

Future Chippenham Road Design

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PEAOR Non-Technical Summary

14/01/21

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Notice

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This document has 29 pages including the cover.

Document history

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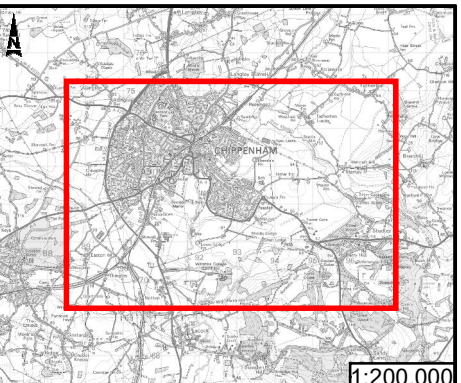
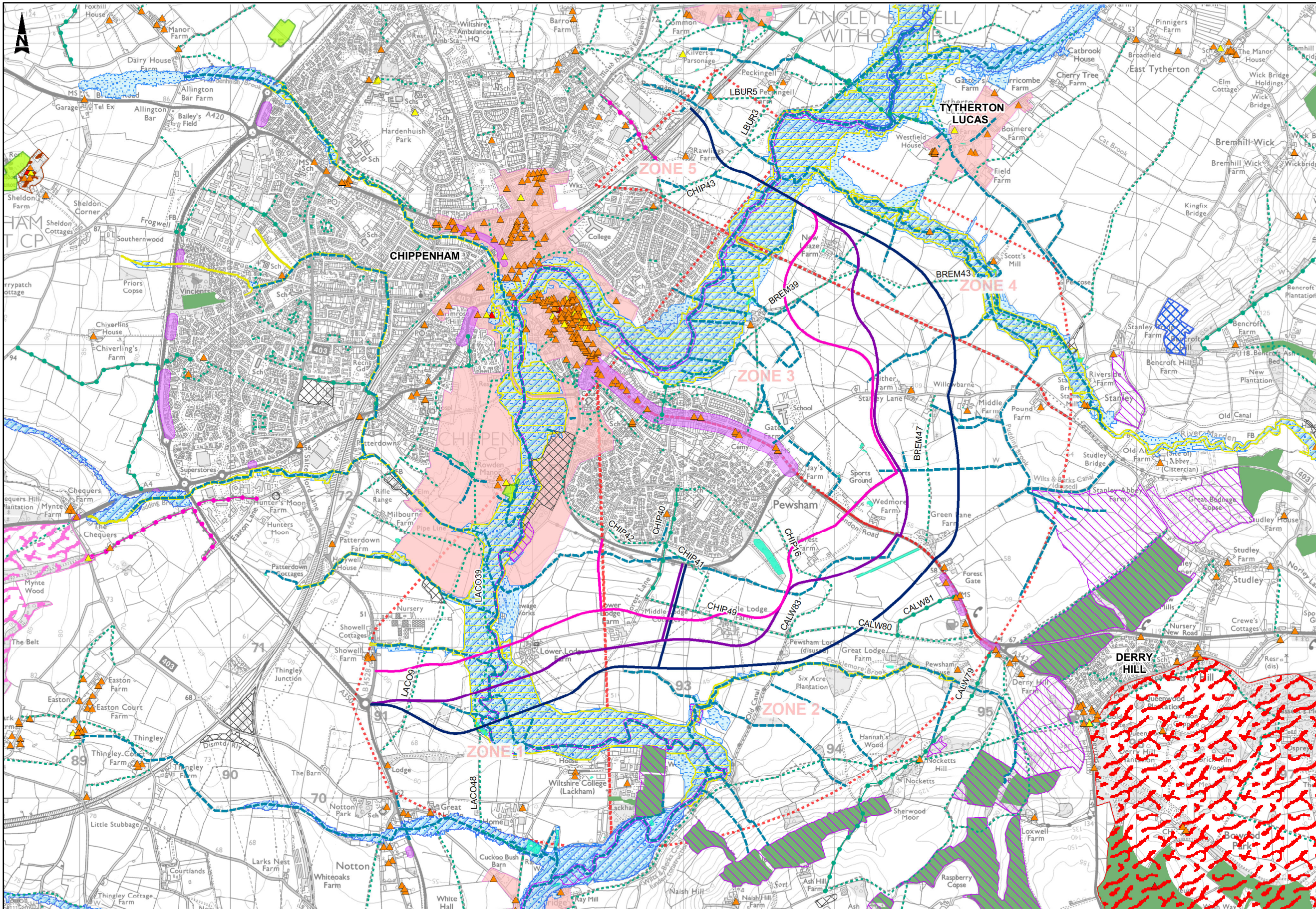
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1. Introduction

- 1.1.1. In March 2019 Wiltshire Council submitted a £75 million bid to the Ministry of Housing, Communities and Local Government (MHCLG) Housing Infrastructure Fund (HIF) for the delivery of a distributor route to the east of Chippenham and improvements to M4 junction 17. The full distributor road would link to the existing highway network at the A350 Lackham roundabout to the south of the town, cross the A4 London Road and link to the A350 Malmesbury roundabout to the north of the town.
- 1.1.2. The distributor road will provide access to development land to the south and east of Chippenham enabling the delivery of future growth in Chippenham over the next 30 years. Potential development areas in this location are owned by Wiltshire Council and private landowners. The Council established Future Chippenham as the delivery function for this area and draws on Wiltshire's Housing, Major Projects and Highway Teams and has been separated from the Council's Regulatory Teams.
- 1.1.3. In November 2019 Wiltshire Council's successful HIF bid was announced. The authority was awarded £75 million from MHCLG to deliver the distributor road and improvements at M4 junction 17 and unlock the delivery of homes in Chippenham for the next 30 years. In order to secure the funding Wiltshire Council will need to meet a range of conditions set by Homes England. A key condition of the HIF is that the distributor road and improvements at M4 junction 17 should be delivered by March 2026.
- 1.1.4. The HIF bid demonstrated the need for the distributor road to unlock future growth. The Chippenham Site Allocation Plan (CSAP) adopted in 2017 included policies earmarking land for new transport proposals.
- 1.1.5. Wiltshire Council is currently conducting a Local Plan Review for the plan period 2016-2036, having identified a housing need for Wiltshire in the plan period. The largest identified housing need in Wiltshire is within the Chippenham Housing Market Area.
- 1.1.6. On the 13th January 2021 a Local Plan Review was published and considers preferred options for accommodating this housing development. The proposed options for development in the Plan were not available during the consideration of alternative route alignments assessed by Future Chippenham. The alignments referenced in this report allow enough flexibility to be able to serve a wide area of development and development scenarios and will require further refining, subject to consultation and a review of options against further development scenarios.
- 1.1.7. The Future Chippenham Distributor Road Scheme ("the Scheme"), affects a considerable area of land. The Scheme has the potential to bring about noticeable changes to the environment and the way people currently enjoy and move around the land where development is being considered. This means that an Environmental Statement (ES) must be produced to support any application for planning permission for the Scheme to be built.
- 1.1.8. An ES reports on a process called an environmental impact assessment (EIA), which explores how a scheme is likely to change the environment in detail. An ES reports on whether these changes will be positive or negative and, importantly, whether they would be significant in relation to the definition within the legislation that governs the EIA process.
- 1.1.9. Proposals are included in an ES for avoiding or reducing negative effects, as well as ways to improve the environment as part of building any scheme – together these are called mitigation and enhancement measures. An ES then provides an overall conclusion on the environmental impacts of the project, taking into account the mitigation and enhancement measures.
- 1.1.10. To date, a range of technical work has been completed that compares options for the Scheme's design, including a Preliminary Environmental Assessment of Options Report (PEAOR). The PEAOR provides the beginnings of the ES for the Scheme, describing important features of the existing environment and providing information about how it may change as a result of each of the options being considered at this stage of the project to help inform the option selection process.
- 1.1.11. The assessment in the PEAOR follows the approach of the Options Assessment Report (OAR) by considering each option by 'zone' to ensure that a consistent approach could be applied in the overall options assessment. The information in chapter 4 summarises the findings of the PEAOR for each zone. The three options for the highway, and the 'zones' the assessment is broken down into

can be found in the figure below. Further description of these zones is provided in the OAR Findings Summary document that is also part of the suite of documents produced for the Future Chippenham Distributor Road consultation.

