, and kept separate from other construction wastes, in order to avoid contaminating ‘clean’ materials.

11.8.9. Further to the above, mitigation measures associated with transport of materials and waste and greenhouse gas emissions have been identified in their respective chapters of this PEAR.

11.9. Further work

11.9.1. When more detailed information is known about material asset use and waste generation, this assessment will need to be updated to reflect any changes.

11.10. Summary

11.10.1. A material and waste assessment has been undertaken for the Scheme in accordance with DMRB LA 110.

11.10.2. The chapter has summarised the effect from material asset use and waste generation without mitigation, which is shown to be large for material assets and moderate/large for waste.

11.10.3. Mitigation that follows the waste hierarchy can be applied during design and construction which can lead to material and waste reduction, reuse, recycling, and recovery.

11.10.4. Assessment following application of the mitigation measures demonstrates that during construction, the effect of material asset use is estimated to be slight and for waste generation it is estimated to be neutral, this is based on the Scheme meeting the following criteria (from

11.10.5. Table 11-1):

Material Assets

- 1) project achieves 70-99% overall material recovery / recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and
- 2) aggregates required to be imported to site comprise re-used/recycled content in line with the relevant regional percentage target.

Waste

- 1) no reduction or alteration in the capacity of waste infrastructure within the region.

11.10.6. As shown in Table 11-2 a neutral or slight effect is classified as not significant.

11.10.7. Assessment for operation has been scoped out as it is considered that during operation (defined in DMRB LA 110 as the opening year) there will be negligible material asset use or waste generation.

12. Population and Human Health

12.1. Introduction

12.1.1. This chapter provides the preliminary environmental assessment of the potential environmental effects on population and human heath from construction, operation, and maintenance of the Scheme.

12.1.2. In terms of the population aspect of the chapter, the Scheme has been assessed against the following Land Use and Accessibility topics:

- Private property and housing;
- Community land and assets;
- Development land and businesses;
- Agricultural land holdings; and
- Walkers, cyclists, and horse-riders (WCH).

12.1.3. Note, the agricultural land holdings assessment includes an assessment of potential effects of the Scheme on commercial agricultural land holdings and associated infrastructure, but not agricultural soils and land quality which are assessed separately in Chapter 9, Geology and Soils.

12.1.4. In terms of human health, the Scheme has been assessed against the following wider determinants of health which have been carefully chosen due to the nature and location of the Scheme:

- Air pollution;
- Soil and water pollution;
- Noise pollution and vibration;
- Landscape and visual amenity;
- Risk of injuries and death;
- Active travel;
- Work and training;
- Access and accessibility to housing;
- Education, healthcare services, and other social infrastructure; and
- Social cohesion and lifetime neighbourhoods

12.1.5. The assessment represents a detailed but high-level assessment, based on desk-top analysis only. No surveys or consultations have been conducted. More detailed assessment will be carried out in future stages of the assessment, as appropriate.

12.2. Planning policy

12.2.1. The following section provides a high-level review of the national, regional, and local planning policy and guidance that has been considered in the baseline and assessment, providing direction on relevant issues such as the environment, health, land use and economic activity. A more detailed description of some of these policies is described in Appendix C.1, Volume 2, where appropriate.

able 12-1 – National planning policy and guidance

National planning policy	Relevance to population and human health assessment/ sensitive receptors
National Planning Policy Framework (2021) (NPPF)[164]	The NPPF promotes environmental protection, healthy lifestyles, and sustainable transport, and supports economic growth, all of which are relevant to the Scheme. The sustainable transport policy in the NPPF

164 Ministry of Housing, Communities & Local Government (2021) (link: National Planning Policy Framework (publishing.service.gov.uk))

National planning policy	Relevance to population and human health assessment/ sensitive receptors
	promotes integrated transport and spatial planning solutions, with a presumption in favour of sustainable development.
National Planning Practice Guidance (NPPG)	National Planning Practice Guidance provides supplementary guidance on several sub-topics which are relevant to the assessment, including air quality (November 2019, healthy and safe communities (November 2019, and the natural environment (July 2019), to assist with planning applications and/or strategic development.
Countryside Rights of Way Act (2000)	CRoW 2000 regulates all PRoW and ensures access to them. It requires local highways authorities to publish a Rights of Way Improvement Plan (RoWIP), which should be reviewed every 10 years. CRoW 2000 also obliges that the highway authority recognises the needs of the mobility impaired when undertaking improvements.

12.2.2. The Development Plan for Wiltshire includes the Wiltshire Core Strategy, incorporating saved policies from district local plans, Chippenham Site Allocations Plan, Wiltshire Housing Site Allocations Plan, Minerals and Waste Plans and made Neighbourhood Plans. A summary of the main local plan policies is set out below.

Table 12-2 – Local planning policy

Local planning policy	Relevance to population and human health assessment/ sensitive receptors
Wiltshire Core Strategy (2015)	The Wiltshire Core Strategy Development Plan Document (CS DPD) was formally adopted on 20 January 2015. The CS DPD provides a positive and flexible overarching planning policy framework for Wiltshire for the period up to 2026. The CS DPD covers the whole of Wiltshire (excluding Swindon) and sets out the strategic vision, key objectives, and overall principles for development in the county. Planning for job growth and meeting the needs of business are central to this. The overarching priorities are to help build and protect resilient communities, by creating an economy that is fit for the future, reduces disadvantage and inequalities, and tackles the causes and effects of climate change
Saved Policies of the West Wiltshire District Plan (First Alteration June 2004)	Saved policies not replaced by the Wiltshire Core Strategy will continue to be saved until replaced by policies in a subsequent plan. They sit alongside the policies of the Core Strategy for strategic and decision-making purposes.
Wiltshire Housing Site Allocations Plan (Feb 2020)	The Wiltshire Housing Site Allocations Plan revises, where necessary, settlement boundaries and allocates new sites for housing, including in Melksham, to ensure the delivery of homes across the plan period.
Wiltshire Council Local Plan (Looking to the future) – Planning for Melksham (January 2021)	This Local Plan Review document has been produced by Wiltshire Council to develop the strategy for what Melksham will look like in the future. It seeks the views of the local community on how much the town should grow, what priorities should be tackled, and where development should take place. It seeks opinions on the key priorities for Melksham, such as an A350 bypass and alleviating pressure on community services and transport infrastructure in the town, and how this should be achieved.

12.2.3. The following health and community legislation, policy, strategies, and plans have also been considered in the baseline and assessment.

Table 12-3 – Health legislation, policy, strategies, and plans

Legislation, policy, strategy, or plan	Relevance to population and human health assessment/ sensitive receptors
Fair Society, Healthy Lives (the Marmot Review) 2010[165]	This Review highlights the need for economic and social development, bringing jobs, better transport links and other benefits to local communities, which can help to reduce health inequalities. The Scheme can also help to integrate transport network improvements with planning, housing, environmental and health systems to address social determinants of health in the local area.
Health and Social Care Act 2012[166]	Impacts from development has the potential to affect the physical and mental health or social wellbeing of the local population, which can have impacts on public health, and health and social care provision. At the local level, The Health and Social Care Act gives local authorities the responsibility for improving the health of their local populations. Health and wellbeing information for the NHS commissioning area, Wiltshire Clinical Commissioning Group, Wiltshire local authority, Wiltshire Health and Wellbeing Board, and Melksham Area Board Health and Wellbeing Group has been used to inform the baseline and assessment.
[Public Health England] Strategy 2020 to 2025 (2019)[167]	The PHE Strategy sets out how Public Health England will work to protect and improve the public's health and reduce health inequalities to 2025. This is guided by several key aims to keep people safe, prevent poor health, narrow the health gap, and support a strong economy.
The Wiltshire Community Plan 2011 - 2026	The vision for Wiltshire is to build stronger and more resilient communities, and greater localism lies at the heart of this. The Council want to encourage and support communities to take the initiative to strengthen their ability to deal with local challenges and issues in creative ways which are tailored to their unique circumstances.
Wiltshire Health and Wellbeing Joint Strategic Needs Assessment (JSNA) 2017/18	The JSNA uses current data and evidence about health and wellbeing in Wiltshire, to highlight the health needs of the whole community. It demonstrates how needs may vary for different age groups, as well as identifying health differences for disadvantaged or vulnerable groups. The JSNA looks at a wide range of factors that help shape and influence the health and wellbeing of individuals, families, and local communities such as education, employment, housing, transport, and the environment
Wiltshire Health and Wellbeing Strategy 2019-2022	The Health and Wellbeing Strategy is a shared strategy, which aims to improve the health and wellbeing of the local population, reduce inequalities and promote the integration of services. It uses the analysis and data from the JSNA, to help identify and agree the key ambitions for our population which as a Health and Wellbeing Board we will work together to deliver

12.2.4. The following strategies have also been considered.

165 Fair Society Healthy Lives full report (parliament.uk)
166 Health and Social Care Act 2012 (legislation.gov.uk)
167 PHE Strategy 2020-25 (publishing.service.gov.uk)

Table 12-4 – Other strategies

Legislation, policy, strategy, or plan	Relevance to population and human health assessment/ sensitive receptors
Local Transport Plan (LTP3) (2011-2026)	LTP3 highlights that the transport system in Wiltshire needs to support economic growth, reduce disadvantages and inequalities, and tackle the causes and effects of climate change. This includes the need to ease congestion at significant 'hot spots' and maintain journey time reliability on key routes. Key goals include: • Reducing the risk of death or injury due to transport accidents; • Reducing the impacts of transport on public health, including air quality; • Enhancing social inclusion by enabling disadvantaged people to access key services, goods and opportunities; • Contributing to the reduction in the gap between economic growth rates for different areas; • Reducing the number of people exposed to high levels of noise from road networks; and • Improving the experience of end-to-end journeys for transport users.
Swindon and Wiltshire Strategic Economic Plan 2016	The SEP highlights that none of the main north-south road connections in the wider sub-region (such as the A350) are fit for purpose and the increasing unreliability of these routes is significantly constraining business and development growth. As a result, Strategic Objective 2 'Transport infrastructure improvements' seeks to achieve a well-connected, reliable and resilient transport system to support economic and planned development growth at key locations. This will be achieved partly through the delivery of key road junction and infrastructure improvements.

12.3. Study area and PEAR methodology

Study area

12.3.1. By using professional judgement, industry best practice and knowledge from the assessment of other highways schemes, including offline options, the likely effects of the Scheme on population and human health will predominantly be assessed within a core study area comprising a 500 m buffer from the Scheme design extent boundary, however other study areas will also be used to develop an understanding of the characteristics and sensitivity of local communities and key receptors which could be impacted by potential impacts/ effects arising from the Scheme. The following study areas will be used:

Table 12-5 – Descriptions of the study areas to be used in the assessment

Study area	Explanation
Core study area (based on the construction footprint/ Scheme boundary, plus a 500m area extending outwards)	From a population and human health perspective, this 500 m core study area is likely to capture the key sensitive receptors which have the potential to be affected by the Scheme. Within this core study area, the level of potential disruption effects on population and human health/ receptors will generally be considered on the basis that the closer the proposed works occur to sensitive receptors (e.g. residential properties would be the physical receptor; the residents/occupants living within these residential properties would be the human receptors), the more mitigation may be required (e.g. close to the proposed works or more directly affected, as opposed further away) – bearing in mind that some of the human receptors may be particularly vulnerable or susceptible to changes to the baseline conditions.

Study area	Explanation
Agricultural land study area	At this stage, the boundaries of most agricultural enterprises is unknown; therefore, for most of the alignment, the study area is the agricultural land which falls within the Scheme's design extent boundary, taking into account future dualling and ponds. The exceptions are two holdings, Snarlton Farm, a dairy farm (ST925 635) and Oakley Farm, a free-range egg producer (ST939 656) which are very highly sensitive to land take effects and severance. For these two farms the study area is extended to include the whole holding.
Wider study area (1) (used to define the characteristics and sensitivity of local communities and the context within which the local economy operates)	For human health, a wider study area is required to encompass the communities and areas that have the potential to be directly or indirectly affected by the Scheme. The selection of the following community area, Lower Layer Super Output Areas (LSOAs) and wider local authority and regional areas will be used, which has been informed by the nature, extent, and characteristics of the Scheme. This wider study is generally defined to include: • The Melksham Community Area • Selected LSOAs[168]; • The Wiltshire local authority area; • The wider region.
Wider study area (2) (used to define the characteristics of population and human health and health inequalities)	For human health, this wider study area encompasses the health profiles of the communities and areas that have the potential to be directly or indirectly affected by the Scheme. This includes the areas within which the local and regional National Health Service (NHS) organisations operate, and health statistics/ findings are reported.
Other study areas	Effects for human health are largely derived from changes to the wider health determinants covered by the other technical assessments undertaken in the PEAR (e.g. Air Quality, Noise Pollution and Vibration, Geology and Soils). Consequently, the study areas defined within each contributing technical chapter will also apply.

12.3.2. These study areas will be further reviewed during the detailed assessment stage and may be increased or decreased should relevant considerations become known.

Assessment criteria

12.3.3. The assessment methodology is based on guidance provided in National Highways (former Highways England) Design Manual for Roads and Bridges (DMRB) guidance document LA112 Population and human health[169] and IEMA guidance[170] [171].

Population (land-use and accessibility)

12.3.4. The assessment will describe the nature and scale of the likely impacts/ effects of the Scheme (Beneficial, Neutral or Adverse) on land-use and accessibility covering the land use and accessibility types: Private property and housing, community land and assets, development land and businesses, and agricultural land holdings. It will also describe any potential changes to

[168] Lower Layer Super Output Areas (LSOA) are a geographic hierarchy designed to improve the reporting of small area statistics in England and Wales
[169] LA 112 Population and human health, Design Manual for Roads and Bridge, Highways England (2019) (source (standardsforhighways.co.uk)
[170] Cave B, et al. Health in Environmental Impact Assessment: a primer for a proportionate approach. Lincoln, England, Ben Cave Associates Ltd, IEMA and the Faculty of Public Health. 2017
[171] Assessing Health and Wellbeing. IEMA, 2016

walking, cycling and horse-rider (WCH) provision.

12.3.5. Where the requirement to acquire land and assets is likely to result in significant effects, either through direct land take or the restriction of accessibility/ introduction of severance, a more detailed assessment will be undertaken at the future stages.

Sensitivity criteria

12.3.6. The sensitivity of land use and accessibility receptors will be reported in accordance with the criteria set out in Table C.2 in Appendix C, Volume 2. In accordance with DMRB LA112, the sensitivity value of receptors will be reported as Very High, High, Medium, Low or Negligible.

12.3.7. For development land and businesses, a higher sensitivity score than stated can be allocated, for example where a business is the main source of employment for a community with little or no provision for substitution.

12.3.8. DMRB LA112, in contrast to its predecessor, provides precise descriptions of environmental sensitivity (value) for commercial farms.

Magnitude of impact

12.3.9. The magnitude of likely change to the baseline conditions as a result of the Scheme shall be reported in accordance with the criteria set out in Table C.3 in Appendix C. Magnitude will be reported as Major, Moderate, Minor, Negligible or No change.

Significance of effects

12.3.10. Significance of effects shall be derived for each element of the land use and accessibility sub-topics by combining the assigned value (sensitivity) of receptors with the magnitude of impact, as shown in Table C.4 in Appendix C.

12.3.11. Where Table C.4, Appendix C identifies two potential effects outcomes e.g. Moderate (significant) or Large (significant), or Slight (not significant) or Moderate (significant), professional judgement has been applied in each instance to determine the appropriate level of significance.

12.3.12. Any significance of effects considered to be Very Large, Large or Moderate will be deemed to be significant and those Slight or Neutral, to be not significant.

Human health

Assessment criteria

12.3.13. Using professional judgement and best practice guidance, the human health assessment is based upon DMRB LA 112 and IEMA guidance contained in ‘Health in Environmental Impact Assessment: A Primer for a Proportionate Approach’ and the World Health Organisation (WHO) definition of health used by the public health profession in the UK. Here, health is defined as a ‘a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity’.

12.3.14. Every human being has the fundamental right to enjoy the highest attainable standard of health without distinction of race, religion, political belief, economic or social condition. Therefore, a further consideration in the assessment is the distribution of effects (demographic, socio-economic, geographic) within the affected population.

Identifying the sensitive receptors

12.3.15. In general terms, the assessment considers the potential health impacts of the Scheme on two types of population. The first is the general or wider population (e.g. workers and contractors constructing the Scheme, workers at nearby local businesses, residents living in houses, operators and users of community land and facilities, users of footpaths and PRoW, users of open space,

recreation and leisure facilities, and public transport users). The second is vulnerable groups in the study area, who may be more susceptible to impacts arising from the Scheme.

12.3.16. The baseline study has identified the following vulnerable or sensitive groups within the study area, which have been included for assessment.

- Families with children and adolescents (e.g. pregnant women, babies, children and adolescents);
- People who are physically or mentally disadvantaged (e.g. elderly people, people with physical and/or disabilities, people with other health problems or impairments); and
- People who are materially disadvantaged (e.g. people on low income, people without access to a car, unemployed people).

12.3.17. These vulnerable groups are not mutually exclusive e.g. an individual may fit into one or more of these categories.

Wider health determinants

12.3.18. Wider health determinants are a diverse range of social, economic, and environmental factors which influence people's mental and physical health, and social wellbeing. Based on IEMA guidance, the population and human health assessment considers several environmental, social, and economic aspects relevant to the Scheme. As a result, the following wider health determinants have been chosen for assessment:

- Natural environment – air pollution, soil and water pollution;
- Built environment – risk of injuries and death; active travel;
- Local economy – work and training;
- Community – access and accessibility to housing; education, healthcare services and other social infrastructure; social cohesion and lifetime neighbourhoods;
- Activities – active travel; and
- Lifestyle – noise pollution and vibration.

12.3.19. The sensitivity of receptors depends on whether the receptor is likely to be directly or indirectly impacted by changes to the wider health determinants caused by the Scheme and whether the receptors are well placed to deal with any of these changes. The sensitivity of receptors will be reported as follows.

1. low;
2. medium; or
3. high.

12.3.20. The health impacts (both beneficial and adverse) of the Scheme depends on the sensitivity of the receptors to changes to the wider health determinants. The likely health outcome(s) arising from the Scheme have been described using four broad categories/ direction of change: Positive, Neutral, Negative, and Uncertain, as described in Table 12-6.

Table 12-6 – Human health outcome categories

Health outcome category	Health outcome description
Positive	A beneficial health impact is identified
Neutral	No discernible health impact is identified
Negative	An adverse health impact is identified
Uncertain	Where uncertainty exists as to the overall health impact

12.4. Assumptions and limitations

12.4.1. Whilst it is possible to identify some changes to the wider health determinants likely to arise from the Scheme which could impact health, health outcomes are dependent on multiple factors, some of which rest with individuals and/or lie outside the powers or influence of physical infrastructure and/or planning decisions.

12.4.2. Identifying the impacts/ effects of the Scheme on population and human health and their significance will therefore be a largely qualitative exercise. The findings are based upon a proportionate, high-level desk-based study only of the study area and information available at the time of writing, along with consultants' professional judgement and knowledge based on previous similar schemes.

12.4.3. No site visits have been undertaken to inform the assessment and no specialist mapping or address based services have been used to identify exact receptors. Information, where relevant, has been used from the other technical assessments (e.g. Air quality, Geology and Soils) to help assess the impacts of the Scheme on some of the wider determinants of health/ receptors.

12.4.4. For agricultural land holdings, a preliminary assessment for the purposes of consultation has been based on the following data gathered to date:

- Analysis of agricultural land use, taken from recent and historic Google Earth imagery; and
- Confirmation of a dairy farm and free-range egg producer from on-line farming directories.

12.4.5. The main limitation at this stage is lack of certainty over the boundaries and size of most of the affected agricultural land holdings. This can only be established by interviews with landowners, and these will be carried out at the future detailed assessment stages.

12.4.6. Flood compensation areas have not yet been identified and may be required as part of the measures to mitigate the impacts of the Scheme. Here the land will be lowered, and its agricultural quality reduced so that it may be suitable only for permanent grass.

12.4.7. A detailed assessment will be reported at the future assessment stage when consultee comments and any further Scheme/ design details can be considered.

12.5. Consultation

12.5.1. No consultation has been directly carried out with any consultees or affected landowners for the purposes of this chapter. Landowner engagement has begun to commence, and any feedback received will be used to further develop the design and inform the future assessment(s).

12.6. Baseline conditions

12.6.1. Baseline data collection for this chapter has, to date, principally involved the high-level collection from a variety of data sources. This includes:

- ONS 'Mid-2019 Population estimates' data by Lower-layer Super Output Area;
- A350 Melksham WebGIS viewer;
- OS 1:25,000 map;
- Google mapping services;
- Wiltshire Core Strategy maps ArcGIS;
- Wiltshire Core Strategy 2015;
- Wiltshire Core Strategy policy maps: Melksham Community Area map;
- ONS NOMIS 2018;
- Wiltshire Health and Wellbeing Strategy 2019-2022; and
- Wiltshire Intelligence – Bringing Evidence Together (Melksham Community Area).

12.6.2. The search for relevant planning applications and allocated residential and employment generating development within the study area was undertaken in May 2021.

12.6.3. Agricultural baseline data collected for the assessment comprises farm sizes and land use. For farm holdings owned by Wiltshire Council, this data is provided by consultation with the senior estates' manager. Information on other farm holdings has been obtained from Google Earth imagery and yell.com online farm listings. Agricultural landowners and occupiers have not been consulted at this stage.

12.6.4. The following sections provide a high-level overview of the population and health baseline conditions for the study area(s), including key receptors and key issues identified. More detailed information will be provided at the future detailed stage.

Melksham profile

Table 12-7 – Melksham profile

Baseline type	Description of characteristics
General profile	Melksham has a strong employment and manufacturing base and benefits from having fast access to the motorway network. The proximity of the market towns of Trowbridge, Chippenham, and Devizes (and the city of Bath and Swindon only 30 and 45 minutes away respectively) ensures strong competition between these centres for economic advantage.
Melksham town centre	Melksham town centre provides a range of local services and convenience shopping; however, it needs regeneration, and the retail offer has suffered for a number of years. Community and health facilities in Melksham are under pressure, with most GP surgeries and primary and secondary schools at capacity. The strategy for Melksham set out in the CS DPD is to ensure that an appropriate and balanced mix of housing and employment growth is managed to provide contributions to town centre improvement and delivery of enhanced services within the town.
Local economic profile	A high-level review of publicly available information identifies the below general economic profile: Low levels of unemployment, however a large number of jobs are supplied by a single employer which has the potential to leave the town vulnerable to mass job losses; Population statistics show that capacity exists within the labour market to accommodate future growth, however there is a high degree of economic out-commuting, with large numbers of residents travelling to work in the nearby larger centres; Melksham has an important strategic employment role; it is located on the A350 and forms part of the key A350 employment growth area; There are good opportunities to expand the employment base; There is a very limited supply of employment sites and premises in Melksham; There are several brownfield sites in the town which provide good regeneration opportunities; Town centre vacancies are below the national average; and There is no capacity for additional convenience retail floorspace, however there is small capacity for comparison retail floorspace.
Local/ Planning issues	Specific issues to be addressed in planning for Melksham include: Residential growth is required to address the shortfall in affordable housing and contribute towards delivering improved infrastructure;

Baseline type	Description of characteristics
	Growth needs to contribute towards town centre regeneration, including traffic management and revitalisation of the retail and employment offer; Improving Melksham town centre is a priority. Wherever possible, key community services should be located within or well related to the town centre. This should include consideration of how to best provide for the proposed new community campus for the town; Further employment growth will help to further diversify the employment base, providing protection against changes in the employment market. The investment of current employment sites, such as Bowerhill Industrial Estate, remains a priority; New school capacity is needed for the area which will need to be met by expansion of current schools or through additional schools; There is need to increase the capacity of GP surgeries. Additional cemetery capacity is also needed; and Opportunities to maximise the benefits of the Wiltshire and Berkshire Canal will be supported.

Population and human health baseline

12.6.5. To gather a general understanding of the key population and human health issues in the core study area (i.e. within 500 m of the design extent boundary of the Scheme), small area population estimates have been used. This involves Lower-layer Super Output Area (LSOA) population estimates data for Lacock & Gastard east, Melksham Spa – south, and Beanacre & Bowerhill (part) x 2.

Table 12-8 – LSOAs for the cover study area which are relevant to the assessment

ONS Area Codes	LSOA name	LA (2019 boundaries)	LSOA	Map reference (see Figure 12.1 below)
E01031942	Lacock & Gastard east	Wiltshire	Wiltshire 018E	125
E01032069	Melksham Spa - south	Wiltshire	Wiltshire 022E	222
E01032070	Berryfield & Bowerhill (part)	Wiltshire	Wiltshire 021D	223
E01032071	Beanacre & Bowerhill (part)	Wiltshire	Wiltshire 021E	224

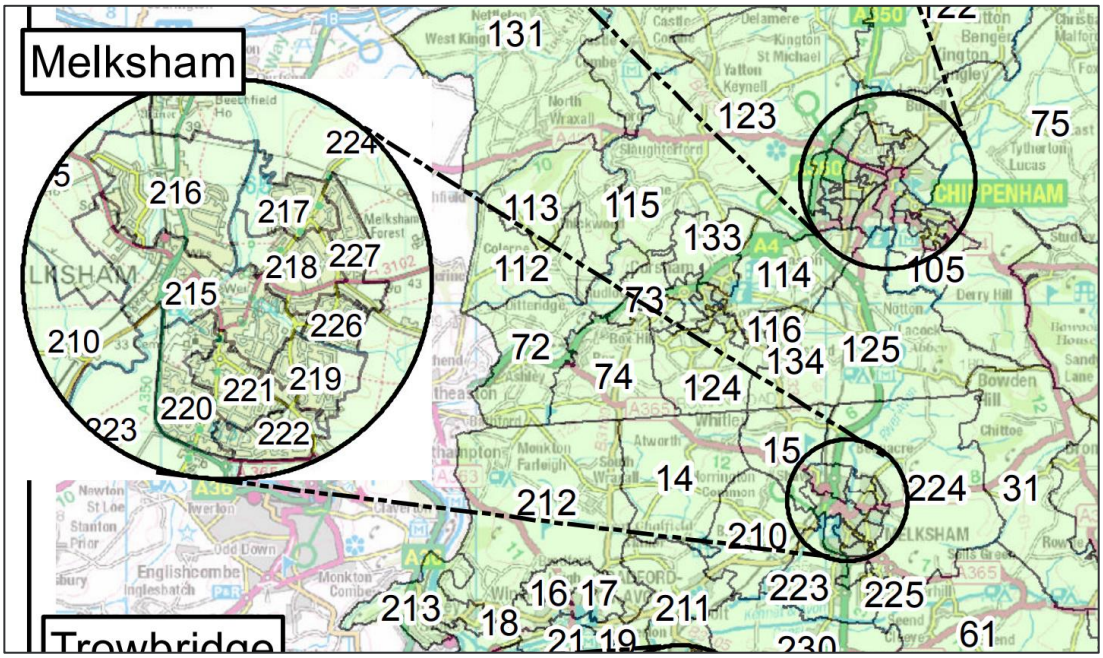
12.6.6. To gain an understanding of the profile of the wider study area, LSOA population estimates data and Community Area population estimates data have been used, as described below. All are based on the ONS mid-2019 population estimates.

Table 12-9 – LSOAs for the wider study area which are considered relevant to the assessment

ONS Area Codes	LSOA name	LA (2019 boundaries)	LSOA	Map reference (see Figure 12.1 below)
E01032057	Broughton Gifford	Wiltshire	Wiltshire 021C	210
E01032062	Melksham North - south west	Wiltshire	Wiltshire 022A	215
E01032063	Melksham North - north west	Wiltshire	Wiltshire 020A	216
E01032064	Melksham North - north east	Wiltshire	Wiltshire 020B	217
E01032065	Melksham North - south east	Wiltshire	Wiltshire 020C	218

ONS Area Codes	LSOA name	LA (2019 boundaries)	LSOA	Map reference (see Figure 12.1 below)
E01032066	Melksham Spa - east	Wiltshire	Wiltshire 022B	219
E01032067	Melksham Spa - west	Wiltshire	Wiltshire 022C	220
E01032068	Melksham Spa - central	Wiltshire	Wiltshire 022D	221
E01032072	Bowerhill south	Wiltshire	Wiltshire 021F	225
E01032073	Melksham Woodrow - south	Wiltshire	Wiltshire 020D	226
E01032074	Melksham Woodrow - north	Wiltshire	Wiltshire 020E	227

Figure 12-1 – Map showing LSOAs relevant to the assessment



12.6.7. Melksham Community Area covers 99km² and only one town, Melksham. It covers 11 parishes, including Melksham Parish which covers the central core of Melksham and Melksham Without, and also the outer areas of Melksham such as Bowerhill, Berryfield and Beanacre.

12.6.8. The key population and human health issues for the LSOAs that the Scheme runs through (Berryfield & Bowerhill (part) & Beanacre & Bowerhill (part)), the wider LSOAs, and Melksham Community Area[172] considered relevant to the assessment are described in Table 12.10 as follows:

[172] melksham-2020_43409200-2.pdf (wiltshireintelligence.org.uk)

Table 12-10 – Key population and human health issues for the LSOAs and Melksham Community

Baseline type	Characteristics of the LSOAs that the Scheme runs through (Wiltshire 018E, Wiltshire 022E, Wiltshire 021D, Wiltshire 021E)	Characteristics of the wider LSOAs considered relevant to the assessment (see Table 12.9)	Characteristics of Melksham Community Area	Relevance to the assessment
Population	8,793 people live in the LSOAs that the Scheme falls within/ runs through This accounts for approximately 1.8% of the total population of Wiltshire	21,989 people live in the LSOAs identified for assessment This accounts for approximately 4.4% of the total population of Wiltshire	30,770 people live in the Melksham Community Area. This accounts for approximately 6.2% of the total population of Wiltshire	There is a large resident population in the LSOAs and Melksham Community Area which makes up the wider study area. Transport infrastructure can have a range of positive and negative effects on people, communities, and places. Positive effects include opportunities for walking and cycling and improved access to jobs, education, shops, social support networks, health services and the countryside. There can also be negative effects such as pollution, danger, noise, stress and anxiety, land loss and planning blight, and changes in accessibility (positive or negative) to established communities.
Working age population	A lower working age population (aged 18-64) (47%) than for the wider Wiltshire area (59%) and England (60%)	A lower working age population (aged 18-64) (43%) than for the wider Wiltshire area (59%) and England (60%)	A slightly lower working age population (aged 18-64) (56%) than for the wider Wiltshire area (59%) and England (60%)	There is a large working age population in the wider study area. Transport infrastructure can have a range of positive and negative effects on workers. Positive effects include opportunities for improved access to jobs and other facilities. There can also be negative effects such as congestion, journey uncertainty, increased journey times and delays, pollution, danger, and a range of environmental and amenity effects.
Working age population (on benefits)	Now known, without further assessment	Now known, without further assessment	6% of the working age population are on out of work benefits	
Population change	Now known, without further assessment	Now known, without further assessment	A higher increase in population since 2015 (3.1%) than for the wider Wiltshire area (2%)	In the years 2016 to 2036, the following population changes are expected for Wiltshire:

Baseline type	Characteristics of the LSOAs that the Scheme runs through (Wiltshire 018E, Wiltshire 022E, Wiltshire 021D, Wiltshire 021E)	Characteristics of the wider LSOAs considered relevant to the assessment (see Table 12.9)	Characteristics of Melksham Community Area	Relevance to the assessment
				An Increase in the older population (26% increase in the 60-74 age group and 83% in the 75+ age group); A 3% decrease in the 0-14 age group; A 4% increase in the 15-29 age group; No change in the 30-44 age group; and A 16% decrease in the 45-59 age group. This would increase the pressures on existing infrastructure and community services in Melksham, such as the A350 and local road network, school provision and access to a GP and other essential services. In Melksham and Wiltshire, congestion and a lack of transport investment are contributors to lower economic performance, inequalities, poverty, and health issues. If nothing is done, the predicted growth in employment, population and housing in/around Melksham will exacerbate the current problems.
Gender	The same proportion of males (50%) to females (50%)	A slightly higher proportion of females (51.1%) than males (48.9%)	A slightly higher proportion of females (51.2%) than males (48.8%)	Some people express concerns about using public transport and /or accessing local services and workplaces because of their gender or because they need to travel at certain times of the day or night. These concerns include walking to and waiting at bus stops. Women travellers may be more reliant and feel more sensitive using public transport, noting that women carry out a

Baseline type	Characteristics of the LSOAs that the Scheme runs through (Wiltshire 018E, Wiltshire 022E, Wiltshire 021D, Wiltshire 021E)	Characteristics of the wider LSOAs considered relevant to the assessment (see Table 12.9)	Characteristics of Melksham Community Area	Relevance to the assessment
				higher number of journeys on public transport, such as local bus stages, per person per year.
Younger people	A slightly higher proportion of younger people (under 16) (20%) than the wider Wiltshire area (19%) and the same as for England (20%)	The same proportion of younger people (under 16) (19%) as the wider Wiltshire area (19%) and a slightly lower proportion than for England (20%)	A higher proportion of 10 to 11-year olds that are obese or overweight (32%) than the wider Wiltshire area. This equates to almost 1 in 3 children in Year 6	Children and adolescents constitute a sensitive population group due partly to their need to be able to move around freely to and from home, school, community facilities, open space, greenspace and recreational activities, whilst they lack the experience and judgement displayed by adults when moving around in traffic, near construction sites, in public spaces and when using public transport. Children and adolescents are at elevated risk from danger distributed by motorised transport, such as at roads and crossing points. Children and adolescents are more sensitive than working age adults to impacts from air pollution, noise, odour and other environmental factors and their bodies and minds are less able to deal with them. Those with existing health issues (e.g. asthma, allergies, some types of cancers) are particularly susceptible.
Younger people – education and pupil achievement	Now known, without further assessment	Now known, without further assessment	A lower proportion of children (57%) that achieve the expected standard in reading, writing and mathematics at the end of primary school than the wider Wiltshire area (64%) A lower average Attainment 8 score (40.8) than the wider Wiltshire area (48.7)173	
Younger people – vulnerable children	Now known, without further assessment	Now known, without further assessment	A slightly higher proportion of pupils (14%) with an Education, Health and Care Plan or Special Educational Needs than the wider Wiltshire area (13%)	

[173] Attainment 8 measures the achievement (1-9) of a pupil across 8 qualifications

Baseline type	Characteristics of the LSOAs that the Scheme runs through (Wiltshire 018E, Wiltshire 022E, Wiltshire 021D, Wiltshire 021E)	Characteristics of the wider LSOAs considered relevant to the assessment (see Table 12.9)	Characteristics of Melksham Community Area	Relevance to the assessment
Older people	A slightly lower proportion of older people (over 65) (19%) than for the wider Wiltshire area (22%) and the same as for England (19%)	A slightly higher proportion of older people (over 65) (23%) than for the wider Wiltshire area (22%) and a higher proportion than for England (19%)	A slightly higher proportion of older people (over 65) (23%) than for the wider Wiltshire area (22%) and a higher proportion than for England (19%)	Older people constitute a sensitive group as they are more sensitive than young and middle-aged adults. Generally, the older people are, the slower their movement and reactions and the poorer their hearing. They can be more at risk from injury and may fear falls, steps or lack of suitable access, lack of safe crossing points, short crossing times at safe crossing points and other aspects of the built environment. This can deter them from outdoor activity, especially walking, whereas walking is critical for muscle strength and reduces the risk of falls amongst other benefits. This group finds the neighbourhood and road setting particularly anxiety-provoking and worrying which can lead to withdrawal or isolation or an increase in accidents. Older people can feel more sensitive when using public transport and are more reliant on easy access to health services. Their continuing independence at home is often dependent on having available a range of transport modes and route options.
	Now known, without further assessment	The same proportion of over 85s (3%) as the wider Wiltshire area and England	Slightly lower life expectancy for men (80 years) and slightly higher life expectancy for women (85 years) than the wider Wiltshire area (81 years and 84 years, respectively)	
Older people – hospital admissions	Now known, without further assessment	Now known, without further assessment	A rate of hospital admissions due to falls for people aged 65+ of 2,574 per 100,000 persons, which is slightly higher than the wider Wiltshire area (2,135 per 100,000 persons)	
Older people – supported to live independently	Now known, without further assessment	Now known, without further assessment	A slightly lower proportion of people aged 65+ supported to live independently (40 per 1,000 persons) than the wider Wiltshire area (45 per 1,000)	
Deprivation	None of the areas have high multiple deprivation	A number of areas with high multiple deprivation, notably	11% of the population live in the most deprived areas	

Baseline type	Characteristics of the LSOAs that the Scheme runs through (Wiltshire 018E, Wiltshire 022E, Wiltshire 021D, Wiltshire 021E)	Characteristics of the wider LSOAs considered relevant to the assessment (see Table 12.9)	Characteristics of Melksham Community Area	Relevance to the assessment
		Melksham North - south west and Melksham North - north east, but also: Melksham North - north west; Melksham Spa – east; Melksham Spa – west		The most deprived in Melksham and Wiltshire have repeatedly poorer outcomes than the least deprived. Inequalities can be caused by levels of access to the transport system, or the level of service provided by the system. Ideally, transport facilities need to be accessible for key services at a reasonable cost, in a reasonable time and with reasonable ease and safety. People on low incomes (living in deprived areas is a proxy measure for low income) and people without access to a car constitute a sensitive group as they are likely to walk further because they can't afford public transport or own a car, and their lack of transport options may limit life and work opportunities. Those on low incomes may also be less able to adapt to changes in access, such as greater travel distances or alternative transport provision. People living in deprived areas tend to suffer the most from road traffic incidents (deaths and injuries), noise and air pollution as these areas tend to be characterised by high traffic volume as well as other environmental burdens such as industrial facilities. This group is generally more likely to already have reduced access
	A high percentage of income deprivation affecting older people in Berryfield and Bowerhill (part) x 2	A high percentage of income deprivation affecting older people – particularly in Melksham North - south west; Melksham North - north east; Melksham Spa – central	Now known, without further assessment	
	Lacock and Gastard east is within the 10% most deprived LSOAs for barriers to housing and services and within the 20% most deprived LSOAs for living environment. Berryfield and Bowerhill (part) x 2 are both within the 20% most deprived LSOAs for barriers to housing and services. Melksham Spa – south, performs well over most domains	Melksham North - south west and Melksham North - north east are both within the 10% most deprived LSOAs for barriers to education, skills, and training. Melksham North – south west is within the 20% most deprived LSOAs for employment, health deprivation and disability, and crime. Melksham North - north east is within the 20% most deprived LSOAs for income. Melksham North – north west, is within the 20% most deprived LSOAs for barriers to housing and services.		

Baseline type	Characteristics of the LSOAs that the Scheme runs through (Wiltshire 018E, Wiltshire 022E, Wiltshire 021D, Wiltshire 021E)	Characteristics of the wider LSOAs considered relevant to the assessment (see Table 12.9)	Characteristics of Melksham Community Area	Relevance to the assessment
Child poverty	A high percentage of children living in poverty in Berryfield and Bowerhill (part) x 2	A high percentage of children living in poverty – particularly in Melksham North - south west; Melksham North - north east; Melksham North - north west	A slightly higher proportion of 0 to19-year olds living in poverty (11%) than the wider Wiltshire area (9.4%)	to health and social care as well as reduced access to other services and facilities.
Fuel poverty	Now known, without further assessment	Now known, without further assessment	9.1% of homes experience fuel poverty, which is slightly lower than for the wider Wiltshire area (9.3%)	
Social exclusion – risk of loneliness	Berryfield and Bowerhill (part) x 2 is an area with the highest risk of loneliness	A number of areas with the highest risk of loneliness – e.g. Melksham North - south west; Melksham North - north east; Melksham Spa – central	Now known, without further assessment	As mentioned above, those that find the neighbourhood and/or road setting particularly anxiety-provoking and worrying can experience withdrawal or isolation. This group can feel more sensitive when using public transport and are more reliant on easy access to health services. Their continuing independence at home is often dependent on having available a range of transport modes and safe route options.
		A number of areas with reported higher risk of loneliness e.g. Melksham North - north west; Melksham North – south east; Melksham Spa – east; Melksham Woodrow – north	Now known, without further assessment	
Risk of injury and death	Now known, without further assessment	Now known, without further assessment	A hospital admissions rate as a result of accidental injury of 136 per 10,000 persons, which is slightly lower than the wider Wiltshire area (140 per 10,000 persons)	There is evidence to establish an association between changes in traffic patterns and increase in road traffic and road traffic incidents resulting in serious injury and fatalities. An individual's risk of injury may be impacted by many social, personal,

Baseline type	Characteristics of the LSOAs that the Scheme runs through (Wiltshire 018E, Wiltshire 022E, Wiltshire 021D, Wiltshire 021E)	Characteristics of the wider LSOAs considered relevant to the assessment (see Table 12.9)	Characteristics of Melksham Community Area	Relevance to the assessment
			A marginally lower rate of people killed or seriously injured on roads (45 per 100,000 persons) than the wider Wiltshire area (46 per 100,000). The same rate of road traffic collisions causing injury (196 per 100,000 persons) as the wider Wiltshire area. Between 2016 - 2018, almost 3,000 road traffic collisions causing injury were recorded on Wiltshire roads.	economic, and environmental factors. The physical environment such as transport systems and infrastructure, land use and urban development can affect the rate of incidents, injuries and death. Children and adolescents, older people and people living in deprived areas are more susceptible to suffer the most from road traffic incidents (deaths and injuries).
			Between 2012-2017, there was an estimated 6.9% increase in traffic flow on roads in the Melksham Community Area	
Mortality rates	Now known, without further assessment	Now known, without further assessment	A slightly higher mortality rate for causes considered preventable (156 per 10,000 persons) than the wider Wiltshire area (147 per 10,000 persons)	Mortality rates, or death rates, is a measure of the number of deaths in a population, scaled to the size of that population, per unit of time. Poor air quality is the largest environmental risk to public health in the UK, as long-term exposure to air pollution can cause chronic conditions such as cardiovascular and

Baseline type	Characteristics of the LSOAs that the Scheme runs through (Wiltshire 018E, Wiltshire 022E, Wiltshire 021D, Wiltshire 021E)	Characteristics of the wider LSOAs considered relevant to the assessment (see Table 12.9)	Characteristics of Melksham Community Area	Relevance to the assessment
				respiratory diseases as well as lung cancer, leading to reduced life expectancy. In general, mortality rates (all circulatory disease, CHD, respiratory diseases) are increasing across Wiltshire.
Housing supply	Barriers to housing are identified in Lacock and Gastard and Berryfield and Bowerhill (part) x 2. This domain measures physical and financial accessibility of housing.	Barriers to housing are identified in Melksham North – north west. This domain measures physical and financial accessibility of housing.	Current identified shortfall in housing supply for Melksham. 2,370 new homes are planned for the current plan period of 2006-2026	There is evidence to establish an association between housing, quality of housing, housing security and stability, and health outcomes. Housing is not just a dwelling place. It provides comfort, shelter, safety and warmth, the cornerstone on which individuals and families build a better quality of life, access services they need and gain greater independence. It provides the main setting for our health throughout our lives. Good housing and physical and financial access to housing can play its part in reducing health inequalities and health harms. Housing can also support existing communities and access to employment, public transport, shops and services. Worries over housing instability can result in distress and affect physical and mental health and wellbeing, particularly for vulnerable groups. Housing instability can disrupt work, school, and day care arrangements, as well as social networks for adults, children and adolescents. Whilst there are inefficiencies across the transport network affecting various places
Housing – house prices			Lower median house price (£240,000) than the wider Wiltshire area (£272,000)	
Income	Now known, without further assessment	Now known, without further assessment	An annual average gross income of £32,800 and net income after housing costs of £22,700 This creates a significant affordable housing need	

Baseline type	Characteristics of the LSOAs that the Scheme runs through (Wiltshire 018E, Wiltshire 022E, Wiltshire 021D, Wiltshire 021E)	Characteristics of the wider LSOAs considered relevant to the assessment (see Table 12.9)	Characteristics of Melksham Community Area	Relevance to the assessment
				across Wiltshire, in the long-term it is areas where there is most pressure for new homes and jobs or areas that require regeneration, such as Melksham, which need improvements in transport infrastructure.
Socio-economics	Now known, without further assessment	Now known, without further assessment	The biggest two employment sectors are manufacturing, and wholesale and retail trade (including repair of motor vehicles and motorcycles)	Melksham has an important strategic employment role. It is located on the A350 and forms part of the key A350 employment growth area. There is capacity within the labour market to accommodate future growth in/around Melksham, according to population statistics, however there is a high degree of economic out-commuting with large numbers of residents travelling to work in the nearby larger centres. Melksham generally suffers low levels of unemployment; however, a large number of jobs are supplied by a single employer which may leave the town vulnerable to mass job losses.

Receptors

12.6.9. To inform the baseline, a high-level desk-top review has been undertaken to identify the main physical assets (physical receptors) and human health receptors present in the study area which have the potential to be affected by the Scheme. This list is not definitive and has been informed by a high-level desk top review only; it will be further developed using address-based tools where available, at the detailed assessment stage. These receptors are described in more detail in Table 12.11.

Table 12-11 – Key receptors with potential to be impacted/ affected by the Scheme

Receptor type	Facility type	Approximate number of receptors and general proximity to the Scheme boundary
Private property and housing		Baseline profile: As the majority of the core study area is located within greenfield and agricultural land uses, there are few key settlements of note in and around the core study area. The properties in Bowerhill represent the most populated area in the core study area. Clusters of properties are also found in Lacock and at Sandridge Common. The core study area includes the following residential properties and farmhouses, which has been split into six main route sections for ease of reference. Section 1 – A350 to Lower Woodrow: • Residential properties at High Street, Lacock; • Sunnycroft, Folly Lane; • Glenverne, Folly Lane; • Old Police House, Folly Lane; • The Ranch House, Folly Lane; • Folly Farmhouse; • Folly House, Folly Lane; • Little Elms, Folly Lane; • Beechfield, Folly Lane; • The Vicarage, Folly Lane; • The Folly, Folly Lane; • 3 Melksham Road, Lacock; • Hobbs Lea, 3A Melksham Road; • 3B Melksham Road, Lacock; • No's. 1 to 4 Talbot View, Melksham Road, Lacock; • The Oaks, Melksham Road, Lacock; • Little Oaks Caravan Park, Melksham Road; • Oak Tree House, Melksham Road; • Riverside Farmhouse, Beanacre; • 1 Queenfield Farm, Woodrow Road, Forest; • 2 Queenfield Farm, Woodrow Road, Forest; • Queensfield Farmhouse, Woodrow Road, Forest; • 220 Forest Lane, Lacock; • Six Guinea Cottage, 212 Lower Woodrow, Forest. Section 2 – Lower Woodrow to A3102 Sandridge Common: • Frogditch Farmhouse, 225 Lower Woodrow, Forest; • 226 Lower Woodrow;

Receptor type	Facility type	Approximate number of receptors and general proximity to the Scheme boundary
		• 227 Lower Woodrow; • Rotheridge Farmhouse, Lower Woodrow; • The Barn, Rhotteridge Farm, Lower Woodrow; • Green Shed Farmhouse, Lower Woodrow; • Hack Farmhouse, Lower Woodrow; • Newly constructed dwelling at Hack Farm, Lower Woodrow; • Oak Tree House, Lower Woodrow; • Mobile Home, Oakley Farm; • Oakley Farmhouse; • The Willows, Lower Woodrow; • The Oaks, Lower Woodrow; • Home Farmhouse, Sandridge Park, Sandridge Common; • Lower Home Farmhouse, Sandridge Park, Sandridge Common; • Stable Cottage, Sandridge Park, Sandridge Common; • Manor Farmhouse, Sandridge Common; • No's. 1 to 12 Lopes Close; • No's. 254 to 256 Sandridge Common; • Residential properties at Sandridge Park, just outside the core study area A342/A3102 junction • 89-91 Devizes Road; • 81 & 83 Devizes Road; • Fairholme, 102 Devizes Road; • Paddock House, 104 Devizes Road; • 80 & 82 Devizes Road; • Caravan, Wyatts Lake Farm; • 250 Westbrook. • Section 3 – A3102 Sandridge Common to A365 Bath Road: • 286 Sandridge Common • Blackmore House, Sandridge Common; • Blackmore Farmhouse, 287 Sandridge Common; • Mobile Home, Tanhouse Farm, Redstocks; • Achilles Caravan, Tanhouse Farm, Redstocks; • Tanhouse Farmhouse, Redstocks; • Coombe House, 425 Redstocks; • No's 427 to 433 Redstocks; • 424 Redstocks; • Redstocks Cottage, 423 Redstocks; • Chapel Goldings, 421A Redstocks; • 421 and 422 Redstocks; • No's 417 to 420 Redstocks; • Elm Tree, 422A Redstocks; • Newhouse Farmhouse; • Vernon Farmhouse, Bowerhill;

Receptor type	Facility type	Approximate number of receptors and general proximity to the Scheme boundary
		• Turnpike Lodge, 416C Bowerhill; • Skye View, 416B Bowerhill; • 416A Bowerhill, Melksham; • Horseshoe Cottage, 416 Bowerhill, Melksham; • Loves Farmhouse, Bowerhill Section 4 – A365 Bath Road to A350: • Turnpike Cottage, 441 Bowerhill; • Mobile Home, 442 Carnation Lane, Bowerhill; • No's 440 and 442 Carnation Lane, Bowerhill; • Rose Cottage, 443 Carnation Lane; • 444 Carnation Lane; • Spinners, 444A Carnation Lane; • 445 Carnation Lane; • Old Loves Farmhouse, Bowerhill; • Dorek House, 455 Bowerhill Lane, Bowerhill; • No's. 448 to 454 Bowerhill Lane; • The Caravan, Bowerhill Lane, Bowerhil; • Little Bowerhill Farmhouise, 457 Bowerhill Lane, Bowerhill; • Ha Penny Cottage, 458 Bowerhill Lane; • 459 Bowerhill Lane, Bowerhill; • Residential properties at Kenley Close, Hastings Road, Hendon Place, Hornchurch Road, The Parade Hornchurch Road, Kittyhawk Close (in south east Bowerhill); • Residential properties at Park Road, Britannia Close, Hornchurch Road, Hawkings Close, Chedwick Close, Debden Close, Dakota Close, Manston Close, Blenheim Park, Wellesley Close, Bowerhill Lane, Locking Close, Soho Farmhouse, St Athan Close, Barnes Wallis Close, Bader Park, Tangmere Close, Duxford Close, Beaufort Close, Brampton Court, • Newtown Farm Cottage, Canal Bridge, Semington; • Newtown Farmhouse, Canal Bridge, Semington; • Old Railway Farmhouse, Outmarsh, Semington; • 541 Outmarsh, Semington. Section 5 – A350 to Littleton Roundabout • Travellers site at Lansdowne; • Greenacres Mobile Park; • April Cottage; • Brickfield Farmhouse. In the wider study area, residential properties are found in the main settlements of Melksham and Bowerhill. There are also a number of smaller settlements in the wider study area such as Bewley Common, Bowden Hill, Sandridge, Seend, Seend Cleeve, The Stocks, Littleton and Semington.
Community land and assets		Baseline profile: The following community land and assets are located in the core study area (within 500m). Section 1 – A350 to Lower Woodrow: • Allotments, Melksham Road;

<table>
<tr><th>Receptor type</th><th>Facility type</th><th>Approximate number of receptors and general proximity to the Scheme boundary</th></tr>
<tr><td></td><td colspan="2">

Allotments adjacent to Hither Way, Lacock
Cemetery, Melksham Road;
Chapel, Land North of the Cemetery, Melksham Road;
Lacock Recreation Ground.

<u>Section 4 – A365 Bath Road to A350</u>:

Play area and sports courts to north of Hornchurch Road;
Allotment gardens south of Locking Close;
Queen Elizabeth II Diamond Jubilee Sports Field;
Bowerhill Sports Pavillion;
Divisional Police Headquarters, Hampton Park, West Melksham.

<u>Section 5 – A350 to Littleton Roundabout</u>

West Wiltshire Crematorium
The main community land and assets are located in the wider study area, in the main settlements of Melksham and Bowerhill.

</td></tr>
<tr><td>Development land</td><td colspan="2">
<u>Baseline profile</u>:
In terms of development land, planning permission has been granted in the vicinity of the Scheme for a number of developments. These applications cover the current planning history with a base date of 17 May 2021.
The following planning applications have been recently approved within the core study area and/or are relevant to the Scheme.
<u>Section 1 – A350 to Lower Woodrow</u>:
None
<u>Section 2 – Lower Woodrow to A3102 Sandridge Common</u>:
<table>
<tr><td>20/09241/FUL</td><td>Conversion of former barn to provide 1No holiday let.
Frogditch Farm, 225 Lower Woodrow, Forest, SN12 7RB
(* Within 100m of the Scheme)</td><td>Approved Dec 2020</td></tr>
<tr><td>20/05680/FUL</td><td>Erection of agricultural barn/shed for safe secure storage of agricultural equipment, tools and feed.
Land North East of New Road, Melksham, Wiltshire SN12 7QZ</td><td>Approved Dec 2020</td></tr>
<tr><td>20/00171/FUL</td><td>Erection of stables
Bay Tree Barn, Lower Woodrow, Forest SN12 7RB</td><td>Approved
Mar 2020</td></tr>
<tr><td>16/08205/FUL</td><td>Erection of replacement equestrian stable block and temporary manager accommodation on existing equestrian use site
Ivy Stables, Lower Woodrow, Melksham
(* Within 100m of the Scheme)</td><td>Approved Nov 2016</td></tr>
<tr><td>18/07375/REM</td><td>Reserved matters application pursuant to Outline Permission 17/08111/OUT (Erection of an agricultural workers dwellings) and varied by application 18/00067/VAR, in</td><td>Approved Oct 2018</td></tr>
</table>
</td></tr>
</table>

Receptor type	Facility type	Approximate number of receptors and general proximity to the Scheme boundary	
		relation to access, appearance, scale, layout and landscaping Hack Farm, Lower Woodrow, Melksham, Wiltshire SN12 7RB (* Immediately adjacent to the Scheme)	
	19/02155/REM	Reserved matters applicant pursuant of 17/08111/OUT (Erection of an agricultural workers dwelling) relating to access, appearance, landscaping, layout and scale (Amendment to 18/07375/REM) Hack Farm, Lower Woodrow, Melksham, Wiltshire SN12 7RB (* Immediately adjacent to the Scheme)	Approved May 2019
	20/07375/FUL	Change of Use from Visitor/Education Centre to Farm Stay Accommodation in Connection with the Alpaca Enterprise. Oakley Farm House, Lower Woodrow, Forest SN12 7RB (* the Scheme runs through this development land)	Approved Nov 2020
	14/11175/FUL	Change of use of former chicken house and staff room facilities and associated land to equestrian purposes as livery and grazing Oakley Farm, Lower Woodrow, Forest SN12 7RB (* the Scheme runs through this development land)	Approved Jan 2015
	W/12/01483/FUL	Change of use from agricultural land to equestrian centre, conversion of former poultry house to equestrian use, and new drive to connect new parking area to existing access from public highway. Land to South West and North West of Oakley Farm, Lower Woodrow, Forest, SN12 7RB (* the Scheme runs through this development land)	Approved Oct 2012
	19/09648/FUL	Change of use to secure training and exercise area for dogs Little Copse Farm, Lower Woodrow, Forest Road, Melksham, SN12 7RB (*approximately 250m to the west of the Scheme)	Approved Dec 2019
	PL/2021/03031	Certificate of lawfulness for use of residential mobile homes Willowbank Cottage, New Road, Melksham SN12 7QZ (* just outside the core study area)	Decision Pending
	Section 3 – A3102 Sandridge Common to A365 Bath Road:		

Receptor type	Facility type	Approximate number of receptors and general proximity to the Scheme boundary	
	19/02437/FUL	Development of a 50MW battery storage system and associated infrastructure Land at Snarlton Farm, Prater's Lane, Bridleway, Melksham SN12 7QP (* to the east of the proposed Scheme; the Scheme runs through the access to this development land)	Approved May 2019
	17/08176/PNCOU	Prior Approval of Proposed Change of Use of Agricultural Building to a Dwelling house (Use Class C3), and for Associated Operational Development Newtown Farm, Semington, Trowbridge, Wiltshire BA14 6JU (* approximately 375m to the south of the Scheme)	Prior Approval not required Oct 2017
	Section 4 – A365 Bath Road to A350:		
	19/08636/PNCOU	Notification for Prior Approval under Class Q for a Proposed Change of Use of an Agricultural Building to a Single Dwellinghouse (Use Class C3) and for Associated Operational Development Newtown Farm, Semington, Trowbridge, Wiltshire BA14 6JU (* approximately 375m to the south of the Scheme)	Prior Approval not required Oct 2019
	It is possible that other relevant planning applications may come forward during the application process for the Scheme. There are also sites identified for potential development within the SHELAA. <u>Section 3 – A3102 Sandridge Common to A365 Bath Road</u>: • Land North and East of The Spa – potential for 596 residential dwellings; • Woodrow House Farm - potential for 366 residential dwellings; • Land South of Falcon Way, Bowerhill - potential for 1,530 residential dwellings; • Land at Blackmore Farm - potential for 1,939 residential dwellings; • Land at Snarlton Lane - potential for 889 residential dwellings; • Land North of A3102 - potential for 184 residential dwellings. <u>Section 4 – A365 Bath Road to A350</u>: Hampton Business Park/ Lancaster Road employment allocation		
Local businesses	<u>Baseline profile:</u> The following local businesses are located in the core study area (within 500m). <u>Section 1 – A350 to Lower Woodrow</u>: • SW Machinery Hire Ltd Folly Lane; • Sewage Disposal Works, south of Melksham Road, Lacock; • Six Guinea Cottage, 212 Lower Woodrow, Forest (Health and fitness business, bootcamps); • Commercial/ industrial premises at Manor Farm Estate, Sandridge Common; • No businesses of an industrial/commercial nature present in this section;		

Receptor type	Facility type	Approximate number of receptors and general proximity to the Scheme boundary
	• No land identified in plans, policies or strategies for development or subject to planning permission. Section 2 – Lower Woodrow to A3102: • Commercial businesses at Oakley Farm (Livery); • Commercial business at Little Copse Farm (dog training facility); • Equine Stud and Stables, New Road, Melksham SN12 7AX; • No other relevant recent planning permissions; • No land identified in plans, policies or strategies for development. A342/A3102 junction • Devizes Road Garage; • V and P Collins Farm Shop. Section 3 – A3102 Sandridge Common to A365 Bath Road: • Solar photovoltaic farm (Snarlton Farm); • More Than Mowers/ Melksham Groundcare Machinery Ltd, Tanhouse Farm; • M Vincent Windows and Glazing (421 Redstocks); • Hurley Motors, Bowerhill. Section 4 – A365 Bath Road to A350: • Turnpike Garage and Chilli Kitchens, Bowerhill; • Plots/ units at Little Bowerhill Farm; • Sewage Pumping Station; • Pumping Station, Blenheim Park, Bowerhill; • Industrial and commercial premises at Bowerhill Industrial Estate; • Businesses at Hampton Business Park; • Wiltshire Air Ambulance Charitable Trust, Outmarsh; • No other relevant recent planning permissions; • No land identified in plans, policies or strategies for development. Section 5 – A350 to Littleton Roundabout • Littleton Stables • The majority of businesses within the wider study area are located within Melksham and Bowerhill due to the built-up nature of the settlements in contrast to the rural nature of the core study area.	
Agricultural land	Baseline profile: Agricultural land use in the study area is a mixture of grass for beef cattle and sheep and arable cropping, often in rotation on the same farm. Land in semi-continuous arable rotations are found at the northern end of the Scheme, close to Lacock, and at the southern end between Bowerhill and the Kennet and Avon Canal. In between these arable farms, the land is mainly under grass with some arable fields in the rotation, producing feedstock such as barley and maize for cattle. These farms are all of medium sensitivity, meaning that access between land and key agricultural infrastructure is required on a reasonably frequent basis. Two farms are of very high sensitivity. These are areas of land in which the enterprise is wholly reliant on the spatial relationship of land to key agricultural infrastructure; and access between land and key agricultural infrastructure is required on a frequent basis (daily). Snarlton Farm, off Snarlton Lane, west of Melksham, is a 60ha dairy farm; and is the only dairy farm bisected by the Scheme.	