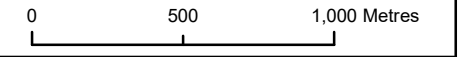
- 1.1.12. This document is a non-technical summary of the main findings of the PEAOR. Whilst the PEAOR contains sections per topic related to the assessment, this non-technical summary document of the PEAOR provides only an overview of the baseline environment in which the project is situated, and a summary of the findings of the overall assessment when mitigation has been applied. Further detail about the methodology of these assessments and the potential impacts and mitigation considered in the assessment is provided in the PEAOR.
- 1.1.13. This document refers at various points to a 'preferred route'. This is from a topic specific or environmental perspective only and other considerations such as cost, connectivity, viability of construction and feedback from the public need to be considered in order to determine an overall preferred route for the scheme.



1:200,000

- ROUTE ALIGNMENT OPTION A
- ROUTE ALIGNMENT OPTION B
- ROUTE ALIGNMENT OPTION C
- ZONES
- LISTED BUILDINGS GRADE I
- LISTED BUILDINGS GRADE II
- LISTED BUILDINGS GRADE II*
- BRIDLEWAY
- BYWAY
- FOOTPATH
- WFD SURFACE WATER LINE
- ANCIENT WOODLAND
- CONSERVATION AREA
- HISTORIC LANDFILL
- LOCAL WILDLIFE SITES
- NOISE IMPORTANT AREA
- REGISTERED PARK AND GARDEN GRADE I
- REGISTERED PARK AND GARDEN GRADE II
- REGISTERED PARK AND GARDEN GRADE II*
- SITE OF SPECIFIC SCIENTIFIC INTEREST
- SCHEDULED MONUMENTS
- 1 IN 100 YEAR FLUVIAL FLOOD
- FLOOD ZONE 3
- FLOOD ZONE 2
- WFD SURFACE WATER (PONDS)

NOTE:
ASSESSMENT DOES NOT INCLUDE
ASSESSMENT OF EFFECTS IN ZONE 5.
PLEASE SEE CHAPTER 2 FOR MORE DETAIL



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction	(Enter "None" if applicable)
Maintenance / Cleaning	(Enter "None" if applicable)
Use	(Enter "None" if applicable)
Decommission / Demolition	(Enter "None" if applicable)

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Project Title	FUTURE CHIPPENHAM PLANNING		
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2. PEAOR Approach

- 2.1.1. Environmental considerations were a major part of the options assessment process undertaken for the Scheme. The PEAOR was produced in Spring 2020 to understand the potential environmental impacts of the various route alignments of the Scheme.
- 2.1.2. The bullets below outline briefly the process by which the PEAOR was completed to inform the option selection process in the OAR.
- Identification of the parameters to be assessed, based on known environmental constraints in the area;
 - Confirm the study areas for individual assessments;
 - Review of the existing environment. This determined the 'baseline' to compare the changes arising from the Scheme options against. Undertaken principally through desk-based study, supported by site-based investigations where available;
 - Characterise the 'sensitivity to change' of the defining baseline characteristics;
 - Set out how the Scheme options would change the baseline – the 'impacts';
 - Categorise the 'magnitude' (how large the change) of the impacts on the baseline, noting any particular differences between the Scheme options;
 - Assess what these changes mean – the 'effects' – which is determined by cross-referencing the magnitude of impact against the sensitivity of the baseline;
 - Make suggestions for mitigation and enhancement – alterations to the Scheme designed to overcome environmental issues and prevent significant effects;
 - Define the likely 'residual effects' in light of the mitigation measures and enhancement proposals;
 - Review differences in residual effects between the options to understand if some options lead to lesser effects than others. Any residual effects that remain in the category of 'significant adverse' may be key in helping to decide which of the options should be taken forward as the preferred route; and
 - Review mitigation requirements to reach non-significance of effect, as options that require more mitigation may influence other project factors (e.g. price of construction).
- 2.1.3. The following environmental topics have been assessed within the PEAOR:
- Air Quality
 - Noise and Vibration
 - Biodiversity
 - Water
 - Landscape and Visual Amenity
 - Geology and Soils
 - Cultural Heritage
 - Materials and Waste
 - Population and Health
 - Climate Change and Sustainability
 - Vulnerability of the Scheme to Climate Change

3. The Baseline Environment

3.1. Introduction to the Baseline

- 3.1.1. An assessment was undertaken for each of the topics by firstly gaining an understanding of the environment in its current state in the vicinity of the Scheme, referred to as the 'baseline'.
- 3.1.2. The identification of the baseline environment, and subsequent understanding for the potential environmental impacts for the PEAOR was undertaken through desk-based assessment, supplemented with a site-based Extended Phase 1 Habitat Survey (January 2020) and a landscape and visual walkover and photography survey.
- 3.1.3. The geographical study area for the baseline sections within the PEAOR vary per topic depending on topic specific assessment guidance.
- 3.1.4. The sub-headers below provide a brief overview of the baseline environment within the study area for the Scheme.

3.2. Air Quality

- 3.2.1. There are no Air Quality Management Areas (AQMAs) declared within the vicinity of Chippenham. The closest AQMA is located approximately 4.6 km to the southeast of the Scheme in Calne. Due to this distance, it is not anticipated that the Scheme would directly affect this sensitive area or be affected by poor air quality from the AQMA, however this will be investigated during the detailed assessment undertaken as part of the EIA process.
- 3.2.2. Air quality monitoring is undertaken by Wiltshire Council and is a key component of local air quality management. There are five diffusion tubes located in Chippenham with the closest monitoring location to the Scheme approximately 300m from the A4 at Rowde Mead, and is classified as an 'urban background' site. The most recent publicised annual NO₂ reading at this location was 12 µg/m³, which is significantly under the Annual Air Quality Objective (AQO) of 40 µg/m³.
- 3.2.3. DEFRA background mapping suggests that indicatively across the zones for assessment, levels of air pollutants are very low.

Table 3-1 - DEFRA Mapped Background Concentrations at Chippenham Sites, 2018 and 2024 (µg/m³)

Concentration	2018			2024		
	NO ₂	PM ₁₀	PM _{2.5}	NO ₂	PM ₁₀	PM _{2.5}
Minimum	8.1	12.7	8.3	6.5	12.0	7.7
Maximum	10.6	13.4	9.1	8.3	12.6	8.4
AQS objective	40	40	25	40	40	25

- 3.2.4. DEFRA's Pollution Climate Mapping Modelling indicates that levels of NO₂ are higher than those found during local air quality monitoring by Wiltshire Council in 2018. However, it still indicates that levels are well within the annual AQO, finding roadside annual NO₂ levels in 2018 to be 25.5 µg/m³. The modelling anticipates air quality will improve (in the absence of the scheme) locally by 2024 due to reduced emissions from vehicles as vehicles emissions standards become more strict and therefore produce less pollutants per km travelled.