Receptor type	Facility type	Approximate number of receptors and general proximity to the Scheme boundary
	Oakley Farm, at Lower Woodrow, Forest is a free-range egg producer.	
WCH	The following information is derived from 'rowmaps', an online information source that uses Ordnance Survey mapping to display PRoW mapping. The AtkinsGo geo-spatial tool has also been utilised to provide the baseline conditions. All PRoWs in the core study area, including those that cross or interact with the Scheme, are described below: <u>Section 1 – A350 to Lower Woodrow</u>: • PRoW footpath LACO 2 (runs west to east, through the northern extent of the core study area); • PRoW footpath LACO 5 (runs south to north, with a small part of the route falling within the northern extent of the core study area); • NCN Route 403 (runs along West Street and Hither Way, approximately 200 to 300 metres to the north west of the Scheme, then along Forest Lane and Lower Woodrow, crossing the Scheme at Lower Woodrow); • PRoW footpath LACO 37 (runs between Melksham Road and The Wharf, connecting to the northern arm of the Scheme at Melksham Road); • PRoW footpath MELW 61 (runs roughly north east-south west through the Scheme; connects to MELW 66 and LACO 36); • PRoW footpath MELW 62A (runs roughly west to east through the Scheme, from Queensfield Farm to Forest Lane); • PRoW footpath MELW 63 (runs roughly west to east through the Scheme, from south of Queensfield Farm to Forest Lane); • PRoW footpath MELW 62 (runs roughly parallel with the Scheme, approximately 400 metres to the west, connecting to Lower Woodrow); • PRoW bridleway MELW 55 (runs westwards away from the Scheme, approximately 200m to the east); • Footpaths along Lower Woodrow (the Scheme runs through and connects to these footpaths). <u>Section 2 – Lower Woodrow to A3102 Sandridge Common</u>: • PRoW footpath MELW 50 (runs south eastwards, approximately 200m to 500m east of the Scheme); • PRoW footpath MELW 49 (runs south eastwards, from very near to the Scheme); • PRoW footpath MELW 48 (runs eastwards from Lower Woodrow and crosses the Scheme); • PRoW footpath MELW 47 (runs eastwards from Forest, further to the west, and cross the Scheme); • PRoW footpaths MELW 59 and 60 run eastwards towards New Road, in the outer part of the core study area); • Footpaths along Sandridge Hill/Sandridge Common. • <u>A342/A3102 junction</u> • Footpaths along the A3102 Westbrook Road and the A342 Devizes Road; • PRoW footpath BROM 14 (runs past Wyatt Lakes Farm, further to the east of the junction); • PRoW footpath BROM 13 (runs from the A342 westwards past Wyatts Wood). <u>Section 3 – A3102 Sandridge Common to A365 Bath Road</u>: PRoW bridleway MELW 40 (runs generally southwards from Sandridge Hill, Sandridge Common, crossing the Scheme to the south of Sandridge Hill);	

Receptor type	Facility type	Approximate number of receptors and general proximity to the Scheme boundary
		• PRoW footpath MELW 30 (runs east to west to the north of Tanhouse Farm, crossing the Scheme and connecting to MELW 41); • PRoW bridleway MELW 41 (runs eastwards through the core study area from Eastern Way/ Snarlton Farm towards the Scheme; connecting to MELW 30 just to the west of the Scheme); • PRoW footpath MELW 26 (runs southwards from Sandridge Hill, crossing the Scheme just north of Redstcoks); • PRoW footpath MELW 22 (runs eastwards from near Eastern Way to MELW 26, just to the west of the Scheme); • PRoW footpath MELW 23 (runs eastwards from Eastern Way, crossing the Scheme at two separate locations west of Redstocks, before connecting to MELW 41 and 43 at Redstcoks); • PRoW footpath MELW 24 (runs south eastwards between MELW 23 and MELW 20, crossing the Scheme south-west of Redstocks); • PRoW footpath MELW 23B (runs eastwards within the outer part of the core study area, connecting to MELW 23A); • PRoW footpath MELW 20 (runs southwards, roughly parallel to the Scheme, between Redstocks and Bath Road, approximately 200m to the east). <u>Section 4 – A365 Bath Road to A350</u>: • Footpaths along Bath Road (the Scheme crosses and interacts with these footpaths); • PRoW footpath MELW 37 (runs south eastwards, approximately 200m to 500m from the Scheme); • PRoW footpath MELW 36 (runs southwards from Bath Road, approximately 200m to 250m east of the Scheme, connecting to MELW 35 and 27); • PRoW footpath MELW 35 (runs eatwards from Bowerhill Lane, crossing the Scheme to the south of Bath Road, connecting to MELW 36 and SEEN 18 to the east of the Scheme); • PRoW Bridleway SEEN 18 (runs south westwards, roughly parallel to the Scheme, approximately 150m to 200m to the east); • PRoW Bridleway SEEN 52 (runs generally west to east along the canal towpath, approximately 150m to 500m east of the Scheme); • Kennet and Avon Canal towpaths • PRoW Bridleway SEEN 13 (runs southwards from the end of Bowerhill Lane (SEEN 17 and MELWE 45), crossing the Scheme, and the canal, towards Seend Cleeve); • PRoW Bridleway SEEN 17 (runs southwards from the south of Branazon Way, crossing the Scheme, then towards the Kennet and Avon Canal and Semington); • PRoW Bridleway MELW 45 (runs east to west, approximately 50m to 100m north of the Scheme); • PRoW footpath MELW 42 (runs southwards from Bowerhill Industrial Park, crossing the Scheme, and continuing towards the Kennet and Avon Canal) <u>Section 5 – A350 to Littleton Roundabout:</u> • PRoW footpath MELW 16 (runs west to east along the canal towpath, crossing under the A350); • PRoW footpath SEMI 45 (runs roughly west to east, including below the A350, connecting to MELW 42 to the east);

Receptor type	Facility type	Approximate number of receptors and general proximity to the Scheme boundary
		• PRoW footpath SEMI 25 (runs roughly west to east, crossing under the A350, including an alignment which runs south-north and north-south parallel to, and on either side of the A350 carriageway); • PRoW footpath SEMI 26 (runs roughly north west to south east on either side of the A350, connecting to SEMI 25 that crosses under the A350); • PRoW footpath SEMI 14 (runs roughly parallel to the A350 carriageway, on either side of the carriageway, to the south of Littleton roundabout); • PRoW footpath SEMI 21 (runs roughly south westwards from the bottom of the traveller's site, away from the A350); • PRoW footpath SEMI 17 (runs roughly north-south, to the east of the crematorium, to the west of the A350).

12.7. Potential effects

12.7.1. Tables 12-12 to 12-15 below present the potential effects, mitigation measures and likely residual effects of the Scheme on population and human health during construction and operation.

12.7.2. Effects on land use and accessibility are considered by combining the sensitivity of the affected receptor to changes to the baseline conditions, in order to determine the magnitude of any impacts and, where relevant, their likely significance of effects.

12.7.3. For human health, once community/ population sensitivity and predicted changes to the health determinants as a result of the Scheme have been established, the likely health outcome has been identified.

12.7.4. Potential mitigation measures are summarised in the tables, with further details described in section 12.8.

Construction

Population

Table 12-12 – Potential population effects during construction (Land use and accessibility)

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures in place)
Private property and housing					
Physical receptors: • Residential properties in the core study area (all Scheme Sections) Human receptors: • Residents	High	<u>Demolition</u> • No properties are at risk of demolition to construct or accommodate the proposed Scheme	Physical receptors: • Neutral Human receptors: • Neutral	Ensure that the Scheme does not result in the demolition or loss of any residential properties	Physical receptors: • Neutral Human receptors: • Neutral
Physical receptors: • Other residential properties in the core study area (all Scheme Sections) Human receptors: • Residents	High	<u>Land take</u> No change is predicted: • No other properties would require land take or have their access directly affected by the Scheme. • No residential development land will be directly affected by land take by the Scheme.	Physical receptors: • Neutral Human receptors: Neutral	Ensure that the Scheme does not result in loss of land or access for any other residential properties	Physical receptors: • Neutral Human receptors: • Neutral
Physical receptors: • Residential properties at Melksham Road, Folly Lane East and High Street, and other properties in Lacock	Medium	<u>Severance/accessibility</u> Key construction impacts relate to temporary reduced access to properties at Melksham Road, Folly Lane East and High Street, and other properties in Lacock	Physical receptors: • Moderate adverse (significant) Human receptors:	Melksham Road will be kept open and accessible as much as possible, with temporary routes put in place for local residents and other users to	Physical receptors: • Slight adverse (not significant) Human receptors:

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures in place)
which lie just outside the core study area (in Section 1: A350 to Lower Woodrow) Human receptors: • Residents		which lie just outside the core study area. These properties are principally accessed from the A350 via Melksham Road which would be affected during construction and tie-in works. Although the Scheme would result in the introduction of severance, alternative accessibility options are available via longer routes (such as via Mons Lane) which would result in an increase in journey distance and time, resulting in minor adverse impacts.	• Moderate adverse (significant) * The effects would be the same for the wider group and all vulnerable groups	continue to use the route and communicated to residents. The duration of these temporary measures will be kept to a minimum to reduce disruption as far as possible. Access will be maintained to all properties for the duration of the works.	• Slight adverse (not significant) * The effects would be the same for the wider group and all vulnerable groups
Physical receptors: • Hack Farmhouse and newly constructed dwelling west of farmhouse (in Section 2: Lower Woodrow to A3102 Sandridge Common) Human receptors: • Residents	Medium	The Scheme could result in complete severance to Hack Farmhouse and the newly constructed dwelling, with no alternative accessibility options available, resulting in major adverse impacts which is significant.	Physical receptors: • Large adverse (significant) Human receptors: • Large adverse (significant) * The significant effects would be the same for the wider group and all vulnerable groups	Access should be maintained to Hack Farmhouse (and the newly constructed dwelling), as a residential property and centre for agricultural business, at all times. Lower Woodrow will be kept open and accessible as much as possible, with temporary routes put in place for local residents and other users to continue to use the route and communicated to residents. The duration of these temporary measures will be kept to a minimum to reduce disruption as far as possible.	Physical receptors: • Moderate adverse (significant) Human receptors: • Moderate adverse (significant) * Whilst severance can have greater effects on vulnerable groups, the effects are significant for all group's resident at this property

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures in place)
				Access will be maintained to all properties for the duration of the works.	
Physical receptors: • Residential properties to the west and east of the Scheme at Lower Woodrow (in Section 2: Lower Woodrow to A3102 Sandridge Common) Human receptors: • Residents	Medium	There is likely to be temporary reduced access to properties along Lower Woodrow to the west of the Scheme and properties such as No's. 226 and 227 Lower Woodrow, Frogditch Farmhouse and 220 Forest Lane to the east of the Scheme, during construction and tie-in works. The Scheme would result in severance and there are no alternative accessibility options for travel west and east in the locality without a significant increase in journey distance and time. This would result in temporary moderate adverse impacts, which is significant.	Physical receptors: • Moderate adverse (significant) Human receptors: • Moderate adverse (significant)	Lower Woodrow and Sandridge Common will be kept open and accessible as much as possible, with temporary routes put in place for local residents and other users to continue to use the route and communicated to residents. The duration of these temporary measures will be kept to a minimum to reduce disruption as far as possible. Access will be maintained to all properties for the duration of the works.	Physical receptors: • Moderate adverse (significant) Human receptors: • Moderate adverse (significant) * Whilst severance can have greater effects on vulnerable groups, the effects are significant for all group's resident at these properties
Physical receptors: • Residential properties to the west and east of the Scheme at Sandridge Hill/ Sandridge Common (in Section 3 – A3102 Sandridge Common to A365 Bath Road)	Medium	There is likely to be temporary reduced access to properties along Sandridge Hill/ Sandridge Common to the west of the Scheme such as along Lopes Close and Sandridge Common and properties at Sandridge Park to the east of the Option, during construction and tie-in works.	Physical receptors: • Moderate adverse (significant) Human receptors: • Moderate adverse (significant)	Sandridge Hill and Sandridge Common will be kept open and accessible as much as possible, with temporary routes put in place for local residents and other users to continue to use the route and communicated to residents. The duration of these temporary measures will be	Physical receptors: • Moderate adverse (significant) Human receptors: • Moderate adverse (significant)

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures in place)
Human receptors: • Residents		The Scheme would result in severance and there are no alternative accessibility options for travel west and east in the locality without a significant increase in journey distance and time. This would result in temporary moderate adverse impacts, which is significant.		kept to a minimum to reduce disruption as far as possible. Access will be maintained to all properties for the duration of the works.	* Whilst severance can have greater effects on vulnerable groups, the effects are significant for all group's resident at these properties
Physical receptors: • Residential properties to the west and east of the Scheme at Bath Road (in Section 3 – A3102 Sandridge Common to A365 Bath Road and Section 4 - A365 Bath Road to A350) Human receptors: • Residents	Medium	There is likely to be temporary reduced access to properties along Bath Road to the west of the Scheme and clusters of properties to the east of the Scheme, such as those at Carnation Lane and other properties in Redstocks, and Bowerhill, during construction and tie-in works. The Scheme would result in severance and there are no alternative accessibility options for travel west and east in the locality without a significant increase in journey distance and time. This would result in temporary moderate adverse impacts, which is significant.	Physical receptors: • Moderate adverse (significant) Human receptors: • Moderate adverse (significant)	The A365 Bath Road will be kept open and accessible as much as possible, with temporary routes put in place for local residents and other users to continue to use the route and communicated to residents. The duration of these temporary measures will be kept to a minimum to reduce disruption as far as possible. Access will be maintained to all properties for the duration of the works.	Physical receptors: • Moderate adverse (significant) Human receptors: • Moderate adverse (significant) * Whilst severance can have greater effects on vulnerable groups, the effects are significant for all group's resident at these properties

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures in place)
Physical receptors: • Residential properties in the rest of the core study area and in the wider study area Human receptors: • Residents	High	There is likely to be temporary reduced access to properties in the rest of the core study area and the wider study area, during construction and tie-in works. The Scheme would result in severance, particularly for those receptors where there are no or few alternative accessibility options for travel in the locality without a significant increase in journey distance and time. On balance, taken as a whole, minor adverse impacts are predicted on accessibility, which is not significant.	Physical receptors: • Slight adverse (not significant) Human receptors: • Slight adverse (not significant)	Roads will be kept open and accessible as much as possible, with temporary routes put in place for local residents and other users to continue to use the route and communicated to residents. The duration of these temporary measures will be kept to a minimum to reduce disruption as far as possible. Access will be maintained to all properties for the duration of the works.	Physical receptors: • Slight adverse (not significant) Human receptors: • Slight adverse (not significant) * Whilst severance can have greater effects on vulnerable groups, the effects are significant for all group's not already assessed and resident in the core and wider study area
Community land and assets					
Physical receptors: • Community land and assets Human receptors: • Users of community land/ facilities/ services	High	<u>Demolition and/or land take</u> No land will be required permanently or temporarily from any community land or assets or access directly affected by the Scheme.	Physical receptors: • Neutral Human receptors: • Neutral	Ensure the Scheme does not result in the demolition or loss of land from any community land or assets	Physical receptors: • Neutral Human receptors: Neutral
Physical receptors: • Community land and assets in Lacocks	High	Access to Lacock Recreation Ground, the cemetery and chapel in Lacocks could be temporarily reduced during construction and	Physical receptors: • Slight adverse (not significant)	Melksham Road will be kept open and accessible as much as possible, with temporary routes put in place for	Physical receptors: • Slight adverse (not significant)

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures in place)
Human receptors: • Users of community land/ facilities/ services		tie-in works to Melksham Road. However, alternative accessibility options are available via longer routes (such as via Mons Lane)	Human receptors: • Slight adverse (not significant) * The effects would be the same for the wider group and all vulnerable groups	residents and other users to continue to use the route and communicated to residents. The duration of these temporary measures will be kept to a minimum to reduce disruption as far as possible. Access will be maintained to all community assets for the duration of the works.	Human receptors: • Slight adverse (not significant) * The effects would be the same for the wider group and all vulnerable groups
Physical receptors: • Community land and assets in the core and wider study areas Human receptors: • Users of community land/ facilities/ services	High	Key impacts relate to temporary disruptions to access to community land and assets in the core and wider study areas during the construction phase. There is likely to be some temporary disruptions to access for some residents in the core and wider study area accessing community facilities and services in Melksham and Bowerhill. However, the majority of the works are away from the main settlements in greenfield areas, therefore taken as a whole any impacts are likely to be negligible or neutral.	Physical receptors: • Slight adverse (not significant) Human receptors: • Slight adverse (not significant) * The effects would be the same for the wider group and all vulnerable groups	All roads will be kept open and accessible as much as possible, with temporary routes put in place for residents and other users to continue to use the route and communicated to residents. The duration of these temporary measures will be kept to a minimum to reduce disruption as far as possible. Access will be maintained to community assets for the duration of the works.	Physical receptors: • Slight adverse (not significant) Human receptors: • Slight adverse (not significant) * The effects would be the same for the wider group and all vulnerable groups

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures in place)
Development land and businesses					
Physical receptors: • Local businesses (Solar photovoltaic farm at Snarlton Farm) Human receptors: • Those working at, or using, these local businesses	High	The Scheme could result in complete severance to the Solar photovoltaic farm at Snarlton Farm, with no alternative accessibility options available, resulting in major adverse impacts which is significant.	Physical receptors: • Large adverse (significant) Human receptors: • Large adverse (significant) * The significant effects would be the same for the wider group and all vulnerable groups	Access to the Solar photovoltaic farm (via Lower Woodrow and the access track) will be kept open and accessible as much as possible, and any temporary measures communicated to the owners of this business. The duration of any temporary measures will be kept to a minimum to reduce disruption as far as possible.	Physical receptors: • Moderate adverse (significant) Human receptors: • Moderate adverse (significant) * Whilst severance can have greater effects on vulnerable groups, the effects are significant for all group's resident at this property
Physical receptors: • Local business (Health and fitness business, 6 Guinea Cottage) Human receptors: • Those working at, or using, this local business	Medium	The Scheme would require land take from fields at 6 Guinea Cottage which is believed to be currently used as a health and fitness business (outdoor boot camps). This is a fairly large land plot, however land take could have significant effects on the business	Physical receptors: • Large adverse (significant) Human receptors: • Large adverse (significant) * The significant effects would be the same for the wider group and all vulnerable groups	Avoid land take. If this is not possible, minimise land take and amenity impacts as much as practicable	Physical receptors: • Large adverse (significant) Human receptors: • Large adverse (significant) * The significant effects would be the same for the wider group and all vulnerable groups

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures in place)
Physical receptors: • Local businesses (e.g. Oakley Farm and Equine Stud & Stables, industrial/commercial units at Manor Farm Estate, Sandridge Common; More Than Mowers/ Melksham Groundcare Machinery Ltd at Tanhouse Farm; M Vincent Windows and Glazing (421 Redstocks); Hurley Motors, Bowerhill; Turnpike garage, Bowerhill) Human receptors: • Those working at, or using, these businesses	Medium	Key construction impacts relate to temporary disruptions to access to businesses during the construction phase, particularly affecting those businesses currently accessed by Lower Woodrow, Sandridge Hill/ Sandridge Common, and Bath Road where there are no or limited alternative accessibility options available. This would result in temporary moderate adverse impacts, which is significant.	Physical receptors: • Moderate adverse (significant) Human receptors: • Moderate adverse (significant)	All roads will be kept open and accessible as much as possible, with temporary routes put in place for residents, local businesses, and others to continue to use the route and communicated to affected parties. The duration of these temporary measures will be kept to a minimum to reduce disruption as far as possible. Access will be maintained to local businesses for the duration of the works.	Physical receptors: • Moderate adverse (significant) Human receptors: • Moderate adverse (significant) * Whilst severance can have greater effects on vulnerable groups, the effects are significant for all group's resident at these properties
Physical receptors: • Other businesses in the core and wider study areas Human receptors: • Those working at, or using, these businesses	High	Key impacts relate to temporary disruptions to access to community land and assets in the core and wider study areas during the construction phase. There is likely to be some temporary disruptions to access for some residents in the core and wider study area accessing	Physical receptors: • Slight adverse (not significant) Human receptors: • Slight adverse (not significant)	All roads will be kept open and accessible as much as possible, with temporary routes put in place for residents, local businesses, and others to continue to use the route and communicated to affected parties.	Physical receptors: • Slight adverse (not significant) Human receptors: • Slight adverse (not significant)

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures in place)
		community facilities and services in Melksham and Bowerhill. However, the majority of the works are away from the main settlements in greenfield areas, therefore taken as a whole any impacts are likely to be negligible or neutral.	* The effects would be the same for the wider group and all vulnerable groups	The duration of these temporary measures will be kept to a minimum to reduce disruption as far as possible. Access will be maintained to local businesses for the duration of the works.	* The effects would be the same for the wider group and all vulnerable groups
Agricultural land holdings					
Arable and grass farms	Medium	Land-take	Moderate adverse (Significant)	None	Moderate adverse (Significant)
		Severance	Moderate adverse (Significant)	Provision of access to crossing points and handling pens	Moderate adverse (Significant)
		Haul roads and compounds	Slight adverse (not significant)	Restoration of land to its original capability	Neutral
Snarlton dairy farm	Very High	Land-take	Moderate adverse (Significant)	None	Moderate adverse (Significant)
		Severance	Large adverse (Significant)	Provision of underpass	Moderate adverse (Significant)
		Haul roads and compounds	Unknown	Restoration of land to its original capability	Neutral
		Noise and dust	Slight adverse (not significant)	Noise and dust suppression	Neutral
Oakley egg farm	Very high	Land take and severance	Very large adverse (Significant)	None	Very large adverse (Significant)

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures in place)
		Loss of access by chickens to 25% of the 3.8ha field			
		Severance	Very large adverse (Significant)	None	Very large adverse (Significant)
		Haul roads and compounds	Unknown	Restoration of land to its original capability	Neutral
		Noise and dust	Large adverse (Significant)	Noise and dust suppression	Moderate adverse (Significant)
Walkers, cyclists, and horse-riders (WCH)					
PRoW footpath LACO 37	Medium	Temporary and permanent loss of existing resource. Introduction of severance. >500 metre increase in WCH length. Alternative route available.	Moderate adverse (Significant)	Arrangements would be made to provide crossing facilities where practicable, which could include bridges or underpasses. PRoW to be kept open as long as it is safe to do so during construction, with closures forecasted and advertised in advance of works occurring, with suitable diversions put in place	Moderate adverse (Significant)
PRoW footpath MELW 61	Medium	Temporary and permanent loss of existing resource. Introduction of severance. >500 metre increase in WCH length. Alternative routes available.	Moderate adverse (Significant)		Moderate adverse (Significant)
PRoW footpath MELW 62A	Medium	Temporary loss of existing resource. Introduction of severance. >500 metre increase in WCH length.	Moderate adverse (Significant)		Moderate adverse (Significant)

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures in place)
		Alternative routes available.			
PRoW footpath MELW 63	Medium	Temporary and permanent loss of existing resource. Introduction of severance. >250 to 500 metre increase in WCH length. Alternative route available.	Moderate adverse (Significant)		Moderate adverse (Significant)
PRoW footpath MELW 49	Medium	Temporary and permanent loss of existing resource. Introduction of severance. >250 metre increase in WCH length. Alternative route available.	Slight adverse (not significant)		Slight adverse (not significant)
PRoW footpath MELW 48	Medium	Temporary loss of existing resource. Introduction of severance. >500 metre increase in WCH length. Alternative routes available.	Moderate adverse (Significant)		Moderate adverse (Significant)
PRoW footpath MELW 47	Medium	Temporary and permanent loss of existing resource. Introduction of severance. >250 metre increase in WCH length. Alternative route available.	Slight adverse (not significant)		Slight adverse (not significant)

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures in place)
Sandridge Hill	High	Temporary loss of existing resource. Introduction of severance. >500 metre increase in WCH length. Alternative routes available.	Moderate adverse (Significant)		Moderate adverse (Significant)
PRoW bridleway MELW 40	Medium	Temporary and permanent loss of existing resource. Introduction of severance. >500 metre increase in WCH length. Alternative routes available.	Moderate adverse (Significant)		Moderate adverse (Significant)
PRoW bridleway MELW 41	Medium	Temporary and permanent loss of existing resource. Introduction of severance. >500 metre increase in WCH length. Alternative routes available.	Moderate adverse (Significant)		Moderate adverse (Significant)
PRoW footpath MELW 30	Medium	Temporary and permanent loss of existing resource. Introduction of severance. >250 metre increase in WCH length. Alternative route available.	Slight adverse (not significant)		Slight adverse (not significant)
PRoW footpath MELW 26	Medium	Temporary and permanent loss of existing resource.	Moderate adverse (Significant)		Moderate adverse (Significant)

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures in place)
		Introduction of severance. >500 metre increase in WCH length. Alternative routes available.			
PRoW footpath MELW 23	Medium	Temporary and permanent loss of existing resource. Introduction of severance. >500 metre increase in WCH length. Alternative routes available.	Moderate adverse (Significant)		Moderate adverse (Significant)
PRoW footpath MELW 24	Medium	Temporary and permanent loss of existing resource. Introduction of severance. >500 metre increase in WCH length. Alternative routes available.	Moderate adverse (Significant)		Moderate adverse (Significant)
PRoW footpath MELW 35	Medium	Temporary and permanent loss of existing resource. Introduction of severance. >500 metre increase in WCH length. Alternative routes available.	Moderate adverse (Significant)		Moderate adverse (Significant)
PRoW footpath SEEN 18	Medium	Temporary loss of existing resource. Introduction of severance. >250 metre increase in WCH length.	Slight adverse (not significant)		Slight adverse (not significant)

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures in place)
		Alternative route available.			
PRoW bridleway SEEN 13	Medium	Temporary and permanent loss of existing resource. Introduction of severance. >500 metre increase in WCH length. Alternative routes available.	Moderate adverse (Significant)		Moderate adverse (Significant)
PRoW bridleway SEEN 17	Medium	Temporary and permanent loss of existing resource. Introduction of severance. >500 metre increase in WCH length. Alternative routes available.	Moderate adverse (Significant)		Moderate adverse (Significant)
PRoW footpath MELW 42	Medium	Temporary and permanent loss of existing resource. Introduction of severance. >250 to 500 metre increase in WCH length. Alternative route available.	Moderate adverse (Significant)		Moderate adverse (Significant)
Other PRoWs and footpaths identified in the baseline	Medium	Minor to Negligible alteration of characteristics, features, elements or accessibility	Slight adverse (not significant)		Slight adverse (not significant)

Human health

Table 12-13 – Potential human health effects during construction

Wider health determinant	Sensitivity of the community/ population to changes to the wider health determinant	Predicted impacts of the Scheme on the Wider Health Determinant	Health outcome	Health outcome description
Air pollution	There is a relationship between exposure to air pollutants and health outcomes. Air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions. There is also an important inequality dimension because areas with poor air quality are also often the less affluent areas. Nitrogen oxides are harmful pollutants, which mostly come from road transport, particularly diesel vehicles. Air pollution causes an estimated 40,000 premature deaths a year in the UK and is linked to health problems from childhood illnesses to heart disease and even dementia. Those with existing health issues are likely to be more vulnerable. Asthma, allergies, and some types of cancer are of concern to children. Short-term exposure is associated with exacerbation of asthma, effects on lung function, increases in hospital admissions and reduced life expectancy. Long-term exposure to air pollution reduces life expectancy by increasing deaths from lung, heart and circulatory conditions.	Construction activities could have a short-term negative impact on air quality at some human health receptors. This could include dust emissions from site works and construction vehicles carrying site materials or waste, along with exhaust emissions from construction vehicles and other traffic. The 335 human health receptors within 200 metres (i.e. 44 within 50 metres, 63 within 50 to 100 metres, and 228 within 100 to 200 metres) could be most affected, due to the proximity of these receptors and the relationship between exposure to dust and air pollutants and general health outcomes identified in the baseline. Whilst increased short-term exposure to pollutants and dust at certain locations would result in localised negative health outcomes, this can be minimised through standard and best practice mitigation measures, therefore it's unlikely to significantly exacerbate conditions for the various population groups, including the most vulnerable groups present at these receptors such as children and adolescents, older people, and those with lung and heart conditions.	Negative	A temporary adverse health impact is identified
Soil and water pollution	Sources of soil and water pollution can have an adverse impact on the environment and developments will need to be controlled to ensure that they do not expose existing and new receptors to levels detrimental to healthy living or safety concerns. Soil and water pollution can lead to public health impacts directly when people encounter polluted	The Geology and soils chapter (Chapter 9) identifies that construction activities could potentially introduce new sources of contamination (i.e. from spillages and leaks) and disturb and mobilise existing sources of contamination, which may present a risk to human health and controlled waters receptors. Construction activities, such as earthworks, piling, installation of drainage and other below ground services may introduce new pathways for migration of existing	Negative	A temporary adverse health impact is identified

Wider health determinant	Sensitivity of the community/ population to changes to the wider health determinant	Predicted impacts of the Scheme on the Wider Health Determinant	Health outcome	Health outcome description
	water and soil through recreation activities and/or indirectly through other activities.	contamination and exposure of contaminated soil, remobilisation of contaminants through soil disturbance and the creation of preferential pathways for surface water run-off and ground gas migration. Construction activities could also potentially generate contaminated dust and vapours. Therefore, an adverse health impact on soils and water is predicted, resulting in a negative health outcome. This would be the same for all groups.		
Noise pollution and vibration	There is a relationship between noise pollutants and health outcomes. Noise can be a particular issue for residents, particularly in certain parts of Melksham. Noise is linked to potential negative effects on physical, social, and mental wellbeing. Potential health effects identified include hearing loss or loss of hearing sensitivity, sleep disturbance, cardiovascular and physiological effects, mental health effects and behavioural effects, including poor school performance by school children.	The Noise and Vibration chapter (Chapter 5) considers the potential for adverse impacts on health and quality of life from changes to noise and vibration levels in the study area, considering that some people will experience noise and vibration differently. Construction activities have the potential to generate noise and vibration levels which may be disturbing to occupants of surrounding properties, with demolition and piling works likely to cause some of the highest noise levels. It is also anticipated that certain phases of work would need to be undertaken during the evening and night when there is increased likelihood of adverse effects. Traffic management measures may also need to be introduced, meaning noise impacts could be experienced at roadside receptors. The Noise and vibration chapter identifies significant effects may be experienced at noise sensitive receptors within 40 metres of construction activities during the daytime, within 90 metres of construction activities during the evening, and within 225 metres of construction activities during the night-time. Any vibration effects are not predicted to be significant.	Negative	A temporary adverse health impact is identified