3.3. Noise and Vibration

- 3.3.1. The proposed highway alignment options for the Scheme pass through predominantly rural areas. Therefore, for areas remote from existing road network, existing baseline noise and vibration levels are expected to be relatively low. Existing noise within the locality of the options is likely to be associated with distant traffic noise from the existing road network and activity at local farms.
- 3.3.2. Major roads in the area, such as the A4, Pewsham Way, A350 and Swindon Road (B4065), are expected to dominate the existing noise and vibration environment for nearby sensitive receptors. The contribution of road traffic noise to existing baseline noise and vibration levels is dependent on

distance to roads, and the existing traffic flow, composition and speeds on those roads. This is demonstrated by these major routes having Noise Important Area (NIA) designations assigned.

- 3.3.3. There are two NIAs in close proximity to the Scheme on London Road north of Pewsham Roundabout (NIA ID:3736) and the A4 near Forest Gate Business Park (NIA ID: 3737). Re-distribution of traffic which may arise from the operation of the Future Chippenham Distributor Road may also have the potential to change noise levels at three other NIAs located within Chippenham although this is yet to be modelled.
- 3.3.4. The majority of receptors that are sensitive to noise are residential properties and are not distributed evenly throughout the study area (defined as within 600m of the new highway alignments). These are largely focused on the population centre in Pewsham, the various farms across study area and some individual residential houses along the A4 and Stanley Lane.
- 3.3.5. The total number of existing noise sensitive receptors in the study area for this assessment of 600m of the new highway for the options has been estimated as 53, based on AddressBase Plus data. However, for the EIA which will need to be undertaken as part of the planning application for the scheme, the assessment will need to consider traffic noise effects from changes in flows across the highway network which will mean far more receptors will be regarded as potential 'noise sensitive receptors'.

3.4. Biodiversity

- 3.4.1. The assessment of the biodiversity baseline has included a site-based Extended Phase 1 Habitat survey, Ground Level Tree Assessment (GLTA) for bats, and wintering bird surveys.
- 3.4.2. Since the point at which the PEAOR and OAR was authored, further ecological surveys have continued on the site.

Statutory Designated Sites

- 3.4.3. There are two Special Areas of Conservation (SAC) designated for bat species within 30 km of the Scheme. A SAC is a European designation set-up to protect one or more special habitats and/or species (terrestrial or marine) that are listed in the Habitats Directive.
- 3.4.4. There are six other statutory designated sites within 5 km of the Scheme, including five Sites of Special Scientific Interest (SSSI) and one Local Nature Reserve (LNR). These are shown in Table 3-2.

Table 3-2 - Designated sites in proximity to the Scheme

	Distance from Scheme	Reasons for designation
Bath and Bradford-on-Avon Bats SAC	6.6 km west of Route Option A in Zone 1	Bats - 15% of the hibernation sites of the UK population of greater horseshoe bats; and hibernation sites for populations of Bechstein's bat.
Mells Valley SAC	26.6 km south-west of Route Option A in Zone 1	Bats - the site contains maternity roosts which are used by 12% of the UK population of greater horseshoe bats.
Bencroft Hill Meadows SSSI	1.3 km east of Route Option A in Zone 4	Plant life - unimproved pasture of exceptional botanical quality.
Spye Park SSSI	2.7 km south of Route Option A south of Zone 2	Plant life - the site is a large habitat mosaic with undisturbed alderwoods, oakwood, parkland and dry acidic grassland.
Sutton Lane Meadows SSSI	3.7 km north-east of Route Option A, B and C in Zone 4	Plant life - the site is primarily unimproved neutral grassland and is botanically diverse.
Corsham Railway Cutting SSSI	4.3 km west of Route Option A in Zone 4	Geological designation.

	Distance from Scheme	Reasons for designation
Kellaways – West Tytherton, River Avon SSSI	670 m north-east of Route Option A in Zone 4	Geological designation.
Mortimore’s Wood Local Nature Reserve	460 m west of Route Option C in Zone 1	Plant life - woodland, woodland edge and river bank, supporting a large bluebell community in spring.

Non-statutory Designated Sites

3.4.5. There are seventeen non-statutory designated sites within 2 km of the Scheme. Only the River Avon County Wildlife Site (CWS) is intersected by the Scheme options, with all of the other non-statutory designated sites 200m or more away from the Scheme at their closest point. Further information about these sites is provided in the PEAOR.

Terrestrial Habitats

3.4.6. There are two parcels of ancient woodland within 1 km of the Scheme, located 515m south of Option A at Lackham Wood and 720m south of Close Wood respectively.

3.4.7. There are nine priority habitats identified within 1 km of the Scheme. The majority of these habitats are outside of the 250m habitat study area from the proposed options, and therefore considered to be outside the area affected. The priority habitats within the study area include: deciduous woodland, rivers, hedgerows, arable field margins and ponds.

Terrestrial Species

3.4.8. There are well-connected hedgerows, mature treelines, rivers and woodland patches, that could provide suitable foraging and commuting habitat for bats across Chippenham. There are also buildings with bat roost potential. The Wiltshire and Swindon Biological Records Centre (WSBRC) provided 647 records of 14 species of bats within 5km of the Scheme.

3.4.9. The WSBRC also provided information related to the following protected or notable species within the study area including:

- Badgers: 39 recent records of badger within 1 km, the most recent of which was from 2018.
- Amphibians: 10 records of amphibians (8 Great Crested Newt and 2 common Toad) within 1 km.
- Otters: 18 recent records of otter within 1 km. of the Scheme and one record of Water Vole. Most records are associated with the River Avon, with the others associated with Cocklemore Brook (OW6) and a densely vegetated embankment adjacent to the railway.
- Hazel Dormice: no records, recent or otherwise of hazel dormice within 1 km. However, some mature hedgerows connected to parcels of woodland do offer a variety of food sources and a layered structure preferred by dormice.
- Notable Bird Species: 62 recent records of notable bird species within 1 km. There are a large number of records associated with Lackham Wood CWS and ancient woodland and Baydons Meadows CWS.
- Reptiles: 20 recent records of reptiles within 1 km. These records consist of 10 slow-worm, 9 grass snake and 1 common lizard.
- Non-Native Plant Species: no records of non-native plant species within 1 km.

Aquatic Species

3.4.10. A desk study identified that numerous Environment Agency monitoring sites for fish, aquatic macrophytes and aquatic macroinvertebrates are present in the River Avon and the River Marden. Both rivers were found to support relatively diverse aquatic macro-invertebrate populations from review of this data. A monitoring site on the River Avon also recorded a single sample containing European Eel, a species Critically Endangered on the International Union for Conservation of Nature (IUCN) Red List of threatened species and therefore of note. Further information related to

the aquatic ecology baseline is available in the PEAOR.

3.5. Water Environment

- 3.5.1. The main surface watercourse in the vicinity of the scheme is the River Avon, which flows from north to south with an extensive floodplain. It has various tributaries that join along this stretch. The River Marden flows into the River Avon at the northern end of the study area; the Pudding Brook (Avon) at the western edge of study area; and an unnamed tributary at the southern extent of the study area. The floodplains of these tributaries are predominantly rural. There are several Ordinary Watercourses (including drains and ditches) throughout the study area that will be on hydraulic connectivity to these Main Rivers. The old route of the Wilts and Berks Canal also runs through the south of the study area, of which parts of the canal remain 'wet' during winter months whilst others are infilled and dry year round.

3.6. Landscape and Visual

- 3.6.1. A 1 km study area from all of the route options was defined as part of the desk study. This was confirmed on site walking Public Rights of Way (PRoW) and checking representative viewpoints that will inform later consultation and design. Relevant core policy adopted by Wiltshire Council in 2017 relate to green infrastructure and Wiltshire canals. Other relevant planning documents include the Chippenham Site Allocations Plan (adopted 2017), NP3 Bremhill Neighbourhood Plan, and Chippenham Landscape Setting Assessment 2014. There are no national or regional statutory landscape designations within the study area or wider context although local landscape initiatives by stakeholder groups/organisations have been identified.
- 3.6.2. The broad, flat, low-lying clay vale, is strongly characterised by the presence of the River Avon, River Marden and other tributaries, such as the Cocklemore Brook and Pudding Brook, streams and ditches with associated river bank (riparian)vegetation, damp meadow and pasture along watercourses and the valley floor. The Avon vale is contained by limestone ridges of Naish Hill, Nocketts Hill and Old Derry Hill to the south; and Bencroft Hill and Bremhill to the east.
- 3.6.3. The lowland valley landscape comprises medium scale, mixed arable farmland with some grazed meadow that is strongly defined by a framework of woodland blocks and intact and predominantly well-managed hedgerows frequently with hedgerow trees - although in places hedgerows have been removed creating a more open and fragmented landscape character prevalent on the edges of transport corridors and development.
- 3.6.4. The quality of the landscape is influenced by the proximity to Chippenham settlement edge, transport corridors, transmission lines and small employment sites. These contrast with some of the more rural and tranquil areas characterised by waterways, scattered farmsteads and characterful settlements that include Langley Burrell, Tytherton Lucas and East Tytherton to the north, and Lacock to the south.
- 3.6.5. Sensitive features identified in the Wiltshire Landscape Character Assessment, 2005 include: *'rural tranquillity; hedgerow pattern; water bodies and water ways of varied character and ecological value; streamside willows and other riparian vegetation; remnant hay meadows; wide open views; and settlement pattern of nucleated villages with variety of vernacular building materials'*.
- 3.6.6. Views across the generally semi-open landscape within the study area mean that the extent of views are contained by subtle changes in landform, localised hillocks or ridges to the east and north-east of Chippenham. Land at Rawlings Green, to the north-east provides a raised foreground to the Chippenham settlement edge. The neighbourhoods of Hardens Mead and Monkton Park are visible to the east whilst to the south, the settlement edge is partially screened by topography and vegetation. The neighbourhood of Rowden Hill, parts of central Chippenham, and the industrial unit at Parsonage Way are visible from viewpoints located to the south-west of the settlement edge.

- 3.6.7. To the south of Chippenham and particularly around the settlement edge of Pewsham, landform and intervening woodland limit views. Rowden Manor provides a local landmark. There are glimpses of disused market garden and green houses near Showell Farm. In addition, there are also views from outlying viewpoints south of Peckingell, Tytherton Lucas and Lackham Agricultural College.
- 3.6.8. Pewsham and Rowden Hill settlement edge are visible in views generally from the south of Chippenham along approach roads and from footpaths within the River Avon corridor. There are views from approach roads such as the A4, which descends from Derry Hill eastwards and also from Patterdown, a southerly approach road connecting from the A350 to the south.
- 3.6.9. There are approach views or a progression of views along country lanes such as Stanley Lane, PRoW and recreational routes including the North Wiltshire Rivers Cycle Route (National Cycle Route (NCR) 403), Wilts and Berks Canal and Avon Valley Path that are distinct linear landscape features along the valleys of the River Avon and River Marden.
- 3.6.10. In the wider area, long distance elevated views are possible from Derry Hill, Snaith Hill and Bencroft Hill. Generally, Chippenham and the modern built form of the new Wiltshire College campus are visible with spires of St Paul's and St Andrew's Churches featuring as local landmarks in these views. In some instances, the eastern and southern countryside edges are both visible.

3.7. Soils and Geology

- 3.7.1. Within the scheme area, the bedrock comprises sandstone, siltstone and mudstone of the Kellaways Formation in the west and the Oxford Clay formation to the east. Historical flooding of the Rivers Avon and Marden have left alluvium deposits, typically comprising clay, silt, sand and gravel.
- 3.7.2. Published geology indicates that Made Ground (i.e.: human-made) is not recorded anywhere within the extents of the options works, but it should be noted that it may be present locally related to historical development, particularly in proximity to roads, bridges and buildings. One site which may be of interest in this regard is in Zone 2 at the former site of a historical brickworks, opencast clay quarry (1886 to 1925) and a section of former canal that crosses all options to the south-east of Pewsham and south-west of Forest Farm.
- 3.7.3. The majority of soils within the study area are grade 3B and therefore are not recorded as the best and most versatile soils for agricultural use. However, there are known pockets of grade 1 and 2 soils (higher quality) in Zone 1, with section of grade 3a soils interspersed across all zones.
- 3.7.4. There are four recorded groundwater abstractions within the study area related to irrigation, at Showell Farm Nurseries located 180 m north, 375 m north and 400 m north of options C, B and A respectively. Information provided by Wiltshire Council has confirmed that there are no unlicensed private abstractions (<20 m³/day) located within zones 1-4.

3.8. Cultural Heritage

Designated Heritage Assets

- 3.8.1. The study area for designated assets is 1km from the route options in each direction. This area includes a total of 71 designated heritage assets, including four conservation areas, one scheduled monument and 60 listed buildings, many of which are within the town centre of Chippenham.

Conservation Areas

- 3.8.2. The following conservation areas have been identified
- Rowden Park to the south of Chippenham.
 - Tytherton Lucas to the north east of Chippenham.
 - Chippenham Conservation Area to the north of Chippenham.
 - Lacock to the south of Chippenham.

Scheduled Monuments

- 3.8.3. The following scheduled monuments have been identified:
- Rowden Manor to the South of Chippenham.
 - Medieval settlement of Sheldon to the West of Chippenham and the A350.

Listed Buildings

- 3.8.4. There are three grade II* listed buildings located at Rowden Park, Tytherton Lucas and Langley Burrell respectively. The rest of the listed buildings are grade II and comprise country houses, farmhouses and associated buildings, churchyards and cemeteries, mills, an old brewery, bridges, cottages and milestones.

3.9. Materials and Waste

- 3.9.1. Waste generated by the Scheme during construction and operation will predominantly be non-hazardous and inert, with small quantities of hazardous waste (e.g. paints, solvents and contaminated soil) although the construction and operation of the housing the Scheme unlocks may lead to greater quantities of waste being generated.
- 3.9.2. The amount of landfill capacity and waste infrastructure in the study area will fluctuate year on year based on the number, type and size of construction projects underway. This in turn is heavily influenced by factors such as the economic situation, investment levels and legislative and policy variations.

3.10. Population

- 3.10.1. The population baseline is comprised of the following receptor sub-groups:
- private property and housing;
 - community land and assets;
 - development land and local businesses;
 - agricultural land holdings; and
 - walkers, cyclists and horse-riders (WCH).
- 3.10.2. Key community assets and land, as well as key community walking routes and WCH facilities within the study area include:
- Kings Lodge Primary School;
 - Abbeyfield School;
 - Pewsham Park;
 - Woodland located along Cocklemore Brook towards Old Derry Hill;
 - Stanley Park Youth Football Club and Stanley Park Sports Ground;
 - Avon Valley Walk; and
 - North Wiltshire Rivers Route cycle path.
- 3.10.3. The agricultural land holdings baseline predominantly consists of grass for beef production and dairy. Most grassland farms also grow maize and barley and other forage crops. Harden's Farm, Forest Farm, Cottage Farm and Lower Lodge Farm 5 are dairy farms.

3.11. Health

- 3.11.1. The health baseline is comprised of the following sub-groups:
- health profiles of the affected communities;
 - access to community assets and employment sites;
 - green space and land blight;
 - air pollution;
 - noise pollution and vibration;

- soil and water pollution; and
- risk of injuries and death.

3.11.2. The following two tables outline the health baseline for all wards which fall within the study area. The tables present a population which is generally above the national average in terms of general health and the ability to undertake day-to-day activities.