Wider health determinant	Sensitivity of the community/ population to changes to the wider health determinant	Predicted impacts of the Scheme on the Wider Health Determinant	Health outcome	Health outcome description
		This would result in localised negative health outcomes which would need to be managed by appropriate mitigation measures, such as Best Practicable Means.		
Landscape and visual amenity	Visual receptors in the study area include PRoW and properties (residential, business, and community receptors). The visible landscape is believed to affect human health in many ways, including aesthetic appreciation and health and well-being. Visual amenity relates to the way in which people visually experience the surrounding landscape. Adverse visual effects may occur through the intrusion into established views of new features, out of keeping with the existing structure, scale, and composition of the view. However, visual effects may also be beneficial where an attractive focus is created in a previously unremarkable view or the influence of previously detracting features is reduced. The health impact will vary, depending on the nature and degree of change experienced and the perceived value and composition of the existing view.	Some adverse health impacts are predicted from changes to views at several residential receptors, particularly from upper storeys and during the winter period, including: • Residential properties along Folly Lane East, Piccadilly Caravan Park and Melksham Road in Lacock; Lower Woodrow Road, Woodrow Road and Forest Lane; Sandridge Hill/ A3102, Lopes Close and Sandridge Common; Eastern Way, east of Melksham, and Carnation Lane; around Redstocks and A365; along Bath Road/ A365 and Bowerhill Lane, Bowerhill; along Church Street and Manor Close, Semington; • Farmsteads and businesses along the A361 and near Littleton Roundabout; near the A342/ A3102 junction; • PRoWs and NCN Route 4, Kennet and Avon Canal Route; NCN Route 403	Negative	A temporary adverse health impact is identified
Risk of injury and death	There is evidence to establish an association between changes in traffic patterns and increase in road traffic and road traffic incidents resulting in serious injury and fatalities. An individual's risk of injury may be impacted by many social, personal, economic, and environmental factors. The physical environment such as transport systems and infrastructure, land use and urban development can affect the rate of incidents, injuries, and death. Overall, children from the lowest social classes are five times more likely to die in road accidents than	Construction activities, increased traffic, and the introduction of construction traffic (particularly in the residential areas), alterations to existing traffic routes and patterns, and an unawareness of altered traffic movements has the potential to temporarily increase the risk of injury and death. Vulnerable road users, such as motorcyclists, elderly drivers, new drivers and cyclists, children, and pedestrians, may be more at risk from changes to the baseline conditions, albeit slower vehicle movements due to construction activities may temporarily improve the situation in some locations.	Negative	A temporary adverse health impact is identified

Wider health determinant	Sensitivity of the community/ population to changes to the wider health determinant	Predicted impacts of the Scheme on the Wider Health Determinant	Health outcome	Health outcome description
	those from the highest social class. More than 1 in 4 child pedestrian casualties happen in the 10% most deprived wards.			
Active travel	There is a relationship between active travel and health outcome. Active travel promotes mental and physical wellbeing by encouraging walking and cycling which improve health. Such communities are generally more physically active, experience increased social contact, lower levels of traffic injuries and are less exposed to air pollution. Regular physical activity has many benefits to health. It reduces the risk of chronic conditions such as cardiovascular disease, diabetes, cancer, obesity, musculoskeletal conditions, and mental health problems and improves mood. Footways and cycle lanes contribute to physical activity.	During construction, there would be a decrease in amenity and an increase in severance for pedestrians and others at a number of PRoWs and footways in the study area, particularly the routes which interact with the Scheme close to the construction works.	Negative	A temporary adverse health impact is identified
Work and training	There is evidence to establish an association between economic activity, including local procurement, and health outcomes. The transport system and good pedestrian and cycling facilities enables people to get to work. An effective and efficient transport system is essential to the economic prosperity of the area. The local patterns of employment can either increase or decrease the need for people to travel, and the greater the distances involved the more likely people are to rely on motorised transport and have complicated, expensive, and time-consuming journeys. Nationally, 2 in 5 job seekers said lack of transport was a barrier to getting a job, 1 in 4 said that the cost of transport is a problem and 1 in 4 young people had not applied for a particular job because of transport problems.	There would be some localised land take and potential severance effects that could affect the health and fitness business at 6 Guinea Cottage and the Solar photovoltaic farm located at Snarlton Farm, respectively. Other key construction impacts relate to temporary disruptions in access to local businesses, particularly the businesses currently accessed by Lower Woodrow, Sandridge Hill/ Sandridge Common, and Bath Road where there are no or limited alternative accessibility options available. Residents could also face temporary disruptions when travelling to work in the core and wider study area from construction activities.	Negative	A temporary adverse health impact is identified
		The main socio-economic impact during construction is likely to be the additional temporary employment generated as a result of the construction of the Scheme. Construction is expected to support a number of direct	Positive	A beneficial health impact is identified

Wider health determinant	Sensitivity of the community/ population to changes to the wider health determinant	Predicted impacts of the Scheme on the Wider Health Determinant	Health outcome	Health outcome description
	It is estimated that 10% to 15% of car trips at peak times could be made by alternative, more sustainable types of transport, or replaced by the use of electronic communication. Income and work are two of the most important determinants of health and wellbeing. Employment and skills influence mental and physical health, with low education levels and unemployment linked with increased stress, lower self-confidence, increased rates of illness and premature death. Those on lower incomes due to low skills or unemployment are also less likely to be able to engage in healthy behaviours which impact physical and mental health.	jobs as well as further indirect and induced jobs that may be supported through supply linkage and income multiplier effects. This includes firms supplying construction materials and equipment, and construction workers spending part of their wages in the local economy. This would support Strategic objective 1 of the Wiltshire Core Strategy. The Council can seek to maximise local employment opportunities, with a proportion of the workforce living within commuting distance.		
Access and accessibility to housing	There is evidence to establish an association between access and accessibility of housing and health outcomes. Housing is not just a dwelling place. It provides comfort, shelter, safety and warmth, the cornerstone on which individuals and families build a better quality of life, access services they need and gain greater independence. It provides the main setting for our health throughout our lives. Good housing and physical and financial access to housing can play its part in reducing health inequalities and health harms. Housing can also support existing communities and access to employment, public transport, shops and services. Changes in accessibility can result in distress and affect physical and mental health and wellbeing, particularly for vulnerable groups. Housing instability can disrupt work, school, and day care arrangements, as well as social networks for adults, children and adolescents.	No demolition of any properties will be required to construct or accommodate the Scheme. A small amount of land take is required at 6 Guinea Cottage; however, this will be a localised factor only. Construction works have the potential to result in temporary disruption and/or amenity effects on existing houses and housing conditions, particularly the properties located closest to the proposed works. This could result in temporary distress and affect physical and mental wellbeing, particularly for any vulnerable groups present at these properties. The introduction of a ‘non-home-based’ construction workforce into an area can impact capacity in the housing market. However, given the nature of these workers, the relatively small number predicted to work on the Scheme, the fact that most are likely to commute to the site from a sustainable distance and few are expected to reside within the core study area itself, any impacts are not predicted to be significant. No impacts are expected on housing availability or the housing policies for Wiltshire.	Negative	A temporary adverse health impact is identified

Wider health determinant	Sensitivity of the community/ population to changes to the wider health determinant	Predicted impacts of the Scheme on the Wider Health Determinant	Health outcome	Health outcome description
	Whilst there are inefficiencies across the transport network affecting various places across Melksham, in the long-term it is areas where there is most pressure for new homes and jobs or areas that require regeneration which need improvements in transport infrastructure.			
Education, healthcare services and other social infrastructure	There is a causal relationship between access to education, health and social care services, and other social infrastructure and health outcomes. Education plays a major role in a person's overall health and wellbeing. Education can affect us throughout our lifetime and has been shown to increase healthy behaviours and improve health outcomes, including obesity rates. Early education is especially important because it sets the foundation for a healthy life. A skilled workforce enables businesses to compete regionally, nationally and globally, which creates a stronger and more resilient economy. Skills are the biggest determinant of success for cities and are critical to achieving economic wellbeing. Availability and use of healthcare services that prevent and treat disease and other social infrastructure is important for promoting and maintaining health, preventing and treating disease, reducing unnecessary disability and premature death, and achieving health equality for the population. Groups more vulnerable to illness, such as the elderly and children, benefit disproportionately. Community facilities covers a range of services and facilities that meet local and strategic needs and contribute towards a good quality of life.	Construction activities may cause delays and/or result in a temporary decrease in access to some services and facilities in the core and wider study area, particularly to the south of Melksham, which could have temporary adverse effects for health and wellbeing, however any impacts are expected to be localised. Maintaining access and minimising disruption and amenity impacts to these services/ facilities will be vital.	Negative	A temporary adverse health impact is identified

Wider health determinant	Sensitivity of the community/ population to changes to the wider health determinant	Predicted impacts of the Scheme on the Wider Health Determinant	Health outcome	Health outcome description
	Lack of accessibility and affordable and appropriate transport is a barrier to employment, healthcare, and social and cultural activities.			
Social cohesion	There is an association between community cohesion and social identity and health outcomes. Social cohesion and lifetime neighbourhoods are important in reducing health and social inequalities. Relationships and support networks are important for physical health, social and mental wellbeing, particularly for elderly populations at risk of social isolation, those on low incomes, young people and children. Social cohesion increases connections and solidarity amongst groups. The potential impact of social capital on social cohesion will vary depending on the ways in which the effects are enhanced or diminished by the wider social, political, economic and cultural environment. Lack of social cohesion can have adverse effects on behaviours, leading to crime, disorder and violence.	Social cohesion may be affected by uncertainty on whether the Scheme will occur, and the prospect of temporary disruption effects. The Scheme would not result in any residential relocations, loss of people who are influential in local social networks or changes to community facilities which can affect community cohesion. Community cohesion could be affected by effects on local businesses, temporary impacts to local roads and disruptions to access to PRoW, footways, and local facilities. There could also be environmental issues such as noise, construction traffic, severance, visual impacts, air quality, dust and odour etc. and disruptions to access that would require mitigation. However, these impacts are localised and taken as a whole, any effects on social cohesion for the community would not be significant. An increase in population arising from a non-home-based construction workforce and contractors working in the area could lead to social impacts and risks that can affect community cohesion. However, the non-home-based workforce is expected to be temporary and transient, and the number of non-home-based workforce is predicted to be low.	Neutral	No discernible health impact is identified

Operation

Population

Table 12-14 – Potential population effects during operation (Land use and accessibility)

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures in place)
Private property and housing					
Physical receptors: Residential properties in the core study area (all Scheme Sections) Human receptors: Residents	High	Where access is altered for a private property as part of the construction of the Scheme, this has been assessed as part of the construction assessment. New junction facilities would be introduced at Lacock, Lower Woodrow, Sandridge Hill/ Sandridge Common, Bath Lane, south of Hampton Business Park on the A350 and at Semington, however no anticipated significant changes to journey length is predicted for residential properties near these junctions. However, overall journey times are predicted to improve as a result of the Scheme. Traffic is likely to improve in Melksham due to the proposed free-flow link road providing an alternative route to the A350, directing displaced congestion from the centre of Melksham. Journey time savings are predicted for current northbound and southbound traffic that uses the A350 to connect to residential properties in Melksham and those connected by local roads such as Sandridge Road and Western Way.	Physical receptors: Slight beneficial (not significant) Human receptors: Slight beneficial (not significant) * The effects would be the same for the wider group and all vulnerable groups	No mitigation	Physical receptors: Slight beneficial (not significant) Human receptors: Slight beneficial (not significant) * The effects would be the same for the wider group and all vulnerable groups
Community land and assets					
Physical receptors: Community land and assets in the	High	The Scheme would not result in any significant changes in access or increased severance to community land and assets in the core or wider study area. Increased network capacity, improved journey time reliability and reduced congestion in the centre of Melksham and on the	Physical receptors: Slight beneficial (not significant)	No mitigation	Physical receptors: Slight beneficial (not significant)

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures in place)
core and wider study areas Human receptors: Users of community land/ facilities/ services		surrounding network is anticipated to improve local and wider access to services and facilities and reduce severance for vehicle travellers, pedestrians and others and creating a better and safer environment.	Human receptors: Slight beneficial (not significant) * The effects would be the same for the wider group and all vulnerable groups		Human receptors: Slight beneficial (not significant) * The effects would be the same for the wider group and all vulnerable groups
Development land and businesses					
Physical receptors: Other businesses in the core and wider study areas Human receptors: Those working at, or using, these businesses	Medium to High	There may be some localised adverse impacts, however, overall, journey time savings are anticipated when accessing businesses off the junctions (e.g. Lower Woodrow, Sandridge Hill/ Sandridge Common, Bath Lane, Hampton Business Park and Semington) and in the centre of Melksham from reduced congestion and improved journey time reliability. Improved connectivity could bring new markets within reach for businesses, which in turn could bring new jobs in reach of the community. This is particularly important for businesses reliant on good accessibility and connectivity, such as distribution and logistics. There is also likely to be a minor beneficial impact on the local economy through improved connectivity for residents that use the Scheme, A350, and local road network, which would become less congested, to access employment in the local and wider area. Sites allocated for employment and planning permissions recently granted in the core and wider study area are anticipated to benefit from improved connectivity, reduced congestion, and improved traffic flow.	Physical receptors: Slight beneficial (not significant) Human receptors: Slight beneficial (not significant) * The effects would be the same for the wider group and all vulnerable groups	No mitigation	Physical receptors: Slight beneficial (not significant) Human receptors: Slight beneficial (not significant) * The effects would be the same for the wider group and all vulnerable groups

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures in place)
Agricultural land holdings					
Farms in the core study area	Medium to Very High	The permanent construction effects reported in the construction assessment would continue to be observed during the operational phase. This is a construction effect and is therefore not considered as an operational effect. No significant effects are predicted during operation.	N/A	N/A	N/A
Walkers, Cyclists and Horse-riders (WCH)					
PRoW footpaths LACO 37, MELW 61, MELW 63, MELW 47, MELW 40, MELW 41, MELW 26, MELW 23, MELW 24, MELW 35, SEEN 13, SEEN 17, MELW 42,	Medium	The permanent significant construction effects reported in the construction assessment would continue to be observed during the operational phase. This is a construction effect and is therefore not considered as an operational effect.	N/A	N/A	N/A
PRoW footpaths MELW 49, MELW 47, MELW 30,	Medium	The permanent non-significant construction effects reported in the construction assessment would continue to be observed during the operational phase. This is a construction effect and is therefore not considered as an operational effect.	N/A	N/A	N/A
Footways at Melksham Road, Lacocks; Sandridge Common; Bath Lane	Medium	There could be some minor severance effects/ increase in journey time/ distance for users of these footpaths because of the introduction of roundabout junctions where currently there is a straight route. However, these effects would not be significant.	Slight adverse (not significant)	No mitigation	Slight adverse (not significant)

Receptor	Value/ Sensitivity	Impacts	Potential effect (without mitigation)	Potential mitigation measures	Potential residual effects (with potential mitigation measures in place)
Footways in Melksham	Medium	Reduced congestion and free flow of traffic on the A350 and through Melksham should provide a better and safer environment for pedestrians and others, including vulnerable groups. Minor beneficial impacts are predicted, resulting in slight beneficial effects, which is not significant.	Slight beneficial (not significant)	No mitigation	Slight beneficial (not significant)
Footways and PRoW in the rest of the study area	Medium	The impacts on amenity and journey times/ journey patterns for users of the other footways, Non-Definitive footpaths and PRoW in the core and wider study area is expected to be no change, resulting in neutral effects.	Neutral	N/A	Neutral

Table 12-15 – Potential human health effects during operation

Wider health determinant	Sensitivity of the community/ population to changes to the wider health determinant	Predicted impacts of the Scheme on the Wider Health Determinant	Health outcome	Health outcome description
Air pollution	There is a relationship between exposure to air pollutants and health outcomes. Air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions. There is also an important inequality dimension because areas with poor air quality are also often the less affluent areas. Nitrogen oxides are harmful pollutants, which mostly come from road transport, particularly diesel vehicles. Air pollution causes an estimated 40,000 premature deaths a year in the UK and is linked to health problems from childhood illnesses to heart disease and even dementia. Those with existing health issues are likely to be more vulnerable. Asthma, allergies, and some types of cancer are of concern to children. Short-term exposure is associated with exacerbation of asthma, effects on lung function, increases in hospital admissions and reduced life expectancy. Long-term exposure to air pollution reduces life expectancy by increasing deaths from lung, heart, and circulatory conditions.	The Air Quality chapter (Chapter 4) identifies: • the majority of human health receptors in the air quality study area are expected to have NO2 concentrations below the AQS objective in the opening year (2028) both with and without the Scheme, with the only exceedances at two receptors with and without the Scheme, and one without the Scheme – all located within the Devizes Shanes Castle AQMA. However, at all three receptors, NO2 concentrations are expected to decrease with the Scheme due to the redistribution of traffic at Dunkirk Hill and a reduction in HGVs along the A361 The Nursery. • In other parts of the air quality study area, annual mean concentrations are below the relevant AQS objectives both with and without the Scheme, however there will be increases and decreases as a result of changes to traffic. Decreases in pollutant concentrations are expected at human health receptors in Melksham and Beanacre with the redistribution of traffic to the eastern and southern fringes of Melksham and Bowerhill. • No adverse impacts are predicted on the AQMAs in Calne and Devizes. In summary, the Scheme would not trigger a significant air quality effect. There would be a beneficial health impact at human health receptors particularly in Melksham and Beanacre from the redistribution of traffic away from the A350 corridor, resulting in localised positive health	Positive	A beneficial health impact is identified

Wider health determinant	Sensitivity of the community/ population to changes to the wider health determinant	Predicted impacts of the Scheme on the Wider Health Determinant	Health outcome	Health outcome description
		outcomes, and no discernible health impact elsewhere in the study area.		
Soil and water pollution	Sources of soil and water pollution can have an adverse impact on the environment and developments will need to be controlled to ensure that they do not expose existing and new receptors to levels detrimental to healthy living or safety concerns. Soil and water pollution can lead to public health impacts directly when people encounter polluted water and soil through recreation activities and/or indirectly through other activities.	The operation of the Scheme may potentially introduce new sources of contamination i.e. spillages and leaks from vehicles and below ground services could create additional potential pathways for the migration of potential contamination which were not present in the baseline. However, it is assumed that the Scheme will be operated in accordance with the relevant regulations and best practice guidance in applying Best Available Techniques and pollution prevention. Therefore, at worst, an adverse health impact in predicted, resulting in a negative health outcome.	Negative	An adverse health impact is identified
Noise pollution and vbration	There is a relationship between noise pollutants and health outcomes. Noise can be a particular issue for residents, particularly in certain parts of Melksham. Noise is linked to potential negative effects on physical, social, and mental wellbeing. Potential health effects identified include hearing loss or loss of hearing sensitivity, sleep disturbance, cardiovascular and physiological effects, mental health effects and behavioural effects, including poor school performance by school children.	Once operational, the Noise and Vibration chapter (Chapter 5) identifies that the noise climate could be affected (positively or negatively) by changes in traffic flows, speeds, and composition on existing roads. The introduction of traffic through the Scheme itself has the potential to cause adverse impacts at sensitive receptors in proximity to the alignment. In addition, noise levels at nearby receptors could also be affected by any changes to the distance between carriageways and the sensitive receptors as a result of changes to the existing road alignments. A summary of the potential impacts from operational noise associated with the Scheme is as follows: <u>Short-term day-time traffic noise impacts</u> • Negligible changes at 2,609 dwellings and 87 non-residential receptors; • Minor beneficial impacts at 4,712 dwellings, due to traffic using the new bypass rather than the A350 (e.g. north-west Shurnhold, west and southern parts of the centre of Melksham), and traffic changes on other local	Neutral	No discernible health impact is identified

Wider health determinant	Sensitivity of the community/ population to changes to the wider health determinant	Predicted impacts of the Scheme on the Wider Health Determinant	Health outcome	Health outcome description
		roads (e.g. A3102, A342, roads within Lacock, Hither Way, The Wharf, Bowdon Hill); • Moderate beneficial impacts at 715 dwellings along the A350 at Beanacre, and north-east of Shurnhold; • Major beneficial impacts at 141 dwellings located closest to the carriageway along the A350 at Beanacre and on Forest Lane; • Minor beneficial impacts at 347 non-residential receptors, moderate beneficial impacts at 32 non-residential receptors, and major beneficial impacts at two non-residential receptors; • Minor adverse impacts at 1,491 dwellings, which includes isolated properties away from the Scheme alignment, and properties along Bollnds Hill, A365/ Bath Road, and the Bowerhill housing area; • Moderate adverse impacts at 533 dwellings, including properties located closer to the Scheme alignment and at Bowerhill closest to the Scheme; • Major increases at 702 dwellings, including properties located close to the Scheme alignment, and at Bowerhill closest to the Scheme; • Minor adverse impacts are predicted at 29 non-residential receptors, moderate adverse impacts at 16 non-residential receptors, and major adverse impacts at 13 non-residential receptors. <u>Long-term day-time traffic noise impacts</u> • Negligible changes at 8,954 dwellings and 463 non-residential receptors; • Minor beneficial impacts at 644 dwellings, due to traffic using the new bypass rather than the A350 (e.g. benefitting dwellings along the A350 between Beanacre		

Wider health determinant	Sensitivity of the community/ population to changes to the wider health determinant	Predicted impacts of the Scheme on the Wider Health Determinant	Health outcome	Health outcome description
		and Shurnhold), and traffic changes on other local roads (e.g. Forest Lane and New Road); • Moderate beneficial impacts at 50 dwellings along the A350 at Beanacre, and between Beanacre and the proposed A350 Scheme Junction at Lacock; • No major beneficial impacts are predicted during operation; • Minor beneficial impacts at 27 non-residential receptors, moderate beneficial impacts at 2 non-residential receptors, and no major beneficial impacts at any non-residential receptors; • Minor adverse impacts at 536 dwellings, which includes isolated properties away from the Scheme alignment, and dwellings located in the Bowerhill housing area; • Moderate adverse impacts at 608 dwellings, including isolated properties located closer to the Scheme alignment and properties at Bowerhill; • Major increases at 111 dwellings, including isolated properties located close to the Scheme alignment, and at Bowerhill; • Minor adverse impacts are predicted at 20 non-residential receptors, moderate adverse impacts at 13 non-residential receptors, and major adverse impacts at one non-residential receptor. The Noise and Vibration chapter (Chapter 5) identifies there will be a range of positive and negative health outcomes in the study area resulting from changes to noise levels associated with the Scheme. This would result in localised beneficial and adverse health impacts, however taken as a whole, a neutral		

Wider health determinant	Sensitivity of the community/ population to changes to the wider health determinant	Predicted impacts of the Scheme on the Wider Health Determinant	Health outcome	Health outcome description
		health outcome is predicted, resulting in no discernible health impact.		
Landscape and visual amenity	Visual receptors in the study area include PRoW and properties (residential, business, and community receptors). The visible landscape is believed to affect human health in many ways, including aesthetic appreciation and health and well-being. Visual amenity relates to the way in which people visually experience the surrounding landscape. Adverse visual effects may occur through the intrusion into established views of new features, out of keeping with the existing structure, scale and composition of the view. However, visual effects may also be beneficial where an attractive focus is created in a previously unremarkable view or the influence of previously detracting features is reduced. The health impact will vary, depending on the nature and degree of change experienced and the perceived value and composition of the existing view.	Some adverse health impacts are predicted from changes to views at several residential receptors, particularly from upper storeys and during the winter period, including: • Residential properties around Lower Woodrow Road, Woodrow Road and Forest Lane; Sandridge Hill/ A3102, Lopes Close and Sandridge Common; Eastern Way, east of Melksham, and Carnation Lane; around Redstocks and A365; along Bath Road/ A365 and Bowerhill Lane, Bowerhill; along Church Street and Manor Close, Semington; • Farmsteads and businesses along the A361 and near Littleton Roundabout; near the A342/ A3102 junction; • PRoWs and NCN Route 4, Kennet and Avon Canal Route; NCN Route 403	Negative	An adverse health impact is identified
Risk of injury and death	There is evidence to establish an association between changes in traffic patterns and increase in road traffic and road traffic incidents resulting in serious injury and fatalities. An individual's risk of injury may be impacted by many social, personal, economic, and environmental factors. The physical environment such as transport systems and infrastructure, land use and urban development can affect the rate of incidents, injuries, and death. Overall, children from the lowest social classes are five times more likely to die in road accidents than those from the highest social class. More than 1 in 4	During operation, there is expected to be a general reduction in traffic related injury and risk as the Scheme would allow vehicles to move more freely, bypassing Melksham and reducing the volume of traffic, including HGVs, in the centre of Melksham which would create a better and safer environment for pedestrians and others, reduce conflicts and the risk of shunts and slow speed collisions. Vehicles would instead move freely on the approximate six mile stretch between Lacock and Semington, albeit increased traffic travelling at speed and new junctions could introduce some risks. New road surfacing, lighting,	Positive	A beneficial health impact is identified

Wider health determinant	Sensitivity of the community/ population to changes to the wider health determinant	Predicted impacts of the Scheme on the Wider Health Determinant	Health outcome	Health outcome description
	child pedestrian casualties happen in the 10% most deprived wards.	good visibility, and new signage should help to minimise any effects on safety. Subject to detailed design, there may be new risks for users of PRoW that need to cross the Scheme, however usage of the PRoWs is expected to be low, and solutions can be incorporated into the design. Overall, the Scheme is expected to have a beneficial health impact on risk of injury and death, which would result in a positive health outcome. This could have particular benefits in the centre of Melksham and for vulnerable groups such as children and adolescents, older people, and people with impairments.		
Active travel	There is a relationship between active travel and health outcome. Active travel promotes mental and physical wellbeing by encouraging walking and cycling which improve health. Such communities are generally more physically active, experience increased social contact, lower levels of traffic injuries and are less exposed to air pollution. Regular physical activity has many benefits to health. It reduces the risk of chronic conditions such as cardiovascular disease, diabetes, cancer, obesity, musculoskeletal conditions, and mental health problems and improves mood. Footways and cycle lanes contribute to physical activity.	The permanent adverse construction effects reported in the construction assessment for PRoWs and footways would continue to be observed during the operational phase. This is a construction effect and is therefore not considered as an operational effect. The Scheme would improve the efficiency of the highway network and draw traffic away from other congested routes, particularly the A350 and local connector roads. Particular benefits would be experienced in the centre of Melksham, where the removal of displaced congestion would improve pedestrian safety and use of footways which currently can be daunting. This would make the pedestrian environment more attractive, encourage more users to make their journeys on foot, and would help to reduce journey times/distance and severance. Increased active travel can improve mental and physical wellbeing, increase social contact, and help to reduce the risk of chronic conditions, which would have a beneficial impact for health, resulting in a positive health outcome. Elsewhere, there could be some localised beneficial or adverse health impacts, however, taken as a whole, no	Positive	A beneficial health impact is identified

Wider health determinant	Sensitivity of the community/ population to changes to the wider health determinant	Predicted impacts of the Scheme on the Wider Health Determinant	Health outcome	Health outcome description
		discernible health impacts are predicted for active travel, resulting in a neutral health outcome.		
Work and training	There is evidence to establish an association between economic activity, including local procurement, and health outcomes. The transport system and good pedestrian and cycling facilities enables people to get to work. An effective and efficient transport system is essential to the economic prosperity of the area. The local patterns of employment can either increase or decrease the need for people to travel, and the greater the distances involved the more likely people are to rely on motorised transport and have complicated, expensive, and time-consuming journeys. Nationally, 2 in 5 job seekers said lack of transport was a barrier to getting a job, 1 in 4 said that the cost of transport is a problem and 1 in 4 young people had not applied for a particular job because of transport problems. It is estimated that 10% to 15% of car trips at peak times could be made by alternative, more sustainable types of transport, or replaced by the use of electronic communication. Income and work are two of the most important determinants of health and wellbeing. Employment and skills influence mental and physical health, with low education levels and unemployment linked with increased stress, lower self-confidence, increased rates of illness and premature death. Those on lower incomes due to low skills or unemployment are also less likely to be able to engage in healthy behaviours which impact physical and mental health.	The Scheme is an important part of the delivery of the transport and economic vision for Melksham and Wiltshire which aims to support and help to improve the vitality, viability and resilience of the Wiltshire economy and market towns. The Scheme would support local economic activity by removing through traffic and congestion from the centre of Melksham, which would make the town centre a safer and more attractive environment for users. Journey times and delays would be reduced, and journey reliability improved on the following routes through Melksham and Beanacre: A350 South - A3102, A365 West - A365 East, and A350 South - A365 West. Congestion would also be reduced on nearby connector roads. This would have a beneficial effect overall for local businesses in Melksham, the core and wider study area by improving access and through traffic, encouraging new development opportunities, particularly in the A350 corridor, and additional jobs that could potentially be generated directly and indirectly by the Scheme. The Scheme is expected to improve local and wider access to jobs, better connect businesses to each other and employees, and facilitate the sustainable distribution of traffic and freight across the area and Wiltshire. This could have benefits for various social groups such as improving health, providing financial security, and contributing to elf-esteem. Overall, beneficial impacts are predicted from the Scheme on work and training, resulting in a positive health outcome.	Positive	A beneficial health impact is identified