Table 3-3 - General Health of Residents

Location	Very good health	Good health	Fair health	Bad health	Very bad health
Corsham Without and Box Hill	53.5%	33.9%	9.7%	2.1%	0.8%
Chippenham Pewsham	53.8%	35.6%	8%	2%	0.6%
Calne Rural	52.6%	32.2%	11.4%	3%	0.8%
Chippenham Hardens and England	48.5%	33.3%	13.6%	3.6%	1%
Kington	55.6%	30.7%	10.4%	2.5%	0.8%
England and Wales	47.1%	34.1%	13.2%	4.3%	1.3%

Table 3-4 – Health Limited Activity

Location	Day-to-day activities not limited	Day-to-day activities limited a little	Day-to-day activities limited a lot
Corsham Without and Box Hill	86.5%	8.9%	4.6%
Chippenham Pewsham	90.5%	5.9%	3.6%
Calne Rural	84%	9.4%	6.6%
Chippenham Hardens and England	83%	9.4%	7.6%
Kington	86%	8.1%	5.9%
England and Wales	82.1%	9.4%	8.5%

- 3.11.3. The majority of community assets and employment sites within the study area are located in and around Pewsham, including Abbeyfield School and Pewsham Park. The A4 (London Road) provides a key access point for those wishing to access key healthcare facilities outside the study area.
- 3.11.4. There is very little public green space in the study area, with much of the agricultural land being privately owned. However, woodland and riverside areas can be accessed via PRoW linking Pewsham to green space assets in the south of the study area, including woodland towards Old Derry Hill.
- 3.11.5. The health baseline also includes a number of identified communities which are taken forward into the assessment of potential impacts. The definition of sub-communities is based on a qualitative judgement that evaluates known characteristics of identified receptors, in terms of their geographical location, function, likely user groups and their susceptibility to experiencing impacts from the Options.

3.12. Climate Change

- 3.12.1. Global greenhouse gas emissions, from all sources, currently amount to approximately 50 billion tonnes of CO₂e per year. The UK is the world's eighth largest emitter of CO₂e, with the total background UK emissions for 2017 (the last reported year) being 460 million tonnes of CO₂e. The transport sector was the largest emitting sector of UK greenhouse gas emissions in 2017, emitting 27% of all emissions. Of all sectors, it has also shown the least reduction since the 1990 baseline, at only 2%. For comparison, the next smallest reductions are seen in the residential and agriculture sectors at 16%.
- 3.12.2. The UK has in place carbon budgets for five-year periods up to 2032. The construction of the Scheme will occur across the third (2018 to 2022) and fourth (2023 to 2027) carbon budget periods. With an Opening Year of 2026, operation of the Scheme will fall in the fourth budget period and beyond. The budget for the fourth budgetary period is 1,950 Mt CO₂e. In June 2019, a target of net

zero carbon emissions by 2050 was enshrined in UK law.

- 3.12.3. Wiltshire Council declared a Climate Emergency in 2019, and thus reiterated their commitment to working towards zero carbon.

4. Mitigation

- 4.1.1. Mitigation is used to reduce potential impacts from the Scheme on the environment. The baseline environment is described in section 3 above. Proposals for mitigation follow the hierarchy of avoid, reduce, remedy and compensate. In practice, this means the starting point should be to avoid the impact entirely before trying to reduce, remedy or compensate for that impact. The PEAOR forms part of the options assessment process to identify potentially significant effects to the environment (including people) to try and ensure significant impacts are avoided by selecting different options for the route of the highway. As different topics (such as biodiversity and waste) can have a different preferred option, it is important the assessment considers a range of mitigation types that could prevent significant effects at the options appraisal stage. The aim is to ensure that the option selected provides a compromise of the preferred option from each topic, and not only that achieved through avoidance mitigation.
- 4.1.2. Each topic chapter of the PEAOR outlines potential mitigation that will help to remove or reduce the magnitude of these impacts. This is outlined below for each of the topics.

4.2. Air Quality

- 4.2.1. Whilst no air quality modelling has been undertaken (at the PEAOR stage) to help inform potential operational air quality impacts, selecting a route (the pollutant source) located further away from existing receptors would assist in reducing operational effects from the Scheme. Whilst the effects from re-distribution of traffic on air quality are not yet known and will be informed by traffic modelling undertaken later in project development, measures to reduce congestion and stop-start traffic within Chippenham and on other elements of the road network will assist in reducing potential air quality impacts. The traffic modelling and subsequent air quality modelling will be undertaken as part of the EIA process. This will identify locations where congestion and worsened air quality may arise. In these locations, further junction improvements or similar may then be targeted to reduce adverse air quality effects in these locations.
- 4.2.2. To avoid potential impacts from dust during construction, dust suppression measures and standard construction practice measures will be utilised to prevent dust emissions leaving the construction site and impacting local human and ecological receptors.

4.3. Noise and Vibration

- 4.3.1. To avoid potential impacts from noise during construction, discussions will be held with the Environmental Health Team at Wiltshire Council to ensure any noise and vibration emissions from the construction phase are acceptable and that construction noise and vibration are carefully controlled on site. Wiltshire Council will therefore be able to ensure the construction is undertaken with the necessary controls in place to prevent noise impacts, such as:
- A review of working hours on site to ensure noisy activities are not undertaken during more sensitive times such as evenings, nights and at weekends; and
 - Use of good practice mitigation such as using noise silencing measures on equipment, temporary noise barriers and reducing noise adjacent to sensitive receptors through careful siting of construction compounds.
- 4.3.2. Whilst no modelling has been undertaken (at the PEAOR stage) to help inform potential operational noise impacts, the selection of a route further from existing sensitive receptors or by using barriers between the receptor and the new road (such as a landscaping mound) would assist in reducing operational effects from the Scheme. Whilst no modelling has been undertaken yet to identify potential changes in noise levels in the wider road network, usual mitigation in this regard is to make further minor junction improvements to prevent these effects similar to those outlined in the air quality section above. Other mitigation, such as the use of low noise road surfacing, noise barriers and earth bunds will also be investigated further as design and the EIA process continues.

4.4. Biodiversity

- 4.4.1. Potential impacts on biodiversity from the Scheme identified in the PEAOR could potentially be

mitigated by the following general measures:

- design amendments to minimise habitat loss;
- design amendments to incorporate habitat connectivity features, such as habitat corridors, wildlife underpasses, and/or green bridges;
- design amendments to reduce new structures over watercourses and, where structures cannot be avoided, using clear span structures where possible.
- design amendments to incorporate biological benefits e.g. increased lengths of watercourse habitat using sustainable drainage solutions and natural watercourse channel alignments for any required watercourse realignments;
- reinstatement of any lost riparian vegetation and ponds;
- planting of native species-rich hedgerows and tree planting throughout the design;
- planting of native species-rich wildflower mixes along road verges;
- retention and enhancement of biodiverse habitats present within the Scheme footprint;
- 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 on the Scheme;
- clear demarcation (i.e. fencing) of retained habitats during construction and no allowance of vehicles or storage of materials within these areas;
- 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;
- use of pollution control measures during construction, such as:
 - use of low emission plant to reduce local nitrogen deposition;
 - regular maintenance and inspection of machinery; and
 - use of designated, bunded areas away from sensitive ecological features for fuel storage and refuelling (i.e. following EA Pollution Prevention Guidance (PPGs) and the Construction Industry Research and Information Association (CIRIA) guidance on the control of water pollution from construction sites);
- locating haul roads and site compounds away from sensitive features and use of dust suppression measures during dry periods;
- covering excavations overnight or incorporating features such as ramps to prevent animals getting trapped;
- designing the construction and operation drainage to maintain or enhance the existing hydrological conditions;
- designing the operation drainage to minimise the risk of pollution from the road surface coming into contact with sensitive habitats; and
- designing wildlife tunnels beneath the road at regular intervals and at key crossing locations (determined by later species-specific surveys) will help maintain connectivity across the Scheme, allowing wildlife to cross the landscape safely.

4.4.2. In addition to the general potential mitigation measures outlined above, potential species specific mitigation will be incorporated into the design. This will need to be further developed as species specific surveys are undertaken and design develops. Mitigation in this regard is likely to include:

- Alternative roosting sites for bats to mitigate trees and building roosts lost by the Scheme;
- Creation of foraging and commuting habitats for bats including potentially the use of bat bridges or similar;
- A sensitive lighting scheme to ensure dark corridors can be maintained;
- Alternative habitat provision for resting places and feeding locations for protected species; and

- Use of mammal ledges or similar on watercourses that are culverted where known habitat is located of protected species.

4.4.3. Whilst the above measures are outlined as potential mitigation for effects from the Scheme, opportunities to provide enhancement are also being investigated to identify areas where local habitat could be improved as a result of the Scheme.

4.5. Water Environment

4.5.1. To avoid environmental impacts on the water environment during construction, mitigation will be focused on reducing runoff and pollution from construction activities into local watercourses and groundwater receptors. Mitigation in this regard will require careful planning of the location of construction compounds, haul roads and drainage systems as well as general good practice measures to prevent pollution events such as those outlined in the Pollution Prevention Guidelines. These measures will be set out in a Construction Environmental Management Plan (CEMP), which will require approval from Wiltshire Council prior to the start of works.

4.5.2. To reduce the potential for increased effects on flooding and effects on how watercourses flow, in channel working will be limited as far as possible as well as limiting the removal of bankside vegetation. The project will be required to apply for Flood Risk Activity Permits and Ordinary Watercourse Consent to work on watercourses within the Scheme area, and these processes will ensure potential impacts on both flooding and the watercourses themselves are kept to a minimum.

4.5.3. During operation, effects on the water environment will be managed largely through a Sustainable Urban Drainage system (SUDs), comprising of swales and attenuation ponds. This SUDs will manage water flow coming from the road and future housing in the area to prevent pollution from roads entering local watercourses and ensuring no increased effect of flooding comes from the Scheme. The SUDs design will also be used to bring amenity and biodiversity improvements when combined with appropriate landscaping and management practices.

4.5.4. The Scheme will not increase flooding caused by rivers by ensuring that the ability of the local floodplains to hold water are not reduced by the proposals. The Scheme will manage this through the use of structures such as viaducts and bridges that will reduce the Scheme footprint in the floodplain of both the River Avon and other local watercourses. In this regard, the Scheme will have to prove to the Environment Agency through modelling that the Scheme in its entirety will not worsen flooding during storm scenarios.

4.6. Landscape and Visual

4.6.1. Detailed mitigation measures will be developed as part of the overall preferred route design to seek to ensure that significant effects are avoided. Avoidance mitigation through careful siting of the highway will be key to prevent and reduce significant landscape and visual effects from the Scheme. General mitigation measures that will apply include:

- Avoidance of the loss of mature trees, hedgerows and safeguarding of existing habitats;
- Limiting vegetation removal to that required to undertake the works;
- Mitigation planting and/or screening bunds being designed to provide both adequate screening of the highway whilst remaining mindful of the character of the existing landscape to enable the new highway to integrate;
- Creation of wet woodland in specific locations to provide both biodiversity and amenity benefit;
- Ensuring the design of structures and finishes associated with the river crossings be locally distinctive and reflect a high quality of design; and
- Ensure the Scheme integrates with local neighbourhoods to provide benefits for walkers and cyclists in the local area.

4.7. Soils and Geology

4.7.1. Very few areas of potential ground contamination have thus far been identified in the areas affected by the highway options due to the largely rural, agricultural nature of the history of the Scheme area. However, when a preferred option has been chosen, a Ground Investigation Assessment will be undertaken to identify potential areas of ground contamination which could cause potential

impacts on the Scheme.

4.7.2. To protect local people and the environment from potential contaminated material, the CEMP for the project will include measures such as:

- 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;
- Implementation of appropriate dust suppression measures to prevent migration of contaminated dust and fibres;
- Working methods during construction to manage groundwater and surface water appropriately and ensure that there is no run-off from the construction works,
- 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 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;
- 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;
- A Soil Handling Management Plan (SHMP) will be produced to ensure that the quality of soil in areas required temporarily for the proposed developed is maintained by following best practice guidance on soil handling. The findings of the proposed agricultural land quality survey would inform the SHMP; and
- 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.

4.7.3. The soils and geology chapter also includes the assessment of the loss of good quality agricultural soils. There is unfortunately no mitigation to the loss of soils during construction in this regard, with avoidance mitigation focused on locating the highway to avoid areas of higher quality soils key to mitigate this impact.

4.8. Cultural Heritage

4.8.1. To prevent effects upon known heritage assets such as Listed Building, Scheduled Monuments and Important Hedgerows, avoidance mitigation remains key in that increasing the offset distance and preventing their removal is key to reducing the impact upon these assets and their setting. Mitigation of settings effects will also be assisted by mitigation to reduce landscape impacts, as well as mitigation to prevent noise and dust emissions.

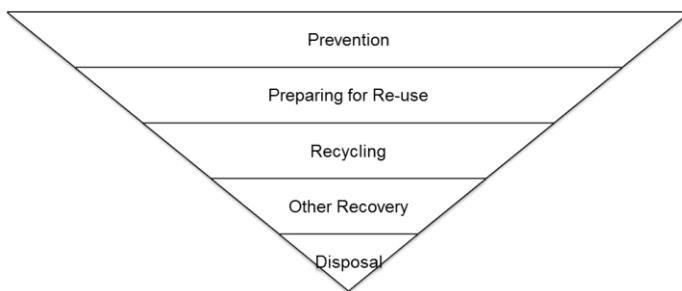
4.8.2. To mitigate effects upon potential below ground archaeological assets in the area, a programme of archaeological works will be required prior to construction to further identify, characterise and evaluate both the known and unknown impacts to heritage assets. Such a programme would include:

- geophysical surveys of the selected Scheme route options to identify as-yet unknown buried archaeological remains;
- input on design options to enable route options to pass over the canal, thus having no direct impact, and to avoid (where practicable) impact to significant archaeology in areas where only temporary construction impacts will occur;
- evaluation trenching to understand the nature and significance of buried archaeological remains that would be affected by the construction of the preferred Scheme route option;
- area excavations or other archaeological recording programmes to off-set the impacts of construction and preserve by record the significant information associated with the remains.

4.9. Materials and Waste

- 4.9.1. Waste is a heavily regulated industry in the United Kingdom with extensive legislation covering specific instructions for its processing, removal and management. In accordance with this, much of the 'mitigation' required to prevent effects on waste is legislative. Further information on these legislative requirements is set out in detail in Chapter 11 Materials and Waste of the PEAOR.
- 4.9.2. Despite this, as a responsible developer, there are additional measures that will be explored and utilised during construction to further reduce the effects. This includes the use of the waste hierarchy (illustrated below) in design to prevent the production of wastes and find suitable re-use within the project where possible. As identified in the illustration below, a key principle of this is to design out waste and follow the hierarchy throughout to reduce impacts on landfill and waste disposal centres.