Wider health determinant	Sensitivity of the community/ population to changes to the wider health determinant	Predicted impacts of the Scheme on the Wider Health Determinant	Health outcome	Health outcome description
Access and accessibility to Housing	There is evidence to establish an association between access and accessibility of housing and health outcomes. Housing is not just a dwelling place. It provides comfort, shelter, safety and warmth, the cornerstone on which individuals and families build a better quality of life, access services they need and gain greater independence. It provides the main setting for our health throughout our lives. Good housing and physical and financial access to housing can play its part in reducing health inequalities and health harms. Housing can also support existing communities and access to employment, public transport, shops and services. Changes in accessibility can result in distress and affect physical and mental health and wellbeing, particularly for vulnerable groups. Housing instability can disrupt work, school, and day care arrangements, as well as social networks for adults, children and adolescents. Whilst there are inefficiencies across the transport network affecting various places across Malksham, in the long-term it is areas where there is most pressure for new homes and jobs or areas that require regeneration which need improvements in transport infrastructure.	There may be some localised amenity and severance impacts, however overall, the Scheme would improve financial and physical accessibility to housing by providing new road links which would help to reduce congestion and improve accessibility to housing. The Scheme would provide the necessary transport infrastructure to support new housing in the western Wiltshire (A350) corridor. There may be potential effects related to population growth and subsequent additional demand for housing in the core and wider study area as a result of economic growth directly or indirectly arising from the Scheme. This could increase the demand on current housing and future/safeguarded sites coming forward for development. However, any effects are not predicted to be significant. Both the local economy and local population, including the number of households in the core and wider study area, are projected to increase regardless of the Scheme. This growth is expected to be enhanced through additional population growth driven by an increase in jobs and accessibility to jobs. However, any effects are not predicted to be significant. Whilst the Scheme could directly or indirectly lead to some increased housing need within the core and wider study areas, this is expected to be generally met by the strategic housing need identified for Wiltshire. The sensitivity of the housing market is low as it is adaptive to change and affected by wider factors. Therefore, no significant adverse effects are predicted on receptors from additional demand for housing in the core and wider study area arising from the Scheme. Although there would be some adverse and positive effects, taken as a whole a beneficial health impact on	Positive	A beneficial health impact is identified

Wider health determinant	Sensitivity of the community/ population to changes to the wider health determinant	Predicted impacts of the Scheme on the Wider Health Determinant	Health outcome	Health outcome description
		housing is predicted, resulting in a positive health outcome.		
Education, healthcare services and other social infrastructure	There is a causal relationship between access to education, health and social care services, and other social infrastructure and health outcomes. Education plays a major role in a person's overall health and wellbeing. Education can affect us throughout our lifetime and has been shown to increase healthy behaviours and improve health outcomes, including obesity rates. Early education is especially important because it sets the foundation for a healthy life. A skilled workforce enables businesses to compete regionally, nationally, and globally, which creates a stronger and more resilient economy. Skills are the biggest determinant of success for cities and are critical to achieving economic wellbeing. Availability and use of healthcare services that prevent and treat disease and other social infrastructure is important for promoting and maintaining health, preventing and treating disease, reducing unnecessary disability and premature death, and achieving health equality for the population. Groups more vulnerable to illness, such as the elderly and children, benefit disproportionately. Community facilities covers a range of services and facilities that meet local and strategic needs and contribute towards a good quality of life. Lack of accessibility and affordable and appropriate transport is a barrier to employment, healthcare, and social and cultural activities.	In general, there may be some localised severance effects to the south east of Melksham, however the Scheme is anticipated to contribute to an overall improvement in the wider accessibility to education, health care services and other community facilities by reducing severance particularly in Beanacre and the northern part of Melksham, taking traffic away from the centre of Melksham, reducing congestion, increasing network capacity, and improving accessibility the core and wider study areas. This can help to address some of the current deficiencies identified in the core study area such as poor living environment and barriers to services. The Scheme is expected to contribute to population and household growth directly and indirectly in line with Wiltshire's economic and development aspirations which may affect the demand for education, healthcare services and other social infrastructure. However, each type of facility will have its own sensitivity to change, and this will be monitored by the Council. At this stage it is not possible to predict the future demographic change in population, households or household composition in the core and wider study areas and demand for education, healthcare services and other social infrastructure. Population and demand for local services in the core and wider study area will increase in future years with or without the Scheme. Operation of the Scheme is not predicted to result in any significant environmental changes (e.g. noise, air quality, odour) or changes in access that would significantly affect schools, healthcare services and/or other community facilities. Overall, despite some localised impacts, beneficial health impacts are predicted, resulting in a positive health	Positive	A beneficial health impact is identified

Wider health determinant	Sensitivity of the community/ population to changes to the wider health determinant	Predicted impacts of the Scheme on the Wider Health Determinant	Health outcome	Health outcome description
		outcome. This outcome is not predicted to be significant and would be the same for all groups.		
Social cohesion	There is an association between community cohesion and social identity and health outcomes. Social cohesion and lifetime neighbourhoods are important in reducing health and social inequalities. Relationships and support networks are important for physical health, social and mental wellbeing, particularly for elderly populations at risk of social isolation, those on low incomes, young people, and children. Social cohesion increases connections and solidarity amongst groups. The potential impact of social capital on social cohesion will vary depending on the ways in which the effects are enhanced or diminished by the wider social, political, economic, and cultural environment. Lack of social cohesion can have adverse effects on behaviours, leading to crime, disorder, and violence.	The Proposed Development is expected to reduce severance and take traffic away from the centre of Melksham and could also have benefits for local connector roads, however it could also cause severance effects in some localities. Overall, this could encourage town centre regeneration and would have benefits for community facilities and social networks in Melksham. The population in the local area is expected to increase in future years with or without the Scheme, however the Scheme would help to stimulate growth by improving conditions in the area. An influx of new residents from other areas, would increase the local population and could result in changes (positive and negative) to social networks and provision of community facilities. In the short-term, there could be some minor impacts on community cohesion as new residents and communities arrive, however in the long-term it is expected that existing social networks could be strengthened, and new social networks will develop. Over time, feelings and perceptions about the community following integration are also likely to establish new norms. In summary, there may be short-term effects linked to population growth and medium or long-term effects relating to the consequence of such change on community cohesion. On balance, beneficial health impacts are predicted, resulting in a positive health outcome, however any effects are not predicted to be significant.	Positive	A beneficial health impact is identified

12.8. Potential mitigation measures

12.8.1. At this early stage of design development, much of the construction methodology of the Scheme is currently unknown and therefore assumptions are required. The general construction assumptions are outlined below:

- Construction activities that affect the existing A350 will avoid peak times to minimise congestion and therefore disruption during construction.
- Where new junctions are proposed that effect other roads such as the A3102 Sandridge Hill and A365 Bath Road, temporary routes will be put in place for local residents and other users to continue to use the route. The duration of these temporary measures will be kept to a minimum to reduce disruption as far as possible. The duration of junction construction will depend on the construction stages of the whole project, but in isolation it may vary from 2 to 4 months.
- Access will be maintained to all properties for the duration of the Scheme.
- Night works will be limited as far as and possible and only used when the existing network requires closing for tie in works or road surfacing.
- PRoW will be kept open as long as it is safe to do so during construction, with closures forecasted and advertised in advance of works occurring, with suitable diversions put in place.
- Temporary light pollution is expected to be kept to minimum, only when required for safe working/operations.
- Modular construction methods are going to be incorporated in the design to optimise programme, reduce impact on the environment and reduce safety risks.
- Best practice construction working practices to minimise dust and air quality impacts.
- Construction noise levels are expected to be kept to a minimum, especially in proximity to residential areas.
- Landscape and planting proposals to minimise landscape and visual impacts

Agricultural land

12.8.2. There is no mitigation for permanent land-take beyond financial compensation, which is outside the scope of an environmental assessment and so the impact will remain moderate.

12.8.3. The impact of land-take will also be exacerbated in places by the creation of small and inconveniently shaped land parcels which may only be mitigated if the landowner obtains planning permission to remove or relocate hedgerows.

12.8.4. Snarlton dairy farm will be provided with an underpass, which will enable the farm to function, but the overall impact will remain moderate.

12.8.5. Oakley free range egg farm will lose 25% of its 4 ha to land-take and permanent severance and this is a major impact.

12.8.6. Elsewhere, severance will not generally be mitigated by the provision of farm bridges and underpasses. Instead, farm vehicles will have to travel to a crossing point, with accommodation tracks provided where necessary. Handling pens will be provided on livestock farms so that livestock can be loaded onto transporters to take them to severed land. The impact of severance will remain moderate, because of the extra journey times and general inconvenience.

12.8.7. Field drains will be repaired and drinking water systems replaced, where necessary.

12.8.8. Noise and dust will be suppressed, where necessary.

12.8.9. Land temporarily acquired for haul roads and construction compounds will be restored to its original capability if agriculture is the agreed end use.

Additional suggestions on mitigation

12.8.10. If the design of the road is modified at a future date, consideration should be given to taking it to the

eastern boundary of Oakley Farm to reduce the very large impact on this free-range egg producer.

12.8.11. South of Bowerhill the road bisects 57 ha of arable land. Moving the road to close to the northern boundary would significantly reduce the impact of the Scheme on this farmland.

12.9. Further work

12.9.1. At a later stage of the EIA, agricultural landowners and occupiers will be consulted to discuss impacts and details of mitigation measures.

12.10. Summary

Construction

Population

12.10.1. The following significant effects could arise during the construction phase for the proposed Scheme, subject to more detailed assessment.

Private property and housing

12.10.2. Severance, changes in wider access, and temporary disruption effects could be experienced at private property and housing at Hack Farmhouse, and to the west and east of the Scheme where it runs through Lower Woodrow, Sandridge Hill/ Sandridge Common, and Bath Road.

Development land and businesses

12.10.3. Significant land take effects could be experienced by the health and fitness business at Six Guinea Cottage and significant severance/disruption effects could be experienced at the Solar photovoltaic farm located at Snarlton Farm.

12.10.4. Temporary significant disruption effects could also be experienced by other local businesses, particularly those that currently use or are accessed by Lower Woodrow, Sandridge Hill/ Sandridge Common, and Bath Road.

Agricultural land holdings

12.10.5. The main impacts of the Scheme would be land-take and severance of farmland from the main farm buildings. These combined impacts affect not just farm size and access but can also create small and inconveniently shaped parcels of land.

Severance

- Severance is particularly important in the case of Snarlton dairy farm and Oakley free range egg farm. The daily movement of cows between pastures and the milking parlour, and of roaming hens and their housing, would be prevented by a new road. Dairy and egg farms also differ from the other farms in having specialised capital equipment that restricts their ability to diversify and so the unmitigated impact is major.
- For other livestock farms, severance necessitates loading and transporting animals to the severed fields, which is time consuming and difficult for one person to manage alone.
- For arable farms and grass-based farms producing silage, maize and barley, additional journey times will be necessary, which can slow down harvesting operations when trailers are transporting cut plants and grain to stores.
- The unmitigated impact of severance is, therefore, assessed as moderate on most of the affected arable and grass holdings.

Land-take

- Permanent agricultural land-take within the Scheme boundary will be around 140 ha. For the 9

km of the road, this equates to 15 ha per 1 km, 7.5 ha per 500 m and 1.5 ha per 100 m. For most farms, the land loss this represents will have a moderate impact, but for Oakley Farm the loss to land-take and permanent severance is major.
- Dualling of the A350 up to Littleton Roundabout will take very little, if any, agricultural land as the land has already been acquired for this purpose.

Temporary construction impacts

- Temporary construction impacts include haul roads and compounds, but their locations are unknown at this stage. Generally, the impacts will be localised and minor. Other more minor impacts are damage to field drains and drinking water systems. Noise and dust will also be temporary impacts during construction, particularly on Oakley Farm.

Walkers, cyclists, and horse-riders (WCH)

12.10.6. Severance/ temporary disruption effects could be experienced at PRoW footpaths LACO 37, MELW 61, MELW 62A, MELW 63, MELW 48, MELW 40, MELW 41, MELW 26, MELW 23, MELW 24, MELW 35, MELW 42, PRoW Bridleways SEEN 13, SEEN 17, and footpaths along Sandridge Hill.

Human health

12.10.7. Human health effects are assessed by bringing together the potential impacts of the Scheme, with mitigation measures in place, to determine the likely health outcome (positive, neutral, negative, uncertain), as described below.

12.10.8. With mitigation measures in place, negative health outcomes are identified during construction for the following wider health determinants: Air pollution, Soil and water pollution, Noise pollution and vibration, Risk of injuries and death, Access and accessibility to Housing, Work and training, and Education, healthcare services and other community facilities, however many of the health impacts are localised.

12.10.9. Some positive health outcomes are also predicted such as the socio-economic benefits of temporary employment created by the Scheme on Work and training.

Operation

Population

12.10.10. Some permanent construction effects would continue to be observed during the operational phase; however, these are construction impacts not operational impacts.

12.10.11. There would be no significant residual effects on Private property and housing, Community land and assets, Development land and businesses, Agricultural land holdings, and Walkers, cyclists, and horse-riders.

Human health

12.10.12. The Scheme would have some beneficial health impacts, resulting in positive health outcomes from changes to many of the wider determinants of health examined including Air quality, Risk of injury and death, Work and training, Access and accessibility to housing, Education, healthcare services and other social infrastructure, and Social cohesion, and negative health outcomes from Soil and water pollution, and Landscape and visual. A neutral health outcome is predicted overall from changes to Noise exposure where localised impacts (positive and negative) are anticipated to result in no discernible health impact.

12.10.13. These health outcomes would be the same for all groups, however disadvantaged groups could benefit most from improvements brought about by the Scheme or be proportionately disadvantaged by its adverse impacts.

13. Climate Effects

13.1. Introduction

13.1.1. This chapter provides a preliminary assessment of the Scheme's effects on climate. It addresses the climate change requirements outlined in Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (hereafter referred to as the 'EIA Regulations'), which state that the assessment should consider the potential effects of the project on climate, in particular the nature and magnitude of greenhouse gas emissions emitted during both construction and operation.

13.1.2. The scope of the effects on climate details an assessment of the Scheme's effects on climate during construction and operation. It identifies the study area, describes the methodology, presents baseline conditions, identifies potential impacts on climate and presents suggested mitigation measures during construction and operation. The approach taken aligns with the guidance set out in Design Manual for Roads and Bridges (DMRB) LA 114[174] and DMRB LA 105 Air quality[175].

13.1.3. The Scheme has the potential to affect the earth's climate by increasing the emission of greenhouse gases (GHGs) into the atmosphere, which will occur during construction and throughout its operational life. The earth absorbs energy from the sun and re-emits it as thermal infrared radiation. GHGs in the atmosphere absorb this radiation, preventing it from escaping into space. The higher the concentration of GHGs, the more heat energy is retained, and the higher global temperatures become. Due to human activities the concentration of GHGs in the atmosphere has increased dramatically, leading to global warming. This leads to myriad indirect impacts as the climate responds to the increased atmospheric temperature.

13.1.4. The UK has made commitments to tackle the root cause of climate change by reducing GHG emissions, as well as to increase the resilience of development and infrastructure to the changing climate. The Climate Change Act 2008 (as amended in 2019)[176] sets a target to reduce net GHG emissions by at least 100% from 1990 levels by the year 2050.

13.1.5. The effective assessment and management of impacts on climate offers the opportunity to reduce the impact of projects on climate by minimising the magnitude of GHG emissions as far as possible.

13.2. Planning policy

13.2.1. Human activities contribute to the emission of GHGs such as carbon dioxide (CO_2) to the atmosphere, primarily by the combustion of fossil fuels. Greenhouse gases trap heat in the atmosphere, with higher concentrations leading to increased global temperatures. Atmospheric CO_2 concentrations now exceed 400 parts per million for the first time in around 3 million years, and increased emissions have led to global average surface temperatures of 1°C higher than pre-industrial levels. There is a global consensus that emissions must be reduced dramatically. Relevant international, national and local policies are cited below in Table 13-1. The UK's carbon reduction targets and carbon budgets are presented in Table 13-2.

[174] https://www.standardsforhighways.co.uk/dmrb/search/87f12e4f-70f8-4eed-8aed-9e9a42e24183
[175] https://www.standardsforhighways.co.uk/prod/attachments/10191621-07df-44a3-892e-c1d5c7a28d90?inline=true
[176] https://www.legislation.gov.uk/ukdsi/2019/9780111187654

Table 13-1 - Legislation, regulatory and policy framework for effects on climate

Scale	Legislation/ regulation/ policy	Summary of requirements
International	Kyoto Protocol (1997)	The first international agreement to mandate greenhouse gas emission reductions. Under the United Nations Framework Convention on Climate Change (UNFCCC) treaty, industrialised nations pledged to cut their annual emissions by 5% on a 1990 baseline by 2012. Although the target was met successfully, it was insufficient to offset the increase in emissions from industrialising countries. Total global emissions continued to grow over the period, by 40% between 1990 and 2009. Strengthened negotiations at COP 21 led to the 2015 Paris Agreement, the aim of which is to maintain the increase in global average temperature at 'well below' 2°C and 'pursue efforts' to limit the temperature increase even further to 1.5°C . By April 2016, 190 parties, including the UK, had made voluntary pledges to reduce emissions[177], however the cumulative effect of these would still lead to an estimated 3°C of warming or greater. In 2018, the International Panel on Climate Change (IPCC) published a special report in response to the Paris Agreement, to present the impacts of the targeted 1.5°C temperature rise. The report highlighted that to achieve this, global emissions must decrease by 45% by 2030 (against a 1990 baseline), and that net zero global emissions (where emissions and removals from the atmosphere are balanced) must be achieved by 2050. This is noted to require rapid and far-reaching transitions for every sector on an unprecedented scale.
National	Climate Change Act (2008) as amended in 2019[178]	To support international efforts, the UK Climate Change Act (2008) sets a legal reduction target of 80% against 1990 levels by 2050. It also introduced a series of carbon 'budgets' for five-year periods, to act as stepping-stones to the overall reduction. There are budgets currently set up to 2032. In response to the ambitions of the Paris Agreement, in June 2019 the Climate Change Act was amended to set the overall reduction target by 2050 to at least a 100% reduction in net emissions against 1990 levels, i.e. 'net zero carbon'. The UK has so far outperformed its budgets, but progress is slowing, and the country is not on track to meet its future budgets or the overall reduction target, according to the most Recent Progress to Parliament by the Committee on Climate Change[179] .
	Town and Country Planning (Environmental Impact Assessment)	Schedule 4 of the Regulations requires a description of the factors likely to be significantly affected by the development which includes climate (for example GHG emissions and impacts relevant to adaptation).

[177] Intended Nationally Determined Contributions
[178] http://www.legislation.gov.uk/ukpga/2008/27/contents
[179] Recent Progress to Parliament by the Committee on Climate Change

Scale	Legislation/ regulation/ policy	Summary of requirements
	Regulations 2017[180]	
	National Planning Policy Framework (NPPF) 2021[181]	Paragraph 152 outlines its support for transitioning to a low carbon future, by way of reducing greenhouse gas emissions and supporting renewable and low carbon energy and associated infrastructure. Building on the NPPF, planning practice guidance first published in June 2014 and revised in March 2019, advises on how to identify suitable measures in the planning process to mitigate for and adapt to climate change[182].
	Department for Transport: Decarbonising Transport – setting the challenge (2020)[183]	The document presents transport modes and their current GHG emissions, the existing strategies and the policies already in place to deliver against current targets. It covers the projected trajectory of the forecast GHG emissions from transport to carbon budget 5 (2028-2032) and beyond based on the firm and funded commitments outlined. The document describes the challenge in meeting carbon budgets and net zero by 2050 and split the challenge into six strategic priorities. The document sets out the work approach through which interested parties and communities around the UK will collaborate to take urgent action on climate change, as well as delivering the substantial co-benefits of decarbonisation.
	Construction 2025 (July 2013) HM Government[184]	Construction 2025 (2013) sets out how efficiency improvements will be created in construction covering sustainability and carbon and including a target to reduce emissions by 50%. The emissions reduction target of 50% is not scheme specific, and the efficiency improvements are broad. In terms of the Scheme and emissions reduction, the reduction target should be taken into account when developing Scheme specific mitigation measures, where relevant.
	Infrastructure Carbon Review (2013) HM Treasury[185]	The Infrastructure Carbon Review sets out carbon reduction action required by infrastructure organisations that have formally endorsed the review; this includes Highways England. The Review shows that the infrastructure industry controls 16% of the UK's total carbon emissions, covering construction (A1-5), and operation and maintenance of assets (B1-8). It also highlights that a further 37% of carbon emissions are related to the use of infrastructure assets (B9), over which the industry can have some influence.
Local	Wiltshire Draft Climate Strategy 2022-2027, published for public	In February 2019, Wiltshire Council resolved to acknowledge a climate emergency to seek to make the county of Wiltshire (and the Council itself) carbon neutral by 2030. A Global Warming and Climate Emergency Task Group was set up to gather evidence and develop recommendations on achieving

[180] The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (legislation.gov.uk)
[181] National Planning Policy Framework (publishing.service.gov.uk)
[182] Climate change - GOV.UK (www.gov.uk)
[183] Decarbonising Transport: Setting the Challenge (publishing.service.gov.uk)
[184] https://www.gov.uk/government/publications/construction-2025-strategy
[185] https://www.gov.uk/government/publications/infrastructure-carbon-review

Scale	Legislation/ regulation/ policy	Summary of requirements
	consultation in September 2021[186]	net zero. Government data gathered in 2019, shows that the key sources of CO_2 emissions in Wiltshire are: transport (45%); industry, commercial and agriculture (29%); and homes (26%). The Wiltshire Draft Climate Strategy is structured around seven delivery themes: Transport; Homes and the Built Environment; Natural Environment, Food and Farming; Energy; the Green economy; Waste; becoming a Carbon Neutral Council; and Working Together. The Strategy includes a number of proposed strategies, targets and timelines for delivery. The delivery theme for Transport includes a number of commitments and proposed initiatives, based on the following objectives: • To achieve a transport system in Wiltshire that has zero carbon emissions, acknowledging the different solutions for our towns and city versus rural villages. • Creating the infrastructure for increased walking, cycling, shared and public transport and use of alternative fuels, including electric vehicle charging points • Achieving high-quality, bus-based, public transport and transport hubs that offer a pleasant and convenient way to get around, and seamless combined journeys • Locating and designing new developments to reduce the need to travel and provide more opportunities for people to travel by zero or low carbon transport modes, for work, leisure and errands.
	A Green & Blue Infrastructure Strategy for Wiltshire (Consultation Draft, September 2021)[187]	The draft Green & Blue Infrastructure Strategy was shaped in consultation with local nature, health and enterprise partnerships and neighbouring authorities. The Strategy is supported by an evidence base and has links to planning guidance on green and blue infrastructure (GBI) and settlement frameworks. It is a high-level strategic document which sets out the vision, goals and principles for GBI across Wiltshire and considers 'what' is needed and 'how' it is to be delivered.
	Wiltshire Council Local Plan, Looking to future (January 2021)[188]	In February 2019, Wiltshire Council acknowledged a climate emergency and agreed to seek to make the county of Wiltshire carbon neutral by 2030. This plan outlines the challenge of climate change in a national and local context and describes how the preparation of the Wiltshire Local Plan can, in part, help address the issue.
	Swindon and Wiltshire Local Enterprise	The SWLEP has published its emerging Local Industrial Strategy[190] 2020-2036 which includes commitments to improving the strategic energy infrastructure, decarbonising

[186] Wiltshire_Council_Draft_Climate_Strategy_Sept21.pdf
[187] 111340-GBIS-Vol1-Strategy-DF-2021-08.indd (wiltshire.gov.uk)
[188] https://www.wiltshire.gov.uk/media/5622/Addressing-Climate-Change-and-Biodiversity/pdf/Wiltshire_Local_Plan_Addressing_Climate_Change_and_Biodiversity_FINAL.pdf?m=637469175263630000
[190] https://static.swlep.co.uk/swlep/docs/default-source/strategy/industrial-strategy/emerging-lis-v0-1-master-31032020.pdf?sfvrsn=4fe0ce5e_14

Scale	Legislation/ regulation/ policy	Summary of requirements
	Partnership (SWLEP)[189]	the economy and helping to deliver the national climate change targets.
	Wiltshire Core Strategy (Adopted in January 2015	Core Policy 41 identifies how sustainable construction and low-carbon energy will be integral to all new development in Wiltshire. In doing so, this policy sets the framework for meeting a number of national and local priorities that seek to achieve sustainable development and conserve natural resources. The policy aims to help reduce Wiltshire's contribution to climate change through improved design and construction methods.

Table 13-2 - UK Carbon Reduction Targets[191]

UK Carbon budget period	UK Carbon budget level
1st carbon budget (2008 to 2012)	3,018 $MtCO_2e$
2nd carbon budget (2013 to 2017)	2,782 $MtCO_2e$
3rd carbon budget (2018 to 2022)	2,544 $MtCO_2e$
4th carbon budget (2023 to 2027)	1,950 $MtCO_2e$
5th carbon budget (2028 to 2032)	1,725 $MtCO_2e$
6th carbon budget (2033 to 2037)	965 $MtCO_2e$

13.2.2. The Committee on Climate Change (CCC) has provided a recommended 6th carbon budget[192], which will run from 2033 to 2037, building on its previous Net Zero advice. The recommended budget looks to set a steeper reduction curve moving forward than was set by the previous budgets, to reflect the 2050 target having been increased from an 80% to a 100% reduction. To facilitate this, the CCC recommends the budget be set at 965 $MtCO_2e$. The Government has agreed in April 2021 with the Climate Change Committee's recommendation on setting the budget at 965 $MtCO_2e$ for the period 2033 to 2037. The 6th carbon budget has been committed to by government and became law in June 2021[193].

13.3. Study area and PEAR methodology

13.3.1. The study area comprises the emission of GHGs resulting from the Scheme in its construction and operation phases. The study area for construction and operational maintenance is not limited to the geographic extent of the Scheme itself, as many emissions will result from upstream, downstream, and off-site activities such as materials production. It comprises GHG emissions associated with project construction related activities and materials and their associated maintenance, for operational road user GHG emissions, the study area is consistent with the affected road network defined in the traffic model.

13.3.2. The study area has been determined based on DMRB LA 114, the boundaries and scopes of Highways England's Carbon Tool, and PAS 2080:2016 'Carbon Management in Infrastructure', which is the technical standard for measuring and managing GHG emissions from infrastructure.

13.3.3. The activities for which emissions have been quantified in the assessment include the direct and supply chain activities for the Do Something scenario of the Scheme's life cycle, for both the construction and operation stages of the Scheme. The specific elements of the Scheme lifecycle

[189] https://www.wiltshire.gov.uk/green-economy-climate-emergency
[191] https://www.theccc.org.uk/about/our-expertise/advice-on-reducing-the-uks-emissions/
[192] https://www.theccc.org.uk/wp-content/uploads/2020/12/The-Sixth-Carbon-Budget-The-UKs-path-to-Net-Zero.pdf
[193] https://www.gov.uk/government/news/uk-enshrines-new-target-in-law-to-slash-emissions-by-78-by-2035

included in the assessment boundary are listed in Table 13-3. The 'assessment boundary' defines the source of emissions considered, including direct or supply chain emissions.

13.3.4. The timescale of the assessment covers:

- Construction, as a single time period;
- Total annual operation for the Opening Year (2028); and
- Total annual operation for the Design Year (2043).

13.3.5. DMRB LA 114 Effects of the Scheme on Climate Change advises on the level of assessment which should be carried out, based on the expected level of data availability at the project stage.

13.3.6. Based on the available design details related to key items like waste, materials, water and energy, quantitative assessment has been undertaken, which quantifies emissions from these elements to identify the potential for significant effects.

13.3.7. The life cycle stages and GHG sources presented in Table 13-3 are included within the assessment, with reference to the type of assessment which has been carried out.

Table 13-3 - Sources and lifecycle stages for project GHG emissions

Main stage of project life cycle	Sub-stage of life cycle	Potential sources of GHG emissions (not exhaustive)	Details of sources scoped in
Construction stage	Product stage; including raw material supply, transport and manufacture.	Embodied GHG emissions associated with the required raw materials.	Materials quantities
	Construction process stage: including transport to/from works site and construction /installation processes.	Activities for organisations conducting construction work	Fuel/electricity consumption. Construction activity type/duration. Transportation of materials from point of purchase to site, mode/distance.
Operation stage (in line with appraisal period)	Use of the infrastructure by the end-user (road user).	Vehicles using highways infrastructure.	Traffic count/speed by vehicle type for highway links.
	Operation and maintenance (including repair, replacement and refurbishment).	Energy consumption for infrastructure operation and activities of organisations conducting routine maintenance.	Fuel/electricity consumption for vehicles, lighting and plant. Waste and arisings quantities, transport mode/distance and disposal fate.
Opportunities for GHG reduction throughout project life cycle (construction, operation and decommissioning)	GHG emissions potential of recovery including reuse and recycling GHG emissions potential of benefits and loads of additional functions	Avoided GHG emissions through substitution of virgin raw materials with those from recovered sources.	Waste and arisings material quantities and recycling/reuse fate.

Main stage of project life cycle	Sub-stage of life cycle	Potential sources of GHG emissions (not exhaustive)	Details of sources scoped in
	associated with the study system.		

Table Source: adapted from LA114

13.3.8. DMRB LA 114 also includes reference to GHG emissions and removals associated with short- and long-term land use change. It states that 'a proportionate approach shall be applied to calculating and reporting GHG emissions from changes in land use and forestry (i.e. reporting only where there is likely to be a substantial change)'. Based on available land use and land use change data, likely changes to land use change, lost sequestration potential and CO_2 released have been calculated and presented in Table 13-9.

13.3.9. It is key to note that whilst effects on climate is a wide-ranging topic in terms of potential sources, it differs from many topics assessed in this PEAR in that there is a single receptor, the atmosphere, on which the Scheme could have a direct impact. All units of carbon dioxide equivalent (CO_2e) can be considered to have the same impact regardless of their emission source or location.

13.3.10. Therefore, assessment of the effects of the Scheme on climate is limited to quantification of the magnitude of emissions, from individual sources and in total, and comparison of these to the baseline. Different GHGs have different global warming potentials (GWPs), and to account for this they have been reported throughout this assessment as their CO2 equivalent (CO_2e) value using their GWPs[194].

13.3.11. Emissions calculations are carried out by multiplying activity data by an emission factor associated with the activity being measured. Activity data is a quantitative measure of an activity that results in emissions during a given period of time, (e.g. kilometres driven, kWh electricity consumed, tonnes waste sent to landfill). An emission factor is a measure of the mass of emissions relative to a unit of activity.

13.3.12. Scheme emissions have been quantified by calculation, using project data from the emerging Scheme design and relevant carbon conversion factors.

Quantifying construction emissions

13.3.13. For the construction stage of the Scheme, calculations have been undertaken using Highways England's Carbon Tool[195] v2.3 (herein after referred to as 'The Carbon Tool'). The Carbon Tool is spreadsheet-based, and provides space to input material and non-material construction information under the following categories:

- Bulk materials
- Earthworks
- Fencing, barriers and road restraint systems
- Drainage
- Road pavements
- Street furniture
- Civil structures and retaining walls
- Fuel, electricity and water use
- Business and employee transport
- Waste.