Figure 4-1 - Waste hierarchy (Source: Atkins)



4.10. Population and Health

- 4.10.1. It is assumed that the following general measures will be embedded into the Scheme:
- the extent of direct, permanent land take affecting identified individual receptors would be minimised;
 - users of affected PRow, footpaths and cycleways would be notified of planned diversions and closures, with signs along sections to be closed during construction, at least one month prior to the works;
 - construction works would be programmed so that affected PRow, footpaths or cycleways remain open for part, or the duration, of the construction period, and that other routes can act as a diversion route for those affected;
 - diversion of PRow would follow the shortest available route, anticipated to be less than 250 m longer than the route it diverts from;
 - clear signage and provision of access information for all users during construction and before operation would be provided; and
 - all the environmental design mitigation from the other topics, notably Landscape, Air Quality and Noise and Vibration which are linked to this topic would be implemented.
- 4.10.2. It is assumed that the following general measures will be embedded into the operational phase of the Scheme:
- clear signage and provision of access information for all users before and during operation;
 - the production of a communication plan by Wiltshire Council to inform the local community (particularly residents, employees, road users and non-motorised users (NMU)) of the improvements to accessibility, connectivity and journey times delivered;
 - ensure pedestrian linkages and accessibility are maintained; and
 - ensure new PRow are provided to increase existing provision and connectivity between local neighbourhood centres.
- 4.10.3. Further receptor specific mitigation is outlined in the PEAOR.

4.11. Climate Change Effects

- 4.11.1. Mitigation to reduce greenhouse gas emissions during construction will largely be driven by Highways England's carbon reduction hierarchy: Avoid / Prevent, Reduce, Remediate. Further details about measures considered under each type and how the project has tried to implement them are outlined below:
- Avoid / Prevent - Materials and construction processes can be reduced to great effect by changing the approach to the problem and reducing the amount of hard engineering required. This would include the following potential solutions:
 - Explore alternative solutions that can deliver Scheme objectives, but which will require less extensive construction work.
 - Maximise the re-use and refurbishment of existing assets and on-site resources.
 - Consider how materials which are key emission sources can be reduced.
 - Avoid disturbance / removal of existing vegetation and soils as far as possible, to reduce the release of carbon to the atmosphere.
 - Incorporate further elements into the Scheme which will encourage a reduction in user emissions, for example modal shift to more sustainable forms of transport.
- 4.11.2. The Scheme has tried to provide this already by investigating different crossing locations of the River Avon to enable potential shorter routes which would lead to reduced concrete requirements (a key emission source in construction). In addition, the inclusion of cycleways as an early assumption at design stage integrates potential avoidance of future operational impacts by encouraging modal shift.
- Reduce - During design, there is the opportunity to use smart engineering solutions to reduce carbon. Key things to consider will be the use of innovative low-carbon materials, and how to set the Scheme up for efficient delivery by design interventions. Further reductions in emissions can be found during construction itself. Examples of how the 'reduce' principle can be followed are outlined below:
 - Specify the use of recycled materials rather than virgin alternatives.
 - Specify low-carbon material alternatives, particularly for those materials that contribute a large proportion of emissions such as concrete.
 - Design for off-site and modular construction where practicable.
 - Design for low-carbon maintenance.
 - Recycle waste rather than sending to landfill.
 - Avoid materials which come in disposable packaging.
 - Specify materials be locally sourced where practicable.
 - Mandate use of electric and other low-carbon construction plant as standard on the Scheme.
- 4.11.3. The practicality of the measures above will be investigated as the detailed design for the Scheme progresses, with regular workshops undertaken between carbon reduction specialists and the design team to ensure construction carbon is minimised.
- Remediate - It will not be possible to reduce carbon emissions to zero using the measures above. To achieve a Net Zero Carbon Scheme, the residual emissions from construction will need to be offset through the life of the Scheme, either through on-site measures or third-party projects. Offsetting approaches could include the following:
 - Maximise vegetation cover to enhance carbon sequestration.
 - Install renewable energy technologies that exceed the consumption requirements of the Scheme and feed into the National Grid to offset emissions.
 - Use wood for permanent design elements. This can provide a long-term store for carbon in the built environment.

- Once opportunity to reduce and sequester carbon emissions within the development boundary has been maximised, consideration may need to be given to financing third-party projects which would provide this benefit..

4.11.4. In addition to the measures above, carbon emissions during the operation of the Scheme can be further reduced by identifying locations where congestion may occur such as junctions and providing localised improvements to ensure greater traffic efficiency and therefore reduced emissions from vehicles.

5. PEAOR Assessment Findings

5.1. Introduction

- 5.1.1. As noted above, the assessment in the PEAOR followed the approach of the OAR by considering each option by zone to ensure that a consistency in approach could be applied in the overall options assessment. The PEAOR has identified in each topic the preferred option in each zone independently of other topics, and thus each topic concludes on its own 'preferred option' from the assessment.
- 5.1.2. In most cases, the difference between the options is not 'significant' in EIA terms. In practice, residual effects in assessments sit within 'bands', and therefore whilst two options may be regarded as having slight adverse effects, one of the options could still be preferable as its level of effect is lower than the other option that may sit higher within that band (and therefore closer to the level above).
- 5.1.3. Where effects between different options are of a level of significance (i.e. one option is a moderate adverse effect, whilst the other options are a slight adverse effect), these are outlined within the text summarising the PEAOR assessment per topic per zone below.
- 5.1.4. Due to the precautionary nature of assessment at this early project stage (undertaken prior to species specific surveys), biodiversity effects are always deemed potentially significant in the PEAOR since it is scoring against potentially suitable habitats for protected species rather than confirmed presence/absence of these species.

5.2. Conclusion per option

Zone 1

- 5.2.1. A summary of options preference by topic area is shown below in Table 5-1. This table shows that, in respect of potential residual effects from the Scheme, Option B is the most preferred¹ option in Zone 1, with only four topics identifying a different preferred option (Option A). These four topics identified Option B as their second preference.
- 5.2.2. Option A was found to be the least preferable option for four topics in Zone 1, whilst Option C was least preferable for five topics. Option C was not the preferred option for any topics.

Table 5-1 - Zone 1 preferred option by topic area

	Option A	Option B	Option C
Air Quality	No route preference		
Noise and Vibration	1 st	2 nd	3 rd
Biodiversity	2 nd	1 st	3 rd
Water Environment	3 rd	1 st	2 nd
Landscape and Visual	3 rd	1 st	2 nd
Soils and Geology	1 st	2 nd	3 rd
Cultural Heritage	2 nd	1 st	3 rd
Materials and Waste	3 rd	1 st	2 nd
Population	1 st	2 nd	3 rd
Human Health	1 st	=2 nd	=2 nd
Climate Change Effects	3 rd	1 st	2 nd

¹ This document references to a 'preferred route', this is from an environmental perspective only and other considerations such as cost, connectivity, viability of construction and feedback from the public need to be considered in order to determine an overall preferred route for the scheme.