[194] Global Warming Potentials (IPCC Second Assessment Report) | UNFCCC
[195] https://www.gov.uk/government/publications/carbon-tool

13.3.14. Data under as many categories as possible will be collected for the Environment Statement; for this preliminary stage, only a subset of the data are available for quantification.

13.3.15. The Carbon Tool then uses a range of pre-programmed materials data (e.g. mass) and carbon factors to calculate an itemised and overall emissions total. Materials emissions factors are sourced from the Bath Inventory of Carbon and Energy (ICE) database v2 and v3. These factors are in tCO_2e/t. All energy and waste factors are taken from Defra 2014 or the Waste Resources Action Programme WRAP. Where an input unit is not required as a mass, such as a number (no.) of products or metres of product, a conversion factor is applied. This is based upon the mass of a product calculated using suppliers' specifications and technical drawings.

13.3.16. When a product contains multiple materials a weighted average carbon factor has been calculated using multiple factors from the ICE inventory. ICE carbon factors used within the Carbon Tool include the embodied carbon within the raw materials but do not account for the carbon associated with the manufacture or processing of the raw materials into a product prior to their purchase by the reporting contractor[196].

13.3.17. The design and construction information for the assessment was obtained from the design team and specific data request spreadsheet prepared based on the requirements of the Carbon Tool.

Quantifying Land Use Land Use Change (LULUC) emissions

13.3.18. The methodology for estimating land use change emissions is based on the principle of dividing the total land area into its different land-use categories and multiplying these areas by sequestration rates and carbon stocks for each category of habitats, to establish the net change in vegetation. Sequestration rates and carbon stock values have been referred from internally held carbon library (prepared by Atkins) which has collated data relating to land use types from reputable sources such as Natural England with high, medium and low estimates.

13.3.19. The study area consists of the estimated footprint of the Scheme and acquired land for construction of various highway elements. The habitat information has been taken from the Phase 1 habitat survey data for the Scheme where available (see paragraph 13.4.8 regarding limitations).

13.3.20. The lost sequestration potential and CO_2 released as loss of carbon stocks are shown in Table 13-9. This takes the high scenario of lost sequestration potential, to capture the worst-case losses due to the Scheme.

Quantifying operational emissions

13.3.21. Operational emissions are calculated separately from the Carbon Tool, which is focused specifically on construction-phase emissions. Road user carbon emissions have been modelled in using modelling methodologies referenced within DMRB LA 105, which specify the calculation of carbon dioxide (CO_2) from expected traffic usage, along with other pollutant gases that will be emitted. Emissions have been calculated using the Defra Emissions Factors Toolkit (v10)[197]. These emission rates were the latest available at the time of the emissions modelling was undertaken and includes assumptions about future fleet mixes. Calculations use traffic data from the Scheme specific traffic model and consider the full road network included in the traffic model.

13.3.22. The data for operational phase have been averaged out for the design life of 15 years, based upon the operational data for opening and design years.

13.3.23. Operational emissions for the Do-Something scenario are compared with emissions from the baseline Do-Minimum scenario to give a magnitude of impact.

Comparison to UK carbon budgets

[196] Emissions Factors tab of the Carbon Tool

197 Defra Emissions Factors Toolkit (v10.1) released 19 August 2020 and the associated Highways England speed band emission rates which account for the August 2020 DEFRA Emissions Factors Toolkit update.

13.3.24. The UK has in place carbon budgets for five-year periods up to 2037. The proposed construction (2025) and Opening Year (2028) of the Scheme fall within the fourth budget period (2023 to 2027) and fifth budget period (2028 to 2032) respectively. The results of emissions calculations will therefore be presented in terms of their percentage contribution to the fourth and fifth carbon budget periods.

13.3.25. However, the Design Year (2043) falls beyond the sixth budget period, and there is currently no budget with which to compare emissions.

Significance assessment

13.3.26. The construction phase of the Scheme will lead to a negative effect on climate due to the generation of emissions from the extraction, processing and transport of the requisite materials, and on-site construction processes. Similarly, the operational phase of the Scheme will lead to a negative effect on climate due to the consumption of energy, water and materials on site,

13.3.27. There is no policy or technical guidance for determining a level of significance of the effect of a development on climate, and there are no legal limits for emissions from any one development. For this reason, professional judgement has been applied in determining significance, considering the Scheme's potential effects on the UK's ability to meet the emission reduction targets set out in its carbon budgets. As stated in DMRB LA 114: 'The assessment of projects on climate shall only report significant effects where increases in GHG emissions will have a material impact on the ability of Government to meet its carbon reduction targets.'

13.4. Assumptions and limitations

13.4.1. The data for the assessment has been provided by the design team and is up-to-date for this stage of the design. Where assumptions have been made, they have been selected to present the worst-case scenario for that particular item/factor.

Materials

13.4.2. Temporary and permanent construction materials data has been provided by the design team, based on the current Scheme design. Where the design is not finalised, assumptions on material types and quantities were made by engineering specialists based on professional judgement on similar data from other highways schemes of a similar scale to this Scheme. The materials and quantities listed in Table 13-4 were included in the assessment; this is the complete list of materials provided design team. The data related to drainage category, along with ready mix concrete under bulk materials for precast concrete headwalls, were provided by the drainage team and rest of the material data were provided by highways team. The carbon factors for materials integral to the Carbon Tool were used.

13.4.3. The quantities for road markings – thermoplastic road marking and arrows, letter and symbols were provided in metres and nos. respectively, however for calculation purpose, these have been converted to tonnes and then modelled in the Carbon Tool.

13.4.4. Penstocks, permeable bunds, culverts, cast in situ concrete apron, flow control chamber and bridge deck kerb units have not been modelled at this stage since the material breakdown data are not available and will be updated in later stages of this assessment. Additionally, the quantity for earthworks from excavation of ponds, chambers, culverts and pipes will be re-used entirely on the site and the same has not been modelled in the assessment.

Table 13-4 - Construction materials

Category	Material	Type	Unit	Quantity
Bulk materials	Fill and aggregate	General fill quantity/aggregate	tonnes	373

Category	Material	Type	Unit	Quantity
	Ready mix concrete	C32/40 (for pre-cast concrete headwalls)	m^3	126
Earthworks	Imported Soil	General Soil	tonnes	375
		Top Soiling	tonnes	57
	Geotextiles	Polypropylene geotextile / matting	m^2	144197
Fencing, barriers & road restraint systems	Fence	Timber rail fence (all types, includes posts)	metres	18022
	Road Restraint System/Safety Barrier	Steel RRS barrier single sides	metres	2160
Drainage	Plastic pipework (HDPE)	300m diameter	metres	7125
		450mm diameter	metres	2375
	Precast concrete manholes	1200mm diameter , up to 3m depth	nos.	96
		1500mm diameter , up to 3m depth	nos.	48
	Plastic inspection chambers	600m diameter, 1.2m-3m depth	nos.	48
	Gullies	Plastic gully pots – PE	nos.	322
	Channel & slot drains	Precast concrete channel (heavy duty)	metres	493
	Petrol interceptor	Glass reinforced plastic GRP (fiberglass)	nos.	16
Road pavements	Bitumen/surface treatment	General bitumen	m^3	47689
	Kerb	Pre-cast concrete 125x150mm	metres	1164
		Pre-cast concrete 125x255mm	metres	29482
	Road markings	Thermoplastic road marking	metres	44073
		Arrows, Letters & Symbols	nos.	44
Street furniture & electrical equipment	Road lighting and columns	LED light	nos.	215
		Aluminium columns 10m	nos.	215
	Cables	Miscellaneous cable	metres	20588

Category	Material	Type	Unit	Quantity
	Cabinets	Any type	nos.	153
	Marker posts/ signs	Signs	nos.	75
		Post	nos.	30

Transport

13.4.5. Information relating to where materials will be sourced from is not yet available, as this will be determined at a later date by the appointed Principal Designer and Principal Contractor. Based on previous experience by specialists of materials transportation for infrastructure schemes, including highway schemes, it has been assumed that all materials have been transported an approximate worst-case distance of 100 km by heavy goods vehicle (HGV). Locally sourced materials are often preferentially used to reduce transportation cost and to minimise transport emissions, and many materials will be sourced from a distance of less than 50 km. However, not all required material is expected to be available locally and will have to be sourced from further afield. Hence, based on professional judgment and consultation with the design team to prefer locally sourced material as far as possible, 100 km worst case has been considered. This draws on the Royal Institution of Chartered Surveyors 'whole life carbon' transport distances of 50 km for locally manufactured materials, but accounts for some scenarios where portions of the necessary materials may have to be transported from further afield. The emission factor used for transportation is based on a HGV having an assumed average load. This factor is integral to the Carbon Tool. The tool takes into consideration the travel to the site, and from the site by the HGV.

Construction processes

13.4.6. The construction period for the main works has been approximated from 2025 to 2028. Further details are provided in description of the Scheme chapter (Chapter 2).

13.4.7. At the time of writing this report, the data for construction processes including waste, fuel and energy is not available as the Scheme is in options assessment stage. Once available, this data would need to be modelled in the highways carbon tool and findings to be updated in this report during preliminary design stage.

Land use change

13.4.8. The assessment of land use change/sequestration has been undertaken by using mapped Phase 1 habitat survey data which covers 54% of the Scheme design extent boundary area. The remaining 46% does not have a specific land use or habitat type linked to it at the time of writing this report and hence marked as ‘unmapped’. This limits the assessment, since the original land use type for this area, and the potential sequestration value of those land uses, cannot be known and cannot form part of the baseline.

13.5. Consultation

13.5.1. Wiltshire Council was consulted in June 2021 to confirm the methodology of assessment that was proposed to be used for the assessment of climate effects. It was confirmed that the construction emissions will be calculated using Highways England Carbon Tool along with a high level overview of land use change emissions as a requirement of this chapter.

13.6. Baseline conditions

13.6.1. Baseline conditions are defined by the:

- Total background emissions from all sources, i.e. all UK emissions, at all scales; and
- Predicted total emissions occurring for both the Opening Year (2028), and the Design Year (2043), assuming the Scheme is not constructed, i.e. the Do Minimum scenarios.

National emissions baseline

13.6.2. Global greenhouse gas emissions, from all sources, currently amount to approximately 50 billion tonnes of CO_2e per year. At the time of writing (August 2021) the UK is the world's eighth largest emitter of CO_2e, with the total background UK emissions for 2019 (the last reported year) being 454.8 million tonnes of CO_2e[198]. The transport sector was the largest emitting sector of UK greenhouse gas emissions in 2019, contributing 27% of emissions. There has been little overall change (3% reduction) in emissions from the transport sector between 1990 and 2018. Improvements in fuel efficiency are approximately balanced by increasing vehicle numbers. The UK has in place carbon budgets for five-year periods up to 2037. The construction (2025) and Opening Year (2028) of the Scheme fall within the fourth budget period (2023 to 2027) and fifth budget period (2028 to 2032) respectively, the carbon budget for the 2023–2027 budgetary period is 1,950 $MtCO_2e$, and the budget for 2028-2032 is 1,725 $MtCO_2e$. Whilst budgets are not set beyond this, there is a legal requirement for the UK to reduce net emissions by at least 100% by 2050.

13.6.3. The dataset for the fifth UK carbon budget central scenario[199] includes forecasts of emissions for different sectors, representing the best estimate of the least cost path to the UK's 2050 target of reducing emissions by 80% of 1990 levels. In this dataset, total domestic transport emissions (excluding domestic aviation and shipping) for the third budget period are 480 $MtCO_2e$.

Scheme emission baseline

13.6.4. Scheme-specific baseline emissions equate to emissions in the opening and design years assuming the Scheme was not constructed (the Do Minimum scenario). There are no construction emissions associated with the Do Minimum scenario; only the 'operation' life cycle modules presented in are included in the baseline, shown below for the opening and design years. Road user carbon emissions have been modelled using traffic model data in accordance with DMRB LA 105, as described in section 13.3.21. Operational and maintenance emissions have been estimated as described in 13.3.22.

Table 13-5 - Scheme Do Minimum Emissions

Life cycle module	2028 Emissions (tCO_2e)	2043 Emissions (tCO_2e)	60-year operational period
Road user carbon	1,221,266	1,351,486	80,047,423
Operation and maintenance	3,542	3,919	232,138
Total operation	1,224,808	1,355,406	80,279,561

13.7. Potential effects

13.7.1. The construction stage of the Scheme would have an adverse effect on climate, as it would give rise to emissions. These emissions would arise from the production of materials to be used in construction, their transportation to site, and onsite through construction activities (for example from emissions from diesel-fuelled construction plant).

13.7.2. The operational stage of the Scheme would give rise to emissions from road users and operational energy use (for example, streetlights). Impacts may be positive or negative depending on whether this presents and increase or decrease against the Do Minimum. The results of the assessment are presented in Table 13-7.

13.7.3. The loss of habitats due to construction of new highway and its elements will result in release of carbon stored in plants, which will contribute to the net construction emissions. However, at the time

[198] https://www.gov.uk/guidance/carbon-budgets
[199] https://www.theccc.org.uk/publication/fifth-carbon-budget-dataset/

of writing this has not been calculated in the Scheme's net emission.

13.7.4. This assessment presents the emissions calculated for the Do Something scenario, a comparison against the Do Minimum baseline, and assessment against UK Government carbon budgets.

Construction

13.7.5. Construction phase emissions are broken down in Table 13-6. The Carbon Tool was used to calculate the emissions. The construction of the Scheme will lead to the release of an additional 2271 tCO_2e compared with the Do Minimum scenario.

13.7.6. The largest magnitude of emissions (95.98%) is likely to arise from material production and processing, with a further 4.01% from the transport of emissions to site.

Table 13-6 - Construction phase emissions

Category	Item	Materials		Transport	
		Emissions (tCO_2e)	Percentage of Construction Total (%)	Emissions (tCO_2e)	Percentage of Construction Total (%)
Bulk Materials	Ready mix concrete	41.80	1.84	5.87	0.25
	Fill and aggregate	2.78	0.12	7.24	0.31
Earthworks	Imported soil	10.36	0.45	8.39	0.37
	Geotextiles	346.48	15.25	2.65	0.11
Fencing, barriers & road restraint systems	Timber rail fence (all types-including posts)	67.70	2.98	5.00	0.22
	Steel RRS barrier single sided	132.88	5.85	0.93	0.04
Drainage	Plastic pipework (HDPE)	201.64	8.87	1.55	0.06
	Precast concrete manholes	124.97	5.50	10.58	0.46
	Plastic inspection chambers	67.83	2.98	0.30	0.01
	Gullies	15.45	0.68	0.13	0.00
	Channel & slot drains	22.29	0.98	1.43	0.06
	Petrol interceptor	64.80	2.85	0.15	0.00
Road pavements	Bitumen / surface treatment	9.14	0.40	0.93	0.04
	Kerbs	291.87	12.85	42.95	1.89
	Road markings	453.15	19.95	1.54	0.06

Category	Item	Materials		Transport	
		Emissions (tCO_2e)	Percentage of Construction Total (%)	Emissions (tCO_2e)	Percentage of Construction Total (%)
Street furniture & electrical equipment	Road lighting and columns - LED light	17.20	0.75	0.05	0.00
	Road lighting and columns - Aluminium columns 10m	203.63	8.96	0.59	0.02
	Cable	16.27	0.71	0.17	0.00
	Cabinets	84.45	3.71	0.59	0.02
	Marker posts/signs	5.01	0.22	0.01	0.00
Total material		**2179.79**	**95.98**	**-**	**0.00**
Total transport		**-**	**0.00**	**91.10**	**4.01**
Fuel, energy & water		0.00	0.00	0.00	0.00
Business and employee transport		0.00	0.00	0.00	0.00
Waste		0.00	0.00	0.00	0.00
Construction phase total		**2270.90**	**100.00**	**-**	**0.00**

Operation

13.7.7. Operational phase emissions for the opening and design years are shown in Table 13-7. Road user carbon emissions have been calculated using emission modelling methodologies referenced within DMRB LA 105, as described in section 13.3.21. Operational and maintenance emissions have been estimated as described in 13.3.22.

Table 13-7 - Operational phase emissions (Do Something scenario)

Life cycle module	Emissions (tCO_2e)		
	2028	2043	60-year operational period
Road user carbon	1,224,657	1,355,733	80,295,374
Operation and maintenance	3,552	3,932	232,857
Total operation	1,228,208	1,359,665	80,528,231

Comparing Do Minimum and Do Something scenarios

13.7.8. As emissions from construction do not occur in the Do Minimum scenario, it can be considered that the construction stage of the Scheme would have the effect of releasing an additional 2271 tCO_2e into the atmosphere in the Do Something scenario.

13.7.9. The calculated operational stage emissions for the 2028 and 2043 Do Minimum and Do Something

scenarios are compared below in Table 13-8.

Table 13-8 - Do Something and Do Minimum operational emissions comparison

Life Cycle Module	Emissions (tCO_2e)								
	2028 Do Minimum	2028 Do Something	Difference	2043 Do Minimum	2043 Do Something	Difference	Total over 60-year operation* (Do-Minimum)	Total over 60-year operation* (Do-Something)	Difference
Total Operational Emissions	1,224,808	1,228,208	3,401	1,355,406	1,359,665	4,259	80,279,561	80,528,231	248,670

*Cumulative over the period 2028-2088

13.7.10. Whilst road improvement schemes can sometimes lead to reduced greenhouse gas emissions in operation due to easing of congestion, in both the opening and design years, the Scheme will lead to an increase in operational emissions, of 3401 tCO_2e and 4259 tCO_2e respectively compared to the Do Minimum scenario, due to increased vehicle kilometres generated by the Scheme.

Lost sequestration potential and CO_2 released

13.7.11. The loss of habitats due to construction of new highway and its elements will result in lost sequestration potential and release of carbon stored in plants. The reported design extent boundary has an area of approximately 157 ha.

13.7.12. The total land use change expected due to the Scheme is approximately 39 ha based on the data available at the time of writing. The lost sequestration potential and CO_2 released due to loss of habitats is presented in Table 13-9 below. Note that the area not included in the habitat survey at the time of writing makes up 46% of the total design extent area and the details of habitat types in these areas are not available at the time of writing this report (see 13.4.8 above). Table 13-9 below only focuses on 54% of the design extent area that has habitat data.

Table 13-9 - Lost sequestration potential and total carbon released

Habitat	Lost sequestration potential over 60 years (tCO_2)	tCO_2 released as a loss of carbon stocks
A1.1.1 - Broadleaved woodland - semi-natural	254.04	0.01
A1.1.2 - Broadleaved woodland - plantation	90.88	0.00
A2.1 - Scrub - dense/continuous	21.30	0.00
A2.2 - Scrub - scattered	0.00	0.00
B4 - Improved grassland	149.41	0.05
B6 - Poor semi-improved grassland	32.69	0.01
C3.1 - Other tall herb and fern - ruderal	4.31	0.00
G1 - Standing water	0.00	0.00
G2 - Running water	2.04	0.00

Habitat	Lost sequestration potential over 60 years (tCO_2)	tCO_2 released as a loss of carbon stocks
J1.1 - Cultivated/disturbed land - arable	0.00	0.02
J1.2 - Cultivated/disturbed land - amenity grassland	0.00	0.00
J1.3 -Cultivated/disturbed land - ephemeral/short perennial	0.00	0.00
J2.2.2 - Defunct hedge - species-poor	0.00	0.00
J2.3.1 - Hedge with trees - native species-rich	0.00	0.00
J4 - Bare ground	0.00	0.00
Unmapped	0.00	0.00
Total	**554.67**	**0.10**

Comparison to UK Carbon budgets

13.7.13. The Scheme is likely to contribute 63,369 tCO_2e during construction and operation phase up to design year 2043 compared with the Do-Minimum scenario, and these are broken down by each Carbon Budget in Table 13-10 below. The (net) contribution of the Scheme to the fourth Carbon Budget period would be 2,270 tCO_2e (equivalent to 0.00012% of that budget), including construction and operational phase emissions. The contribution of the Scheme to the fifth Carbon Budget would be 17,525 tCO_2e (equivalent to 0.00102% of that budget), from operational emissions. The contribution of the Scheme to the sixth Carbon Budget would be 18,951 tCO_2e (equivalent to 0.00196% of that budget). The Scheme is unlikely to cause significant effects on climate, or significantly affect the UK's ability to meet its emissions reduction targets. It is considered that this magnitude of emissions from the Scheme will not materially impact the Government's ability to meet the budget, and therefore will not have a significant effect on climate. The CO_2 released as a loss of carbon stocks as per Table 13-9 (the GHG emission due to LULUC) has not been considered further in the calculation for the Scheme's net contribution due to limited data availability as this stage. This will be incorporated into Scheme's net emission based on available data and methodology during ES preparation.

13.7.14. The carbon budget associated with the Design Year has not been set and a quantitative assessment of significance for this period therefore cannot be carried out. However, Design Year emissions are of a similar order of magnitude to Opening Year emissions and, in the absence of any information on what the carbon budget for the period might be, it is expected that their contribution would be similarly small.

Table 13-10– Comparison with UK Carbon Budgets

Project stage	Estimated total carbon over carbon budget (tCO_2e)	Net CO_2 project GHG emissions (tCO_2e)	Relevant available carbon budget timeline			Beyond 6th Carbon budget up to design year 2043
			2023-27	2028-32	2033-37	2038-43
Construction*	2,270	2,270	2,270	-	-	-
Operation	20,643,119	61,099	-	17,525	18,951	24,624
Total	**20,645,389**	**63,369**	**2,270**	**17,525**	**18,951**	**24,624**

* Construction emission do not include GHG emission related to the Scheme's LULUC.

Residual effects

13.7.15. Mitigation measures to reduce carbon emissions form an inherent part of the project's design and construction practices.

13.7.16. It is very unlikely that the impact of a road project will, in isolation, affect the ability of Government to meet its carbon reduction plan targets. In this context, it is considered unlikely that this Scheme will in isolation conclude significant effects on climate

13.8. Potential mitigation measures

13.8.1. DMRB LA 114 states that: 'Projects shall seek to minimise carbon emissions in all cases to contribute to the UK's target for net reduction in carbon emissions'. This requirement applies whether or not the Scheme is anticipated to generate a significant effect on climate.

13.8.2. Emissions are mitigated by applying the carbon reduction hierarchy set out in DMRB LA 114: Avoid / Prevent, Reduce, Remediate. Items at the top of the hierarchy have a greater potential to reduce emissions and are prioritised.

- Avoid / prevent:
  - Maximise potential for re-using and / or refurbishing existing assets to reduce the extent of new construction required
  - Explore alternative lower carbon options to deliver the project objectives (i.e. shorter route options with smaller construction footprints).
- Reduce:
  - Apply low carbon solutions (including technologies, materials and products) to minimise resource consumption during the construction, operation, user's use of the project, and at end-of-life
  - It is recommended that as far as possible, materials are locally procured to minimise transportation emissions
  - Construct efficiently, using techniques (e.g. during construction and operation) that reduce resource consumption over the life cycle of the project
- Remediate:
  - After addressing avoid/prevent and reduce measures projects will identify, assess and integrate measures to further reduce carbon through on or off-site offsetting or sequestration.

13.8.3. To fully embed this hierarchy in the project team's ways of working, the Principal Contractor will commit to adhering to the principles of the PAS 2080 – Carbon Management in Infrastructure Verification[200]. PAS 2080 is a global standard for managing infrastructure carbon and looks at reducing carbon across the whole value chain through more intelligent design, construction and use. It also ensures that carbon is consistently and transparently quantified at key points during the process, to inform decision-making.

13.9. Further Works

13.9.1. The next steps will be a further quantitative appraisal of greenhouse gas emissions associated with the scoped in lifecycle stages, in light of fully available design data and materials quantities, at EIA stage.

13.10. Summary

13.10.1. The Scheme is likely to contribute 63,369 tCO_2e to the UK's Carbon Budgets across the period 2025-37, compared with the Do-Minimum scenario. The (net) contribution of the Scheme to the

[200] https://www.bsigroup.com/en-GB/our-services/product-certification/product-certification-schemes/pas-2080-carbon-management-in-infrastructure-verification/

fourth Carbon Budget period would be 2,270 tCO_2e (equivalent to 0.00012% of that budget), including construction and operational phase emissions. The contribution of the scheme to the fifth Carbon Budget would be 17,525 tCO_2e (equivalent to 0.00102% of that budget), from operational emissions. The contribution of the Scheme to the sixth Carbon Budget would be 18,951 tCO_2e (equivalent to 0.00196% of that budget). It is very unlikely that the impact of a road project will, in isolation, affect the ability of Government to meet its carbon reduction plan targets. In this context, it is considered unlikely that this Scheme will in isolation conclude significant effects on climate. However, mitigation measures will be embedded into the Scheme design at the next stage to reduce emissions as far as possible.

14. Vulnerability to Climate Change

14.1. Introduction

14.1.1. The Scheme has the potential to be affected itself by climate change and its indirect effects. For example, by future changes to rainfall as well as by associated changes to flood risk.

14.1.2. This preliminary assessment for climate vulnerability reviews how climate change could affect the Scheme's assets and how it could affect, e.g., intensify, the potential environmental impacts identified in the other chapters of this assessment, i.e., how the Scheme's climate vulnerabilities could impact environmental receptors.

14.1.3. The aim of the assessment is to ensure that climate change, as well as impacts associated with extreme weather, are considered during planning so that they can be avoided and, if that is not possible, mitigated during the construction and operation of the Scheme.

14.1.4. This chapter should be read in conjunction with the other topic chapter in this report, in particular Chapter 7 - Water Environment.

14.2. Planning policy

National planning policy

National Planning Policy Framework (NPPF)[201]

14.2.1. The NPPF develops a planning system that contributes to radical reductions in greenhouse gas emissions, minimises vulnerability and improves resilience; encourages the reuse of existing resources, including the conversion of existing buildings; and supports renewable and low carbon energy and associated infrastructure. The NPPF states in paragraph 154 that “New development should be planned for in ways that avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure”. Paragraph 153 states that policies should “support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts”.

14.2.2. Building on the NPPF, planning practice guidance published in March 2019, advises on how to identify suitable measures in the planning process to mitigate for and adapt to climate change.

Climate Change Act 2008[202]

14.2.3. The UK passed legislation that introduced the world's first long term legally binding framework to tackle the risks posed by climate change. The Climate Change Act (2008) created a new approach to managing and responding to climate change in the UK, by:

- Setting ambitious, legally binding reduction targets;
- Taking powers to help meet those targets;
- Strengthening the institutional framework;
- Enhancing the UK's ability to adapt to the impacts of climate change; and
- Establishing clear and regular accountability to the UK Parliament and to the developed legislatures.

[201] National Planning Policy Framework, 2021, Planning for climate change, 150 (a)
[202] Climate Change Act 2008 http://www.legislation.gov.uk/ukpga/2008/27/contents

14.2.4. Key provisions of the Act in respect of climate change adaptation include a requirement for Government to report, at least every five years, on the risks to the UK of climate change, and to publish a programme setting out how these will be addressed. This Act also introduces powers for Government to require public bodies and statutory undertakers to carry out their own risk assessment and make plans to address those risks. The Adaptation Sub-Committee of the Committee on Climate Change will provide advice to, and scrutiny of, the Government's adaptation work.

Wiltshire strategies and initiatives

Wiltshire Climate Strategy, 2022-2027[203]

14.2.5. Wiltshire Council published the Wiltshire Draft Climate Strategy for public consultation in September 2021. The report acknowledges the need to adapt to impacts of climate change that will be inevitable – for example by preparing for more floods and heatwaves and making sure the design of new homes is adapted to reduce climate change impacts. The report also includes a commitment to update the Update the Wiltshire Council Climate Change Adaptation Plan.

Wiltshire Council Climate Change Emergency Strategy [204&205]

14.2.6. Wiltshire Council has made a firm commitment to becoming a carbon neutral council by 2030. The Council's Climate Strategy and Climate Change Adaptation Plan includes objectives to help cope with a future climate scenario based on a 2°C temperature rise. This means the Council is preparing to protect against consequences like flooding, heat waves and droughts. It also means the council will be more aware of new opportunities, like the possibilities of growing different crops in a changing climate.

Melksham Town Council Environment & Climate Working Group[206]

14.2.7. Melksham Town Council has pledged to make the town carbon neutral by 2030. It has also committed to promote a local awareness of the dangers of not adapting to Climate Change among its citizens, schools, businesses and local organisations.

14.3. Study area and PEAR methodology

14.3.1. The climate vulnerability assessment follows the methodology set out in DMRB LA 114[207]. Accordingly, the study area for assessing the Scheme's vulnerability to climate change is focused on the Scheme boundary, see The Scheme chapter (Chapter 2) but also includes any compound areas and temporary land take needed during construction as well as all environmental receptors that could be affected by the Scheme – as set out in the other chapters of this report (to examine if climate change could intensify the projects impacts on these).

14.4. Consultation

14.4.1. In relation to flood risk and drainage design, requirements in the NPPF[208] and Environment Agency (EA) design guidance relating to climate change apply. Therefore, a separate Flood Risk Assessment (FRA) will be conducted in the next stage of the design. This will include an assessment of climate change effects on flood risk, taking into account current EA climate change allowances for increases in peak river flow and rainfall intensity. Consultation on these assessments

[203] https://www.wiltshire.gov.uk/media/7020/Wiltshire-Council-Draft-Climate-Strategy-September-2021/pdf/Wiltshire_Council_Draft_Climate_Strategy_Sept21.pdf?m=637655080289230000
[204] https://www.wiltshire.gov.uk/green-economy-climate-emergency
[205] https://www.wiltshire.gov.uk/green-economy-climate-change
[206] https://moderngov.microshadeapplications.co.uk/MelkshamTC/documents/s1157/Environment%20ToRs.pdf
[207] https://www.standardsforhighways.co.uk/prod/attachments/87f12e4f-70f8-4eed-8aed-9e9a42e24183
[208] https://www.gov.uk/government/publications/national-planning-policy-framework--2

will be reported within the Water Environment Chapter of the ES. It will include formal consultation meetings with:

- The Environment Agency; and
- The Lead Local Flood Authority (LLFA).

14.4.2. The purpose of consultation will be to agree the scope of the FRA, and agree specific approaches regarding, for example, acceptable climate change allowances for drainage designs and the required return periods for modelling.

14.5. Baseline conditions

14.5.1. Weather describes the condition of the atmosphere at a particular time and place, for example what temperature it is and how moisture is held within it. Climate is defined as the typical weather conditions experienced in a place over a period of time, conventionally expressed as average weather over a 30-year period.

14.5.2. Should a full climate vulnerability baseline be required to support further assessment it will be presented in two parts:

- The first section describing the current climatic conditions in the study area; and
- The second presenting a range of possible future climate projections.

14.5.3. It should be noted that climate change is not only a challenge for the future. We are already observing changes in the UK climate.

Current climate

14.5.4. Melksham is in the Met Offices Southern England climate zone[209]. In this area winters are mild and summers are warm. The climate here can be impacted by continental weather influences that bring cold spells in winter and hot, humid weather in summer. The Schemes location is partially sheltered from the paths of Atlantic depressions, with their associated cloud, wind and rain. Mean annual temperatures in Southern England vary from about 11.5 °C in central London and along the south coast to about 9.5°C over higher ground well inland.

14.5.5. The Schemes climate vulnerability baseline would include a detailed examination of the current climate baseline using the Met Offices latest regional dataset of 30-year averages and data from nearby long running meteorological stations.

Projected future climate

14.5.6. The study area is likely to experience hotter and drier summers and warmer and wetter winters[210]. Alongside these changes in average conditions, it is possible, but less certain, that climate change will also increase the frequency and severity of extreme weather events; such as: heavy rainfall, storms and heatwaves.

14.5.7. The Schemes climate vulnerability baseline would include a detailed consideration of the projected future climate baseline. This will use climate projections from UKCP18 (United Kingdom Climate Projections 2018). These projections have been developed by the Met Office Hadley Centre Climate Programme which is supported by the Department of Business, Energy and Industrial Strategy (BEIS) and the Department for Environment, Food and Rural Affairs (Defra). They provide the most up-to-date assessment of how the climate of the UK may change over the 21st century. The UKCP18 probabilistic projections (25km scale) would be used for the river basin in which the project is located. The lifespan of the project would be assumed to be 60 years and climate projections for

[209] https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/regional-climates/southern-england_-climate---met-office.pdf
[210] https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/index

this time period would be selected accordingly. By way of a precautionary approach the projections used would be for Representative Concentration Pathway (RCP) 8.5. This is a greenhouse gas concentration trajectory under which it is assumed that emissions continue to rise throughout the 21st century.

14.6. Assumptions and limitations

14.6.1. This is a preliminary assessment for the purposes of consultation. The final assessment will be reported within the ES taking into account consultation comments, further design details and the further assessments detailed in section 14.9.

14.6.2. The climate projections used will be from UKCP18 (United Kingdom Climate Projections 2018). The UKCP18 projections do not provide a single precise prediction of how weather and climate will change years into the future. Instead UKCP18 provides ranges that aim to capture a spread of possible climate responses. This better represents the uncertainty of climate prediction science. It should also be noted that the level of uncertainty of the projections is dependent on the climate variable, for example, there is greater confidence around changes in temperature than there is in wind. In the climate vulnerability assessment this will be considered when assessing the likelihood of impacts.

14.6.3. The climate vulnerability baseline proposes to use data from RCP 8.5. This is a greenhouse gas concentration trajectory under which it is assumed that emissions continue to rise throughout the 21st century. There is considerable uncertainty regarding if, how far and how quickly emissions will be reduced in the future. Using RCP 8.5 represents a conservative position.

14.7. Potential effects

14.7.1. This section presents the potential effects, mitigation measures and residual climate vulnerability effects during construction (Table 14-1) and operation (Table 14-2). Further details regarding potential mitigation measures are provided in section 14.8.

14.7.2. Consideration of climate vulnerability impacts during both construction and operation on environmental receptors is included within the other environmental topic chapters of this report. For example, see Chapter 7 – Water Environment – for discussion of potential adverse impacts on the water environment associated with surface water runoff from construction sites following extreme weather. Accordingly, consideration of extreme weather that is part of the existing climate and its potential impacts on environmental receptors would be covered in the ES by the relevant environmental topic chapter.

Table 14-1: Potential effects during construction

Receptor/ Climate trend	Impacts	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
Extreme weather	During a heatwave the construction programme and activity schedule may need to be reviewed with those activities that are less vulnerable to the hot weather being prioritised.	In construction, impacts relating to extreme weather would be mitigated by adherence to best practice, for example undertaking construction risk assessments and implementation of severe weather plans and emergency response plans.	Not Significant
	During drought the construction schedule may be vulnerable to disruption if water availability is limited.		
	Heavy rain could inundate the site, prevent access to the site and/or disrupt supply chains for construction materials.		
	During fog, lightning or high winds it may not be possible to work safely, for example operating tall cranes or erecting scaffolding for work on bridges.		
	Construction staff health issues (e.g. heat stroke, dehydration, respiratory problems) could accompany work during a heatwave and/or time of reduced air quality (often associated with warmer temperatures).		
Road surface and pavements			
Hotter summers	Hotter summers could damage materials, for example: Ageing bituminous binders (deformation and rutting of road surfaces); Softening, deforming and damaging bitumen in asphalt; Over expansion and buckling of concrete roads; Failure of expansion joints; Wider temperature variations causing shrinkage and expansion that leads to cracking.	Best practice construction techniques and appropriate material quality standards will be followed to ensure the design lives specified can be met. For example, roads and pavements will use sufficiently hard binders in the asphalt. The drainage design will ensure the bound material is constructed on a sound foundation that should perform at it's optimum over the design life.	Not Significant

Receptor/ Climate trend	Impacts	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
Heavier rain and wetter winters	Heavier rain and wetter winters will weaken the soil beneath the carriageway. Loads from traffic may then stress the surface past its breaking point.	The design will ensure continuity of drainage in the pavement and road layers. This will reduce the risk of water getting trapped in the foundation layers which could lead to an increase in moisture content and thus a decrease in performance i.e. lack of sufficient support to the overlaying bound material.	Not Significant
Structures (including embankments, earthworks, bridges)			
Hotter summers	Hotter summers could reduce the asset lives of structures, for example causing: Over expansion and buckling (e.g. of culverts or kerbs); or Failure of expansion joints.	The design will ensure structures can adapt to expected future variations in temperature. The Eurocodes[211] used for the bridges in the Scheme stipulate design to a temperature range of -18°C to 34°C which is adjusted to take account of altitude, material type and depth of surfacing thickness, etc. Structures will be monitored throughout the life of the Scheme.	Not Significant
Drier summers	Climate change could adversely affect soil stability impacting structures. This could affect physical assets (e.g. foundations) as well as semi natural features (e.g. embankments) and natural structures (e.g. trees). Impact pathways include: The expected reduction in summer average rainfall is likely to intensify and extend soil moisture deficits and impact groundwater levels. This could impact soil stability, for example causing subsidence or increasing earth pressures; Wetter winters could cause soil instability as heave causes the upward movement of the ground; usually	Risk will be managed by best practice design and construction. The geotechnical design will be in accordance with BS EN 1997-1:2004 Eurocode 7 Geotechnical Design Part 1 General rules. For example, cuttings and embankment works will be designed based on slope-stability analysis using site specific soil parameters. Additionally, to avoid waterlogging around embankments appropriate drainage will be included, for example so that runoff is collected and stored before being released gradually to infiltrate after a storm has passed, see DMRB, CG501 - Design of highway drainage systems. The geotechnical construction will be in line with DMRB Standards (DMRB CD 622 Managing Geotechnical Risk) so risks will be controlled, for example, by:	Not Significant

[211] The Eurocodes are European standards specifying how structural design should be conducted within the European Union. These were developed by the European Committee for Standardisation upon the request of the European Commission.

Receptor/ Climate trend	Impacts	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
	associated with the expansion of clay soils which swell when wet; Wetter winters and heavier rain could cause weakening or washout of structural soils; and Wetter winters may increase regularity of soil saturation and increase risk of embankment collapse, i.e. landslip.	Providing appropriate soil compaction; Completing stability assessments as part of design. Including analysis and modelling to predict maximum and permittable magnitude of movement; Undertaking appropriate ground investigations; Collecting appropriate groundwater flow data; Where foundations extend below the existing groundwater table or could extend below the future groundwater level they are designed in accordance with industry standards; and Monitoring during the construction works to measure movements, with agreed trigger level and action plan. In addition to the above, existing vulnerable assets in the study area will be regularly inspected to assess movements. This will be supported by reference to a full arboricultural survey that is planned for the site and will identify large and/or unstable trees.	
Drainage infrastructure			
Drier summers	Drier summers combined with the projected increase in summer temperatures could lead to increased erosion as soils and their substrates dry out.	Embankments will be compacted and planted; topsoil retention systems may be used if necessary. The drainage design will include inline treatment of runoff for example using SuDs such as attenuation ponds with sediment forebays. Sizing and treatment will be confirmed by a sediment transport assessment. In addition to the above the Landscape and Visual Effects chapter (Chapter 8) proposes the following embedded mitigation: Retain existing trees and vegetation wherever possible; and Replace areas of trees and grass lost to facilitate the works wherever practicable.	Not Significant

Receptor/ Climate trend	Impacts	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
Heavier rain and wetter winters	The projected climate trend of increasing frequency and intensity of heavy rainfall events is likely to increase the risk of pluvial or surface flooding as surface run-off inundates small catchments and the urban landscape. Prolonged periods of excessive precipitation (e.g. wetter winters) saturates soil, increasing the risk of fluvial or river flooding. Above average precipitation for long periods can also lead to a raised water table, which can result in groundwater flooding in areas where the geological characteristics are favourable.	The drainage system will be designed in line with current standards set out in DMRB CG 501[212]. This provides guidance for surface drainage for trunk roads including motorways. The design will include raising the riding surface, using an appropriate camber and providing appropriate maintenance. With regard to pluvial flood risk on the road surface, the surface water drainage system is designed to control runoff rates up to 1 in 100-year return period. Although there are various design storm-periods for different aspects of highway construction, ultimately the absolute rainfall thresholds are highly dependent on the local topography, adjacent land-use, gradient and location within the wider catchment. The DMRB standards highlight the importance of this local information to assess absolute rainfall thresholds. This information will be provided in the Schemes FRA which also include consideration and allowance for climate change. A climate change allowance will also be applied to fluvial flows for the design of the flood compensation areas (to determine their volume), if required, and to determine the distance needed between the soffit of structures and the design flood water level of the rivers being crossed.	Not Significant
Road technology and street furniture (including signs and signals)			
Changes to extreme weather	Extreme weather impacts on electrical equipment: More regular and intense storms in the future could increase the regularity of lightning strikes on infrastructure which could damage electrical equipment Extreme hot temperatures increase thermal loadings on electrical and control equipment reducing their life.	At the detailed design stage, electrical calculations will be carried out for the lighting and a risk assessment detailed in section 443 of BS7671:2018213 will be undertaken to determine if protection against transient overvoltage (lighting strike) is required.	Not Significant

[212] https://www.standardsforhighways.co.uk/prod/attachments/ada3a978-b687-4115-9fcf-3648623aaff2
[213] https://shop.bsigroup.com/ProductDetail?pid=000000000030342613

Receptor/ Climate trend	Impacts	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
		Key electrical components will be regularly checked and replacement cycles may be shortened if deterioration rates increase.	
Changes to extreme weather	High winds in more regular and intense storms could overload small structures and damage roadside planting and furniture, for example traffic signs.	The landscape design will adhere to the Specification for Highways Works set out in Series 3000 (Landscape and Ecology) of the Manual of Contract Documents for Highway Works[214]. The design will also adhere to DMRB LD 117 which sets out that shrubs must not be planted within 4.5 m of the carriageway and large trees not within 9 m of it. Highways England's own Adaptation Assessment[215] found that the effect of wind on bridges is minimal as it is not the dominant load. Fatigue actions due to wind gusting shall be determined in accordance with BS EN 1991-1-4, DMRB 365 and DMRB 354.	Not Significant
Landscaping			
Hotter and drier summers	Hotter and drier summers will increase soil moisture deficits in the future which could negatively impact the Scheme's landscaping. The landscaping has aesthetic benefits but also prevents excessive aeolian soil erosion and protects structures from surface water runoff scour.	The proposed landscape design will futureproof the Scheme in terms of climate change as well as in terms of pests/diseases by adhering to best practice. This will include diversifying planting species as much as possible, including drought tolerant species, whilst still having regard to the local character, and generally planting only native species. It will also adhere to best ecological practice.	Not Significant
End users			

[214] Manual of Contract Documents for Highway Works (MCHW), 2019, www.standardsforhighways.co.uk/ha/standards/mchw/index.htm
[215] Highways England Climate Adaptation Risk Assessment, 2016, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/596812/climate-adrep-highways-england.pdf

Receptor/ Climate trend	Impacts	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
Hotter summers	Climate change will increase average summer temperatures. Vehicle breakdowns are more common during warm weather because the heat puts stress on critical components.	Adherence to DMRB guidance on the design of lay-bys, maintenance hardstanding, rest areas, service areas and observation platforms.	Not Significant
Hotter and drier weather	Climate change will increase average summer temperatures. During warm weather, accident rates typically increase. This is attributable to more solar glare, more people being out (particularly in the evening), more pedestrians and bikes on the road and an increase in fine particulates on the road surface which reduces skid resistance. Additionally, other contaminants, such as oil and tyre rubber can build up in drier weather acting as lubricants further reducing skid resistance.	The long-term landscape design does not include large areas of exposed soil that could become mobile in hot dry weather (blowing onto the road and reducing skid resistance). It is noted that risks associated with driving cannot be fully removed by changes to the Scheme design. This reflects the fact that the cause of most traffic accidents is composite and often includes driver error.	Not Significant
Heavier rain and wetter winters	In the future heavier rain resulting from climate change will create dangerous driving conditions more often as spray reduces visibility, stopping distances increase and standing water creates an aquaplaning risk.	To inform the design of the Scheme an FRA will be completed along with a detailed Drainage Strategy. Both will consider climate change impacts. These along with the Water Environment assessment shall describe how the Scheme will ensure drainage will be sufficient for future rainfall. It is noted that risks associated with driving cannot be fully removed by changes to the Scheme design. This reflects the fact that the cause of most traffic accidents is composite and often includes driver error.	Not Significant

Receptor/ Climate trend	Impacts	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
Changes to extreme weather	More frequent storms and high wind events could affect road user safety. High-sided vehicles can become unstable in gusts of wind over 45 mph. Windblown debris, including loads detached from vehicles and third-party structures blowing onto the network, as well as fallen trees could also be a hazard to vehicles traveling at speed.	The road alignment is not at a high elevation or topographically exposed, e.g. along a ridge. Significant traffic disruption related to wind exposure is therefore not expected. The landscape design will adhere to the Specification for Highways Works set out in Series 3000 (Landscape and Ecology) of the Manual of Contract Documents for Highway Works[216]. The design will also adhere to DMRB LD 117 which sets out that shrubs must not be planted within 4.5 m of the carriageway and large trees not within 9 m.	Not Significant

Table 14-2 - Potential effects during operation

Receptor/ Climate trend	Impacts	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
Drainage infrastructure			
Drier summers	Drier summers combined with the projected increase in summer temperatures could lead to increased erosion as soils and their substrates dry out.	Embankments will be compacted and planted; topsoil retention systems may be used if necessary. The drainage design will include inline treatment of runoff for example using SuDs such as attenuation ponds with sediment forebays. Sizing and treatment will be confirmed by a sediment transport assessment. In addition to the above the Landscape and Visual Effects chapter (Chapter 8) proposes the following embedded mitigation: Retain existing trees and vegetation wherever possible; and	Not Significant

[216] Manual of Contract Documents for Highway Works (MCHW), 2019, www.standardsforhighways.co.uk/ha/standards/mchw/index.htm

Receptor/ Climate trend	Impacts	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
		Replace areas of trees and grass lost to facilitate the works wherever practicable.	
Heavier rain and wetter winters	The projected climate trend of increasing frequency and intensity of heavy rainfall events is likely to increase the risk of pluvial or surface flooding as surface run-off inundates small catchments and the urban landscape. Prolonged periods of excessive precipitation (e.g. wetter winters) saturates soil, increasing the risk of fluvial or river flooding. Above average precipitation for long periods can also lead to a raised water table, which can result in groundwater flooding in areas where the geological characteristics are favourable.	The drainage system will be designed in line with current standards set out in DMRB CG 501[217]. This provides guidance for surface drainage for trunk roads including motorways. The design will include raising the riding surface, using an appropriate camber and providing appropriate maintenance. With regard to pluvial flood risk on the road surface, the surface water drainage system is designed to control runoff rates up to 1 in 100-year return period. Although there are various design storm-periods for different aspects of highway construction, ultimately the absolute rainfall thresholds are highly dependent on the local topography, adjacent land-use, gradient and location within the wider catchment. The DMRB standards highlight the importance of this local information to assess absolute rainfall thresholds. This information will be provided in the Schemes FRA which also include consideration and allowance for climate change. A climate change allowance will also be applied to fluvial flows for the design of the flood compensation areas (to determine their volume), if required, and to determine the distance needed between the soffit of structures and the design flood water level of the rivers being crossed.	Not Significant
Road technology and street furniture (including signs and signals)			
Changes to extreme weather	Extreme weather impacts on electrical equipment: More regular and intense storms in the future could increase the regularity of lightning strikes on infrastructure which could damage electrical equipment	At the detailed design stage, electrical calculations will be carried out for the lighting and a risk assessment detailed in section 443 of BS7671:2018[218] will be undertaken to determine if protection against transient overvoltage (lighting strike) is required.	Not Significant

[217] https://www.standardsforhighways.co.uk/prod/attachments/ada3a978-b687-4115-9fcf-3648623aaff2
[218] https://shop.bsigroup.com/ProductDetail?pid=000000000030342613

Receptor/ Climate trend	Impacts	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
	Extreme hot temperatures increase thermal loadings on electrical and control equipment reducing their life.	Key electrical components will be regularly checked and replacement cycles may be shortened if deterioration rates increase.	
Changes to extreme weather	High winds in more regular and intense storms could overload small structures and damage roadside planting and furniture, for example traffic signs.	The landscape design will adhere to the Specification for Highways Works set out in Series 3000 (Landscape and Ecology) of the Manual of Contract Documents for Highway Works[219]. The design will also adhere to DMRB LD 117 which sets out that shrubs must not be planted within 4.5 m of the carriageway and large trees not within 9 m of it. Highways England's own Adaptation Assessment[220] found that the effect of wind on bridges is minimal as it is not the dominant load. Fatigue actions due to wind gusting shall be determined in accordance with BS EN 1991-1-4, DMRB 365 and DMRB 354.	Not Significant
Landscaping			
Hotter and drier summers	Hotter and drier summers will increase soil moisture deficits in the future which could negatively impact the Scheme's landscaping. The landscaping has aesthetic benefits but also prevents excessive aeolian soil erosion and protects structures from surface water runoff scour.	The proposed landscape design will futureproof the Scheme in terms of climate change as well as in terms of pests/diseases by adhering to best practice. This will include diversifying planting species as much as possible, including drought tolerant species, whilst still having regard to the local character, and generally planting only native species. It will also adhere to best ecological practice.	Not Significant
End users			

[219] Manual of Contract Documents for Highway Works (MCHW), 2019, www.standardsforhighways.co.uk/ha/standards/mchw/index.htm
[220] Highways England Climate Adaptation Risk Assessment, 2016, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/596812/climate-adrep-highways-england.pdf

Receptor/ Climate trend	Impacts	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
Hotter summers	Climate change will increase average summer temperatures. Vehicle breakdowns are more common during warm weather because the heat puts stress on critical components.	Adherence to DMRB guidance on the design of lay-bys, maintenance hardstanding, rest areas, service areas and observation platforms.	Not Significant
Hotter and drier weather	Climate change will increase average summer temperatures. During warm weather, accident rates typically increase. This is attributable to more solar glare, more people being out (particularly in the evening), more pedestrians and bikes on the road and an increase in fine particulates on the road surface which reduces skid resistance. Additionally, other contaminants, such as oil and tyre rubber can build up in drier weather acting as lubricants further reducing skid resistance.	The long-term landscape design does not include large areas of exposed soil that could become mobile in hot dry weather (blowing onto the road and reducing skid resistance). It is noted that risks associated with driving cannot be fully removed by changes to the Scheme design. This reflects the fact that the cause of most traffic accidents is composite and often includes driver error.	Not Significant
Heavier rain and wetter winters	In the future heavier rain resulting from climate change will create dangerous driving conditions more often as spray reduces visibility, stopping distances increase and standing water creates an aquaplaning risk.	To inform the design of the Scheme an FRA will be completed along with a detailed Drainage Strategy. Both will consider climate change impacts. These along with the Water Environment assessment shall describe how the Scheme will ensure drainage will be sufficient for future rainfall. It is noted that risks associated with driving cannot be fully removed by changes to the Scheme design. This reflects the fact that the cause of most traffic accidents is composite and often includes driver error.	Not Significant
Changes to extreme weather	More frequent storms and high wind events could affect road user safety. High-sided vehicles can become unstable in gusts of wind over 45 mph. Windblown debris, including loads detached from vehicles and third-party structures blowing onto the	The road alignment is not at a high elevation or topographically exposed, e.g. along a ridge. Significant traffic disruption related to wind exposure is therefore not expected. The landscape design will adhere to the Specification for Highways Works set out in Series 3000 (Landscape and Ecology)	Not Significant

Receptor/ Climate trend	Impacts	Potential mitigation measures	Potential residual effects (with potential mitigation measures)
	network, as well as fallen trees could also be a hazard to vehicles traveling at speed.	of the Manual of Contract Documents for Highway Works[221]. The design will also adhere to DMRB LD 117 which sets out that shrubs must not be planted within 4.5 m of the carriageway and large trees not within 9 m.	

[221] Manual of Contract Documents for Highway Works (MCHW), 2019, www.standardsforhighways.co.uk/ha/standards/mchw/index.htm

14.8. Potential mitigation measures

14.8.1. The approach to mitigation will be to first seek to avoid climate vulnerabilities and then, where this is not possible, to minimise them and/or reduce their adverse consequences to acceptable levels. Climate vulnerability mitigation will be embedded into the design. Likely mitigation for specific impacts are presented in Table 14-1 and Table 14-2.

14.9. Further work

14.9.1. The climate team will continue to input to the design to ensure that appropriate climate adaptations are embedded into the final proposal.

14.10. Summary

14.10.1. The climate in the study area is projected to change in the future. However, after mitigation, which will primarily be embedded into the design in accordance with the design specification and to ensure compliance with standards such as DMRB, it is considered that the project does not have exposure to these changes (i.e. it has no vulnerable elements) that could be significantly impacted. Therefore, no potentially significant residual climate vulnerability impacts are identified at this time

15. Summary

15.1.1. This PEAR has considered the potential environmental effects of the Melksham Bypass Scheme and has set out potential mitigation measures that can be incorporated into the design at the next stage to minimise the impacts.

15.1.2. During the next stage of the Scheme, further surveys and modelling and a full EIA and ES will be prepared which will build on the findings in this PEAR and inform the development of the final Scheme design.

15.1.3. Table 15-1 below summarise the effects that the Scheme will have on the environmental topics that have been assessed in this PEAR.

Table 15-1 – Summary of potential effects and mitigation measures during construction and operation

Topic	Summary of potential construction effects (with potential mitigation)	Summary of potential mitigation	Summary of potential operational effects (with potential mitigation)	Summary of potential mitigation
Air quality (Chapter 4)	**Not significant (adverse)** • Potential for increased emissions of dust at nearby receptors • Additional traffic leading to increased concentrations of NO_2, PM_{10} and $PM_{2.5}$ • Additional traffic leading to increased nitrogen deposition affecting ecological receptors	Best practice construction working practices.	**Not significant (beneficial)** • Decrease is NO_2 concentrations at some receptors **Significant (adverse)** • Operational traffic leading to increased nitrogen deposition affecting ecological receptors	To be confirmed with biodiversity specialist at the next stage
Noise and vibration (Chapter 5)	**Not significant (adverse)** • Noise from construction activities during the daytime at sensitive receptors >20 m from the Scheme • Noise from construction activities during the evening at sensitive receptors >60 m from the Scheme • Noise from construction activities during the night-time at sensitive receptors >200 m from the Scheme • Vibration from construction and piling activities **Significant (adverse)** • Noise from construction activities during the daytime at sensitive receptors <20 m from the Scheme • Noise from construction activities during the evening at sensitive receptors <60 m from the Scheme	Best practice construction working practices. Consider noise insulation or temporary rehoming where appropriate. Noise barriers for properties experiencing significant effects. Low impact piling methods.	**Decreases in noise** • Experienced at receptors along the A350 (including those within identified Noise Important Area IDs 12744, 3752, 3751, 12745, 3749, 3745, 3747), Beanacre at Lacock, The Wharf, Bowdon Hill, A3102, A342, Forest Lane/ Lower Woodrow/ Woodrow Road and Eastern Way **Increases in noise** • Experienced at receptors along Scheme corridor, Bollands Hill and Bath Road, south-east Bowerhill, Bath Road and Sandridge Common	Low noise surfacing Noise barriers where required

Topic	Summary of potential construction effects (with potential mitigation)	Summary of potential mitigation	Summary of potential operational effects (with potential mitigation)	Summary of potential mitigation
	• Noise from construction activities during the night-time at sensitive receptors <200 m from the Scheme			
Biodiversity (Chapter 6)	<u>Designated sites and priority habitats</u> **Not significant (adverse)** • Potential hydrological pollution on Kennet and Avon Canal LWS • Loss of non-priority habitats • Disturbance and impacts on aquatic habitats and species associated with watercourses and ponds impacted by the Scheme **Significant (adverse)** • Loss of woodland and orchard habitats • Disturbance and impacts on aquatic habitats and species associated with the Bristol River Avon LWS • Direct loss of pond habitat and impacts on aquatic species **Effects still be determined following further assessment:** • Impacts on qualifying features of these European Sites - Bath and Bradford on Avon Bats SAC, Mells Valley SAC, Chilmark Quarries SAC and Severn Estuary SAC/SPA/Ramsar • Impacts on Spye Park SSSI • Impacts on Inwood, Lacock and Hill Planting, Eighteen Acre Plantation,	Avoidance of Ancient Woodland, veteran and protected trees. Minimises habitat loss. Good practice working methods for environmental protection. Best practice design for bridges and structures over watercourses.	<u>Designated sites and priority habitats</u> **Not significant (adverse)** • Impacts on woodland and orchard habitats • Loss of non-priority habitats • Impacts on aquatic habitats and species associated with the Bristol River Avon LWS • Impacts on aquatic habitats and species associated with watercourses and ponds impacted by the Scheme • Direct loss of pond habitat associated with aquatic species **Effects still be determined following further assessment:** • Impacts on qualifying features of these European Sites - Bath and Bradford on Avon Bats SAC, Mells Valley SAC, Chilmark Quarries SAC and Severn Estuary SAC/SPA/Ramsar • Impacts on Spye Park SSSI • Impacts on Inwood, Lacock and Hill Planting, Eighteen Acre Plantation, Morass Wood, Hanging Wood, Hack Farm Meadow LWSs from air pollution	Habitat creation including creation of ponds and habitat connectivity features. Drainage system designed to manage runoff.

Topic	Summary of potential construction effects (with potential mitigation)	Summary of potential mitigation	Summary of potential operational effects (with potential mitigation)	Summary of potential mitigation
	Morass Wood, Hanging Wood, Hack Farm Meadow LWSs from air pollution • Impacts on Ancient Woodland and Ancient, veteran and notable trees from air pollution and removal		• Impacts on Ancient Woodland and Ancient, veteran and notable trees from air pollution and removal	
	<u>Protected and priority species</u> **Not significant (adverse)** • Impacts on protected and priority species from loss of habitat, habitat degradation and risk of injury and mortality – Great crested newts and other amphibians, hazel dormouse, otter and water vole, white-clawed crayfish, reptiles, breeding birds and wintering birds, invertebrates, badgers, flowering plants **Significant (adverse)** • Impacts on bats from loss of roosts and habitat, habitat degradation and risk of injury and mortality	Avoid loss of all habitats. Translocation of species where required. Use of Natural England European Species Licence where required.	<u>Protected and priority species</u> **Not significant (adverse)** • Long term fragmentation of habitats and collisions with vehicles for protected species – Great crested newts and other amphibians, hazel dormouse, otter and water vole, white-clawed crayfish, reptiles, breeding birds and wintering birds, invertebrates, badgers, flowering plants **Significant (adverse)** • Flights lines for bats severed from new road and increased collisions	Creation of compensatory and new habitats for all species in the form of new planting woodland, hedgerows scrub, grassland, and providing new ponds, bat and nest boxes, wildlife underpasses.
Water environment (Chapter 7)	**Not significant (adverse)** • Damage to watercourses (large and small) beds, banks and riparian habitats • Increased runoff • Potential contamination entering surface watercourses and groundwater • Loss of floodplain • Increases runoff to watercourse and discharge to groundwater	Best practice construction working methods to minimise working in channel and to manage runoff.	**Not significant (adverse)** • Culverts leading to permanent loss of natural watercourse and habitat • Bridges and viaducts cause loss of bank vegetation • Potential changes in flow and sediment transport • Floodplain encroachment caused by new road • Increase in impermeable surface	Best practice culvert design methods Best practice bridge and viaduct methods Minimal encroachment into the floodplain and floodplain compensation areas provided where required

Topic	Summary of potential construction effects (with potential mitigation)	Summary of potential mitigation	Summary of potential operational effects (with potential mitigation)	Summary of potential mitigation
			• New road cuttings intersecting water table • Loss of floodplain storage • Increase runoff to watercourses and groundwater	Use of swales and the use of other relevant SuDS measures Drainage system designed to manage runoff
Landscape and visual (Chapter 8)	Landscape character **Significant (adverse)** Loss of vegetation and views of the Scheme in the landscape will impact on the Open Clay Valley/ Local landscape	Minimise vegetation loss. Protect existing vegetation. Provide advance planting of replacement vegetation to provide screening.	Landscape character **Significant (adverse)** Change in the landscape from the new road will impact on the Open Clay Valley/ Local landscape	Hedgerow, woodland and tree planting to help with screening.
	Visual amenity **Significant (adverse)** • Visual impacts of the construction of the Scheme will be experienced by properties along Folly Lane East, Piccadilly Caravan Park and Melksham Road, Lacock, Lower Woodrow Road, Woodrow Road and Forest Lane including farmsteads, Sandridge Hill/A3102, Lopes Close and Sandridge Common, Eastern Way, Carnation Lane, Redstocks, Bath Road/A365 and Bowerhill Lane (Bowerhill), Church Street and Manor Close (Semington). Also from Farmsteads and Businesses along A361 and near Littleton Roundabout and near the A342/A3102 junction • Users of the ProW network and National Cycle Route will experience visual impacts during construction	Minimise vegetation loss. Protect existing vegetation. Provide advance planting of replacement vegetation to provide screening. Provide fencing and bunding to screen the works. Provide diversions of PRoW and cycle routes.	Visual amenity **Not significant (adverse)** • Change in landscape and views from the new road on properties along Folly Lane East, Piccadilly Caravan Park and Melksham Road, Lacock, Lower Woodrow Road, Woodrow Road and Forest Lane including farmsteads, Sandridge Hill/A3102, Lopes Close and Sandridge Common, Bath Road/A365 and Bowerhill Lane (Bowerhill), Church Street and Manor Close (Semington). Also on Farmsteads and Businesses along A361 and near Littleton Roundabout and near the A342/A3102 junction. • The Cotswolds and North Wessex Downs AoNBs, Lacock Abbey Registered Park and Garden and Ancient Woodlands will also experience views of the permanent Scheme	Mitigation planting will help to reduce views of the Scheme.

Topic	Summary of potential construction effects (with potential mitigation)	Summary of potential mitigation	Summary of potential operational effects (with potential mitigation)	Summary of potential mitigation
	• Visual impacts of the construction of the Scheme on the Lacock and Bowden Hill Conservation Areas, The Cotswolds and North Wessex Downs AoNBs, Spye Park and Lacock Abbey Registered Park and Garden, Listed Buildings and Ancient Woodland.		**Significant (adverse)** • New road will be in close proximity to properties along Eastern Way, Carnation Lane, Redstocks • Users of the ProW network and National Cycle Route will have their amenity affected due to the new road • Visual amenity will be transformed from the new road on the Lacock and Bowden Hill Conservation Areas • Spye Park Registered Park and Garden and Listed Buildings will experience views of the Scheme	
Geology and soils (Chapter 9)	<u>Agricultural land and soil</u> **Not significant (adverse)** • Potential temporary disturbance to temporarily acquired land **Significant (adverse)** • Loss of BMV Grade 2, 3a, 3b land due to the Scheme	No mitigation for the loss of BMV land. Temporarily acquired land can be restored to original capability.	<u>Agricultural land and soil</u> **Not significant (adverse)** • Potential temporary disturbance to temporarily acquired land **Significant (adverse)** • Loss of BMV Grade 2, 3a, 3b land due to the Scheme	No mitigation for the loss of BMV land. Temporarily acquired land can be restored to original capability.
	<u>Land contamination</u> **Not significant (adverse)** • New pathways for contaminants created from construction activities may affect human health • Removal of vegetation and hardstanding may generate dust to be inhaled by humans	Implementation of best practice construction methodologies.	<u>Land contamination</u> **Not significant (adverse)** • Soils will be encapsulated beneath hardstanding and vegetation, removing pathways for contact to human receptors, groundwater and surface water	Operation and maintenance of the Scheme will be in accordance with best practice.

Topic	Summary of potential construction effects (with potential mitigation)	Summary of potential mitigation	Summary of potential operational effects (with potential mitigation)	Summary of potential mitigation
	• Construction activities may expose and mobilise contaminants in soils which leach to groundwater and watercourses			
Cultural heritage (Chapter 10)	**Not significant (adverse)** • Setting impacts on the Conservation Area and Listed Buildings from the presence of construction related noise and dust • Truncation of archaeological remains from the Roman Road and established ridge and furrow • Removal of below archaeological remains associated with the Medieval Settlement, Southeast of Snarlton Farm and Medieval Settlement of Redstocks and anti-tank ditches	Avoid physical impacts of the Roman Road through design process. Scheme design to avoid significant archaeological remains. Full recording of ridge and furrow. Full excavation of the area to record any archaeological remains associated with the settlement. If archaeology remains are established that they are still in-situ, recording before work commences. Screening and good construction practices.	**Not significant (adverse)** • Presence of new road will affect the setting of the Conservation Area and Listed Buildings near the Scheme	Vegetation screening of the road will avoid visual impacts.
Materials and waste (Chapter 11)	**Not significant (adverse)** • Consumption of resources will impact the regional material availability • Generation of waste to construct the Scheme will impact on the regional waste infrastructure capacity and the regional landfill void capacity	Implementation of a Material Management Plan. Use recycled content in materials and components. Use of off-site manufacture and modular construction.	**N/A – scoped out**	**N/A**

Topic	Summary of potential construction effects (with potential mitigation)	Summary of potential mitigation	Summary of potential operational effects (with potential mitigation)	Summary of potential mitigation
		Use reusable packaging and take back schemes for unused materials. Set targets for landfill diversion and recycling. Separate hazardous wastes from non-hazardous and inert waste.		
Population and human health (Chapter 12)	<u>Private property and housing</u> **Not significant (adverse)** • No properties are at risk of demolition • Construction activities will cause temporary reduced access to properties at Melksham Road, Folly Lane East and High Street, and other properties in Lacock. Also properties in the wider area **Significant (adverse)** • Construction activities will cause severance to Hack Farmhouse and the newly constructed dwelling • Construction activities will cause temporary reduced access to properties along Sandridge Hill/ Sandridge Common and properties at Sandridge Park. Also at clusters of properties at Carnation Lane and other properties in Redstocks, and Bowerhill	Avoid demolition of any residential properties. Provide temporary access routes and keep disruption to a minimum. Ensure access is maintained to all properties for duration of works.	<u>Private property and housing</u> **Not significant (beneficial)** • New junction facilities would be introduced at Lacock, Lower Woodrow, Sandridge Hill/ Sandridge Common, Bath Lane, south of Hampton Business Park on the A350 and at Semington improving journey times	N/A
	<u>Community land and assets</u>	Avoid demolition of any community land or assets.	<u>Community land and assets</u>	N/A

Topic	Summary of potential construction effects (with potential mitigation)	Summary of potential mitigation	Summary of potential operational effects (with potential mitigation)	Summary of potential mitigation
	Not significant (adverse) • No land required permanently or temporarily from any community land or assets or access will be affected by the Scheme • Access to Lacock Recreation Ground, the cemetery and chapel in Lacock may be temporarily reduced during construction • Temporary disruptions to access to community land and assets wider study area may occur	Provide temporary access routes and keep disruption to a minimum. Ensure access is maintained to all properties for duration of works.	**Not significant (beneficial)** • Increased network capacity, improved journey time reliability and reduced congestion in the centre of Melksham and on the surrounding network is anticipated to improve local and wider access to services and facilities	
	<u>Development land and businesses</u> **Not significant (adverse)** • Construction will result in temporary disruptions when accessing community facilities and services in Melksham and Bowerhill **Significant (adverse)** • Construction will result in severance to the Solar photovoltaic farm at Snarlton Farm • Construction will require land take from fields at 6 Guinea Cottage which is believed to be currently used as a health and fitness business (outdoor boot camps) • Construction will result in temporary disruptions to businesses currently accessed by Lower Woodrow,	Access will be kept open and assessable as far as possible. Keep disruption to a minimum. Keep land take to a minimum as far as possible.	<u>Development land and businesses</u> **Not significant (beneficial)** • Journey time savings are anticipated when accessing businesses off the junctions (e.g. Lower Woodrow, Sandridge Hill/ Sandridge Common, Bath Lane, Hampton Business Park and Semington) and in the centre of Melksham from reduced congestion and improved journey time reliability	N/A

Topic	Summary of potential construction effects (with potential mitigation)	Summary of potential mitigation	Summary of potential operational effects (with potential mitigation)	Summary of potential mitigation
	Sandridge Hill/ Sandridge Common, and Bath Road			
	<u>Agricultural land holdings</u> **Not significant (adverse)** • Noise and dust impacts during construction **Significant (adverse)** • Land take and severance of arable and grass farms including Snarlton Dairy Farm and Oakley Egg Farm from construction of the Scheme	No mitigation for land take. Provisions of crossings points and handling pens. Best practice construction methods for noise reduction.	<u>Agricultural land holdings</u> N/A - The permanent construction effects would continue to be observed during the operational phase	N/A
	<u>Walkers, Cyclists and Horse-riders (WCH)</u> **Not significant (adverse)** • Temporary and permanent loss of various PRoW crossed by the Scheme that will require a >250m increase in length **Significant (adverse)** • Temporary and permanent loss of various PRoW crossed by the Scheme that will require a >500m increase in length	Provisions of crossing facilities and diversions. Keep disruption to a minimum.	<u>Walkers, Cyclists and Horse-riders (WCH)</u> **Not significant (beneficial)** • Reduced congestion and free flow of traffic on the A350 and through Melksham should provide a better and safer environment for pedestrians and others, including vulnerable groups **Not significant (adverse)** • Minor severance effects/ increase in journey time/ distance for users of footways at Melksham Road, Lacock; Sandridge Common and Bath Lane because of the introduction of roundabout junctions where currently there is a straight route	N/A
	<u>Human health</u> **Positive health outcome**	Best practice construction working practices to minimise dust, air quality,	<u>Human health</u> **Positive health outcome**	N/A

Topic	Summary of potential construction effects (with potential mitigation)	Summary of potential mitigation	Summary of potential operational effects (with potential mitigation)	Summary of potential mitigation
	• Additional temporary employment generated as a result of the construction of the Scheme will have a positive impact on work and training **Negative health outcome** • Temporary adverse health effects are expected during construction from air pollution, soil and water pollution, noise pollution and vibration, landscape and visual amenity, risk of injury and death, active travel, working and training (impacts on land take on businesses), access and accessibility to housing and education, healthcare services and other social infrastructure and social cohesion	noise and contamination impacts.	• Beneficial human health effects outcomes will be experienced in relation to better air and noise pollution in some locations, reduced risk of injury and death, improved active travel, improved access to work and training, improved accessibility and housing, improved access to education, healthcare services and other social infrastructure and social cohesion **Negative health outcome** • The operation of the Scheme will introduce new sources of contamination in regard to soil and water pollution • There may be some negative noise impacts • Some residents will experience negative landscape and visual impacts from the new road	
Climate change effects (Chapter 13)	**Not significant (adverse)** • Construction of the Scheme will give rise to emissions from the production of materials, their transportation to site, and onsite through construction activities	Maximise potential for re-using and / or refurbishing existing assets to reduce the extent of new construction required. Explore alternative lower carbon options. Use low carbon solutions.	**Not significant (adverse)** • Although road improvement schemes will lead to reduced emissions in operation due to easing of congestion, the operation of the Scheme will release emissions due to increased vehicle kilometres generated by the Scheme	Use low carbon solutions to minimise resource consumption during operation

Topic	Summary of potential construction effects (with potential mitigation)	Summary of potential mitigation	Summary of potential operational effects (with potential mitigation)	Summary of potential mitigation
		Reduce carbon through on or off-site offsetting or sequestration.		
Vulnerability to climate change (Chapter 14)	**Not significant (adverse)** • Impacts on the construction of the Scheme from extreme weather events (rain and droughts) including on road surfaces and pavements, structures, earthworks, drainage, road furniture and signage, landscaping and road users	Best practice construction methods for managing extreme weather. Use of appropriate materials. Best practice drainage and landscape design with consideration of climate change.	**Not significant (adverse)** • Impacts on drainage infrastructure, road technology, landscaping and end users from extreme weather events	Best practice design including drainage, flooding and landscape design with consideration of climate change

16. Glossary

Term	Acronyms and abbreviations	Description
Annual Average Daily Traffic	AADT	The number of vehicles travelling on a particular stretch of road on an average day.
Atmospheric Dispersion Modelling System Roads	ADMS Roads	A comprehensive software tool for investigating air pollution problems due to networks of roads that may be in combination with industrial sites
Assessment of Implications on European Sites	AIES	An assessment of the implications of highway construction or improvement projects on ‘European Sites’ where such sites are designated for their nature conservation interest.
Agricultural Land Classification	ALC	A framework for classifying land according to the extent to which its physical or chemical characteristics impose long term limitations on agricultural use. Agricultural land is classified into five categories according to versatility and suitability for growing crops. The top three grades, Grade 1, 2 and 3a, are referred to as 'Best and Most Versatile' land.
Archaeological Priority Area	APA	An area where there is significant known archaeological interest or potential for new discoveries. They are used to highlight where development may affect heritage assets.
Air Quality Action Plan	AQAP	A plan that must be compiled by a local authority if they declare an air quality management area.
Air Quality Management Area	AQMA	An area identified where the National Air Quality Objectives are not likely to be achieved. The Local Authority is required to produce a Local Air Quality Action Plan to plan how air quality in the area is to be improved.
Air Quality Strategy	AQS	The Air Quality Strategy sets out air quality objectives and policy options to further improve air quality in the UK from today into the long term.
Affected Road Network	ARN	The parts of the road network that would be affected by a change in traffic levels as the result of a transport scheme.
Biodiversity Action Plan	BAP	An internationally recognized program addressing threatened species and habitats and is designed to protect and restore biological systems. The original impetus for these plans derives from the 1992 Convention on Biological Diversity.
British Geological Survey	BGS	A partly publicly-funded body which aims to advance geoscientific knowledge of the United Kingdom landmass and its continental shelf by means of systematic surveying, monitoring and research.
Best and Most Versatile	BMV	Defined as Grades 1, 2 and 3a of the Agricultural Land Classification as land which is most flexible, productive and efficient in response to inputs and which can best deliver future crops for food and non-food uses such as biomass, fibres and pharmaceuticals.

Term	Acronyms and abbreviations	Description
Basic noise level	BNL	A measure of source noise at a reference distance of 10 m from the nearside carriageway edge.
Conservation Area		An area of special environmental or historic interest or importance, of which the character or appearance is protected by law against undesirable changes (Section 69 of the Planning (Listed Buildings and Conservation Areas) Act 1990).
Construction, Demolition and Excavation	CD&E	A term used to describe waste arisings from construction, demolition and excavation activities.
Construction Environmental Management Plan	CEMP	A plan by the contractor describing how the environmental impacts of construction activities would be minimised and mitigated.
Continuous Monitoring Stations	CMS	An air quality monitoring station that houses analysers that continuously monitor the concentrations of air pollutants.
Carbon Dioxide	CO_2	A primary greenhouse gas emitted through human activities as well as natural sources.
Control of Substances Hazardous to Health	COSHH	Under the Control of Substances Hazardous to Health Regulations 2002, employers need to either prevent or reduce their workers' exposure to substances that are hazardous to their health.
Calculation of Road Traffic Noise	CRTN	Method of calculating (and measuring) road traffic noise levels for new and altered highways.
Conceptual Site Model	CSM	Serves to conceptualize the relationship between contaminant sources and receptors through consideration of potential or actual migration and exposure pathways.
Decibel	dB	Logarithmic scale for measuring sound levels.
Department for Communities and Local Government	DCLG	The UK Government department for communities and local government in England and whose job it is to facilitate great places to live and work, and to give more power to local people to shape what happens in their area.
Department for Environment, Food and Rural Affairs	Defra	Defra is the government department responsible for environmental protection, food production and standards, agriculture, fisheries and rural communities in the United Kingdom of Great Britain and Northern Ireland. Defra is a ministerial department, supported by 33 agencies and public bodies.
Department for Transport	DfT	Government department responsible for the transport network in England, and for aspects of the transport network in the devolved administrations.
Design Manual for Roads and Bridges	DMRB	A series of 15 volumes contains information about current standards relating to the design, assessment and operation of motorway and all-purpose trunk roads in the United Kingdom.
Do Minimum	DM	The conditions that would persist in the absence of the implementation of a construction or improvement

Term	Acronyms and abbreviations	Description
		project, but given that maintenance on the road network is ongoing.
Do Something	DS	The conditions that would occur as a consequence the implementation of a construction or improvement project.
Environment Agency	EA	A non-departmental public body with responsibilities relating to the protection and enhancement of the environment in England.
Early Assessment and Sifting Tool	EAST	A decision support tool that has been developed to quickly summarise and present evidence on options in a clear and consistent format. It provides decision makers with relevant, high level, information to help them form an early view of how options perform and compare. The tool itself does not make recommendations and is not intended to be used for making final funding decisions.
Environmental Impact Assessment	EIA	The process of assessing the likely significant environmental impacts of a proposed project as part of gaining planning consent.
Environmental Quality Standards Directive	EQSD	European policy which sets out environmental quality standards for the substances present in surface waters (river, lake, transitional and coastal).
Environmental Statement	ES	The document which reports the process, findings and recommendations of the EIA carried out to assess the environmental impacts of a scheme.
Ecological Zone of Influence	EZoI	The area in which there may be ecological features subject to impacts and subsequent effects as a result of the Scheme, including those that would occur as a result of habitat loss, and those that would occur through disturbance, such as noise.
Flood Risk Assessment	FRA	An assessment that determines the risk of flooding to a proposed project.
Greenhouse gas	GHG	An atmospheric gas such as carbon dioxide, methane, chlorofluorocarbon, nitrous oxide, ozone, or water vapour that slows the passage of re-radiated heat through the Earth’s atmosphere.
Ground Investigation	GI	An intrusive investigation undertaken to determine the ground conditions (including soil, groundwater and ground gas) at a site. Involves the collection of samples for analysis.
Greater London Archaeological Advisory Service	GLAAS	GLAAS is part of Historic England's London Local Office and a Chartered Institute for Archaeologists' (CIfA) Registered Organisation. They provide advice on the understanding on the significance of any heritage assets affected by development schemes.
Generic quantitative risk assessments	GQRA	An initial quantitative assessment of chemical data against generic assessment criteria to identify potentially unacceptable risks from contamination.
Historic Environment Record	HER	A record of all known archaeological finds and features and historic buildings and historic /landscape features, relating to all periods from the earliest human activity to the present day; maintained by each County and Unitary Authority in the United Kingdom.

Term	Acronyms and abbreviations	Description
Heavy Duty Vehicle/Heavy Delivery Vehicle	HDV	Defined in the DMRB as vehicles with a gross weight greater than 3.5 tonnes. Includes HGVs and buses and coaches.
Historic Landscape Character	HLC	A programme initiated by English Heritage to increase understanding of the wider designed landscape, beyond that of the planned parkland of the country estate. Similar programmes operate in Scotland, Wales and the Republic of Ireland, although different terminology is used.
Habitats of Principal Importance	HPI	Under Section 41 of the Natural Environment and Rural Communities (NERC) Act, the Secretary of State is required to publish a list of habitats which are of principal importance for the conservation of biodiversity in England. Fifty-six habitats of principal importance are included on the S41 list. These are all the habitats in England that were identified as requiring action in the UK Biodiversity Action Plan and continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework.
Habitats Regulation Assessment	HRA	A formal assessment of the implications of any new plans or projects which are capable of affecting the designated interest features of European Sites.
Institute of Environmental Management and Assessment (IEMA)	IEMA	The worldwide alliance of environment and sustainability professionals.
Local Air Quality Management Technical Guidance	LAQM.TG	A technical guidance document designed to support local authorities in carrying out their duties under the Environment Act 1995 and subsequent Regulations. These duties require local authorities to review and assess air quality in their area from time to time.
London Air Quality Network	LAQN	Map showing air pollution in London and south east England.
Lead Local Flood Authorities	LLFA	The authority responsible for developing, maintaining and applying a strategy for local flood risk management in their areas and maintaining a register of flood risk assets.
Lowest Observed Adverse Effect Level	LOAEL	The level of noise exposure above which adverse effects on health and quality of life can be detected. No observed effect level: this is the level of noise exposure below which no effect at all on health or quality of life can be detected.
Local Nature Reserve	LNR	A statutory designation made under Section 21 of the National Parks and Access to the Countryside Act 1949, and amended by Schedule 11 of the Natural Environment and Rural Communities Act 2006, by principal local authorities. A Local Nature Reserve must be of importance for wildlife, geology, education or public enjoyment.
Local Wildlife Site	LWS	Non-statutory designated sites selected for their local or county nature conservation value in accordance with set criteria.

Term	Acronyms and abbreviations	Description
Local Geological Site	LGS	Are non-statutory sites that have been identified by local geoconservation groups as being of importance.
Limit Values		Refers to airborne concentrations of chemical substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, over a working lifetime, without adverse health effects.
Mineral Safeguarding Area		An area designated by Minerals Planning Authorities which covers known deposits of minerals which are desired to be kept safeguarded from unnecessary sterilisation by non-mineral development.
Ministry of Agriculture, Fisheries and Food	MAFF	A UK government department created by the Board of Agriculture Act 1889. The Ministry was dissolved in 2002, at which point its responsibilities were merged into the Department for Environment, Food and Rural Affairs (Defra).
Multi-Agency Geographic Information for the Countryside	MAGIC	A web-based interactive map to bring together information on key environmental schemes and designations in one place. Multi-Agency Geographic Information for the Countryside (MAGIC) is a partnership project involving six government organisations who have responsibilities for rural policy-making and management.
Motorised Travellers	MT	A person who travels by a motorised vehicle which is a vehicle that is fitted with an engine or a motor e.g. mobility scooter.
National Character Area	NCA	The subdivision of England into 159 distinct natural areas. Each area is defined by a unique combination of landscape, biodiversity, geodiversity, history, and cultural and economic activity. Their boundaries follow natural lines in the landscape rather than administrative boundaries.
National Cycle Network Route	NCNR	A UK-wide network of signed paths and routes for walking, cycling and wheeling.
Natural England	NE	Executive non-departmental public body responsible for the natural environment.
National Heritage List for England	NHLE	The official, up to date, register of all nationally protected historic buildings and sites in England - listed buildings, scheduled monuments, protected wrecks, registered parks and gardens, and battlefields.
Noise Important Area	NIA	Areas where the 1% of the population that are affected by the highest noise levels from major roads are located according to the results of Defra's strategic noise maps.
Non-Motorised User	NMU	Cyclists, pedestrians (including wheelchair users), and equestrians using the public highway.
National Nature Reserves	NNR	Reserves established to protect some of the most important habitats, species and geology in the United Kingdom, and to provide ‘outdoor laboratories’ for research. There are currently 224 NNRs in England with a total area of over 94,400 hectares - approximately 0.7% of the country’s land surface. Natural England manages about two thirds of England’s

Term	Acronyms and abbreviations	Description
		NNRs. The remaining reserves are managed by organisations approved by Natural England, for example, the National Trust, Forestry Commission, RSPB, Wildlife Trusts and local authorities.
Nitrogen Dioxide	NO_2	Formed by the oxidation of nitric oxide in ambient air
Nitrogen Oxide	NOx	Collective term for nitrogen dioxide and nitric oxide, released from the combustion of fuel and discharged by vehicles and power stations.
No Observed Effect Level	NOEL	This is the level of noise exposure below which no effect at all on health or quality of life can be detected.
National Planning Policy Framework	NPPF	The National planning policy framework for England, dated March 2012.
National Planning Practice Guidance	NPPG	The Planning Practice Guidance web based resource for England first introduced in March 2014 (and which largely superseded planning policy statements (PPGs)) providing guidance on National planning policy and the operation of the planning system.
Noise Policy Statement for England	NPSE	Sets out the long term vision of government noise policy, to promote good health and a good quality of life through the management of noise.
National Vegetation Classification	NVC	The National Vegetation Classification was commissioned in 1975 by the Nature Conservancy Council (NCC) to provide a comprehensive and systematic catalogue and description of the plant communities of Britain. It has now been accepted as a standard, not only by the nature conservation and countryside organisations, but also by forestry, agriculture and water agencies, local authorities, nongovernmental organisations, major industries and universities.
Construction Environmental Management Plan	Outline CEMP	A plan that sets out the mitigation needed to manage environmental effects associated with a development during the construction and operational phases.
Ordnance Survey	OS	National mapping agency for Great Britain.
Project Control Framework	PCF	A joint Department for Transport and Highways England approach to managing major projects. The Framework comprises a standard project lifecycle; standard project deliverables; project control processes and governance arrangements.
Potential Contaminant Linkages	PCL	A linkage between a contaminant and a receptor by the means of a pathway.
Pollution Climate Mapping	PCM	A collection of models designed to fulfil part of the United Kingdom's EU Directive (2008/50/EC) on ambient air quality and cleaner air for Europe, requirements to report on the concentrations of particular pollutants in the atmosphere. There is one model per pollutant, each with two parts: a base year

Term	Acronyms and abbreviations	Description
		model and a projections model. The Pollution Climate Mapping model provides outputs on a 1x1 km grid of background conditions plus around 9,000 representative road side values. The Mapping is also used for scenario assessment and population exposure calculations to assist policy developments and provides model runs to support the writing of Time Extension Notification applications for PM10 and NOx.
Preliminary Conceptual Site Model	PCSM	Provides a summary of a site including details of its current land use, history, geology and hydrogeology and details of potential contaminants, pathways and/or receptors. It is used to support the decision making process in the management of contaminated land and groundwater.
Particulate Matter with a diameter of 10 micrometres or less	PM_{10}	Very small solid particles present in engine exhausts, categorised on the basis of the size of the particles.
Public Right of Way	PRoW	A way over which the public have a right to pass and repass. The route may be used on foot, on (or leading) a horse, on a pedal cycle or with a motor vehicle, depending on its status. Although the land may be owned by a private individual, the public may still gain access across that land along a specific route. Public rights of way are all highways in law.
River Basin District	RBD	A river basin or several river basins, together with associated coastal waters. A river basin district is the main unit for management of river basins under the Water Framework Directive.
River Basin Management Plan	RBMP	Government document that sets out how organisations, stakeholders and communities will work together to improve the water environment.
Road Investment Strategy	RIS	The long-term strategy to improve England's motorways and major A roads. The first RIS (known as RIS1) was published in 2014 and covers the period 2015-2020. A second RIS (RIS2) was published in 2015, and covers the post-2020 period.
Scheduled monument		A 'nationally important' archaeological site or historic building, given protection against unauthorised change and included in the Schedule of Monuments kept by the Secretary of State for Culture, Media and Sport. The protection given to scheduled monuments is given under the Ancient Monuments and Archaeological Areas Act 1979.
Strategic Road Network	SRN	The network of approximately 4,300 miles of motorways and major 'trunk' A roads across England, managed by Highways England.
Special Areas of Conservation	SAC	Areas of strictly protected sites designated under the EC Habitats Directive (92/43/EEC) on the conservation of natural habitats and of wild fauna and flora. The listed habitat types and species are those considered to be most in need of conservation at a European level (excluding birds).

Term	Acronyms and abbreviations	Description
Site of Metropolitan Importance	SMI	Locally important sites of nature conservation adopted by local authorities for planning purposes.
Sites of Importance for Nature Conservation	SINC	Locally important sites of nature conservation adopted by local authorities for planning purposes.
Significant Observed Adverse Effect Level	SOAEL	This is the level of noise exposure above which significant adverse effects on health and quality of life occur.
Special Protection Areas	SPA	Areas of strictly protected sites classified in accordance with Article 4 of the EC Birds Directive (2009/147/EC) on the conservation of wild birds. They are classified for rare and vulnerable birds (as listed on Annex I of the Directive), and for regularly occurring migratory species.
Species of Principal Importance	SPI	Species identified as being of principal importance under the Natural Environment and Rural Communities (NERC) Act 2006, and capable of being a material consideration in the determination of development proposals
Source Protection Zone	SPZ	Areas of land around over 2000 groundwater sources such as wells, boreholes and springs used for public drinking water supply. The zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk. There are three main zones (inner, outer and total catchment) and a fourth zone of special interest, which is occasionally applied to a groundwater source. The zones are used in conjunction with the Groundwater Protection Policy to set up pollution prevention measures in areas which are at a higher risk, and to monitor the activities of potential polluters nearby.
Site of Special Scientific Interest	SSSI	A conservation designation denoting to a protected area in the United Kingdom. The Sites are protected by law to conserve their wildlife or geology.
Sustainable Drainage Systems	SuDS	Drainage system that is considered to be environmentally beneficial, causing minimal or no long-term detrimental damage.
Site Waste Management Plan	SWMP	A Site Waste Management Plan should describe how materials will be managed efficiently and disposed of legally during the construction of the works, explaining how the re-use and recycling of materials will be maximised. This involves estimating how much of each type of waste is likely to be produced and the proportion of this that will be re-used or recycled on site, or removed from the site for re-use, recycling, recovery or disposal. It is the joint responsibility of the client and the principal contractor to ensure that a Site Waste Management Plan is in place before construction begins and to ensure that it is enforced.
Transport Analysis Guidance	TAG	Guidance produced by DfT on the process of appraisal of transport interventions.

Term	Acronyms and abbreviations	Description
Tree Preservation Order	TPO	A Tree Preservation Order is made by a Local Planning Authority to protect specific trees or a particular area, group or woodland from deliberate damage and destruction. TPOs can prevent the felling, lopping, topping, uprooting or otherwise wilful damaging of trees without the permission of the Local Planning Authority.
Unexploded Ordnance	UXO	An explosive weapon (bombs, shells, grenades, land mines, naval mines, cluster munition, etc.) that did not explode when they were employed and still pose a risk of detonation, sometimes many decades after they were used or discarded.
Waste electrical and electronic equipment	WEEE	A term used to describe Electrical and Electronic Equipment which has reached its end of life. The management of WEEE is covered by the Waste Electrical and Electronic Equipment (WEEE) Regulations 2006 (SI 2006/3289) as amended in 2007 (SI 2007/3454), 2009 (SI 2009/2957), 2010 (SI 2010/1155) and 2013 (SI 2013/3113).
Water Framework Directive	WFD	The Water Framework Directive (2000/60/EC) is a EU directive which aims to achieve good status of all water bodies (surface waters, groundwaters and the sites that depend on them, estuaries and near-shore coastal waters) and the prevent any deterioration. It has introduced a comprehensive river basin management planning system to protect and improve the ecological quality of the water environment. It is underpinned by the use of environmental standards.
World Health Organisation	WHO	A United Nations agency concerned with public health.
Written Schemes of Investigation	WSI	Documents which set out the approach to undertaking archaeological monitoring of ground investigation works.
Zone of Influence	ZOI	The temporal and spatial influence of a development project.
Zone of Theoretical Visibility	ZTV	A map, usually digitally produced, showing areas of land within which a development is theoretically visible.

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