- 5.2.3. Option B was identified as the preferred option by the Biodiversity, Water Environment, Landscape and Visual, Cultural Heritage, Materials and Waste and Climate Change topic areas. A more detailed summary of the individual reasoning for this is provided in each of the specific topic chapters within the PEAOR, but a summary of the reasoning for the selection of Option B by each topic area is outlined below:
- Biodiversity – Option B was selected as it contained fewer watercourse crossings and less existing habitat disturbance and removal than Option A and C. The lowest preference for Option C was due to the location of the Pewsham connection of that option (western connection location) within Zone 1. If Option C was to be brought forward utilising the eastern Pewsham link, residual effects would be broadly similar with Option B.
 - Water Environment – Option B was found to have the lowest overall length, width of channel affected, number of watercourses crossed (Equal with Option C) and lowest impermeable area of the options in Zone 1 with the second shortest floodplain distance crossed, combining to make it the preferred option. Option A was found to have potential permanent change on parts of the route and profile (cross section) of the River Avon, constituting a significant adverse effect which would not occur if Option C or Option B was taken forward.
 - Landscape and Visual – Option B is the preferred option in Zone 1 with Option C the 2nd choice although neither would be likely to result in significant adverse residual effects. This is due to Option B being easier to integrate into the surrounding landscape than Option C. Option A is the least preferred option and is likely to have significant residual effects despite mitigation due to its more prominent location within the existing landscape to visual receptors.
 - Cultural Heritage – Option B was selected as it is further from Rowden Park Conservation Area and previously identified archaeological remains at Showell Farm than Option C. Removal of remains at Showell Farm could be expected to result in potentially significant effects. It is also located further from heritage assets to the south of the Scheme than Option A. The removal of remains associated with the medieval deer park by Option A would constitute a potentially significant effect.
 - Materials and Waste – Option B was found to be the preferred option through this Zone due to the lower material quantities required and reduced production of waste material due to lesser earthwork requirements for this option than Option C, whilst the length of Option A leads to greater material usage and waste production than both options.
 - Climate Change Effects – Option B was preferred due to lower material and waste carbon emissions during construction than Options C and A respectively. Option B also has the lowest operational effects due to its shortened route compared to Option A.
- 5.2.4. The noise and vibration assessment found that Option A in Zone 1 was preferable to Options B and C as it avoided potential effects on existing residential receptors. Option B was seen as slightly more preferable to Option C as it was slightly further away from existing residential receptors.
- 5.2.5. The soils and geology assessment found that physical effects on geological assets and the potential for any of the options to lead to the mobilisation of contamination (after mitigation) was the same for all options. The only difference in effect between the options was that Option B and C seemed to have a greater effect upon the better agricultural soils present than Option A, therefore making Option A the preferred option.
- 5.2.6. The population and human health assessments both found that Option A in Zone 1 was preferable to Options B and C, principally due to the increased distance from existing residential receptors and ability to deliver neutral health outcomes for communities that would experience negative health outcomes under Options B and C. Option A also results in less significant adverse effects relating to the severance of agricultural land holdings. There are no community assets and no highly sensitive businesses influencing the preference within this zone. In terms of enabling known future employment and residential development within this zone, all options were assessed as delivering benefits on an equal basis.
- 5.2.7. Overall, the assessment in this PEAOR has found that the preferred option from an environment perspective in Zone 1 is **Option B**. The second best option in Zone 1 is Option C, and the least preferred option is Option A. The effects on the River Avon under Option A would potentially be challenging for design to manage, and thus there is a strong preference that this option is avoided.

In respect of comparison in effects between Option B and Option C, whilst the table indicates Option C is the least preferred, this is partly due to the inclusion within Zone 1 of the western Pewsham link which was assessed as part of Option C only. In reality, the difference in effects between the two options are considered to be minimal, with increased Landscape and Cultural Heritage reasons being the key reason for Option B being preferred over option C.

Zone 2

5.2.8. A summary of the options preference by topic area is shown below in Table 5-2. This table shows that, in respect of potential residual effects from the Scheme, Option C is the preferred option by most topics in Zone 2. Option A had the second most 'preferred option' selections by topics, with the least preferred option being Option B, which was only the preferred for the Noise and Vibration topic area.

Table 5-2 - Zone 2 preferred option by topic area

	Option A	Option B	Option C
Air Quality	No route preference		
Noise and Vibration	3 rd	1 st	2 nd
Biodiversity	1 st	2 nd	3 rd
Water Environment	2 nd	3 rd	1 st
Landscape and Visual	3 rd	2 nd	1 st
Soils and Geology	2 nd	3 rd	1 st
Cultural Heritage	1 st	=2 nd	=2 nd
Materials and Waste	3 rd	2 nd	1 st
Population	1 st	3 rd	2 nd
Human Health	1 st	=2 nd	=2 nd
Climate Change Effects	3 rd	2 nd	1 st
Vulnerability of CC	No route preference		

5.2.9. Option C was selected as the preferred option by the Water Environment, Landscape and Visual, Soils and Geology, Materials and Waste and Climate Change topic areas. A more detailed summary of the individual reasoning for this is provided in each of the specific topic chapters within the PEOR, but a summary of the reasoning for the selection of Option C by each topic area is outlined below:

- Water Environment – Whilst Option C is the preferred option, all options return slight adverse effects in Zone 2, with Option C being the preferred option owing to its slightly smaller impermeable surface area compared to Option A and a much smaller surface area than Option A, whilst being the second best option in respect of the number of watercourses crossed and the width of watercourse channel crossings.
- Landscape and Visual – Option C was preferred as it could be more easily integrated into the existing landscape with additional planting mitigation than the other options due to the existing topography. Option A is likely to give rise to significant residual effects not found under Option B or C as it would be likely to heavily impact the landscape character of Lackham College, as well as remaining more visible to local residential visual receptors.
- Soils and Geology – All options were considered to have moderate significant effects. Option C is preferred as it would result in the least loss of good quality agricultural soils. Option A caused less loss of these soils than Option B so was the second ranked option.
- Materials and Waste – Option C was found to be the preferred option through this zone due to the lower material quantities required and the reduced production of waste material compared to the other options.
- Climate Change Effects – Option C was preferred due to a lower material and waste production than Options B and A respectively and by virtue of also having the lowest operational effects due to its shorter route length through the zone.

- 5.2.10. The noise and vibration assessment found that Option B was preferred in Zone 2 as it had the greatest distance from the local Noise Important Areas on the A4 compared to Options A and C.
- 5.2.11. The biodiversity assessment found that Option A was the preferred option. This route passes the least number of potential bat roosts, by avoiding the farmyards associated with Zone 2. Route Option A does pass very closely to Cocklemore Brook (OW6). However, it is considered to result in the least impact on watercourses and their associated species in this zone due to Options B and Options C requiring more new minor watercourse crossings. Both Options B and C run within close proximity to great crested newt recorded locations and additional waterbodies, increasing the risk of harm to this species, as well as an increased impact to the Pewsham Way Corridor receptor.
- 5.2.12. The cultural heritage assessment also found that Option A was preferred over Options B and C despite identifying potentially significant adverse settings effects at the location of the disused Wiltshire and Berkshire Canal asset. Whilst the assessment found that all options will have significant effects on archaeology associated with the medieval deer park in this zone, Option A is preferred as it avoids a known archaeological site of interest at Forest Farm which Options B and C directly affect.
- 5.2.13. The population and human health assessments both found that Option A in Zone 2 was preferable to Options B and C, principally due to the increased distance from existing residential receptors at the farms and the ability to deliver neutral health outcomes for communities that would potentially experience negative health outcomes under Options B and C. Fewer significant adverse effects relating to severance of agricultural land holdings were identified for Option A in comparison to the alternatives.
- 5.2.14. Overall, the assessment in this PEAOR has found that the preferred option from an environment perspective in Zone 2 is **Option C**. The second best option in Zone 2 is considered to be Option A and the least preferred option is Option B. Whilst Option C is considered the favoured option by most assessments, there is limited difference between Option B and C when you remove the Pewsham Link from the route alignment of Option B. For Cultural Heritage and Biodiversity, Option A is regarded as the preferred option but there are limitations in this assessment. Namely that the route for Options B and C has undergone further surveys for biodiversity and cultural heritage than the area in which Option A is located due to previous planned developments. The results of these previous surveys are recorded in the Environment records for biodiversity and cultural heritage which have been used in the assessment, and it is possible that should the area around Option A have been subjected to similar levels of previous survey and investigation, similar effects as Options C and B may have been recorded.

Zone 3

- 5.2.15. A summary of options preference by topic area is shown below in Table 5-3. This table shows that, in respect of potential residual effects from the Scheme, Option B is the most preferred option in relation to Zone 3, with it not being considered as the least preferred option by any of the topic assessments. Option A had the second most 'preferred option' selections by topics, with the least preferred option being Option C which was only the preferred option from a Landscape and Visual perspective.

Table 5-3 - Zone 3 preferred option by topic area

	Option A	Option B	Option C
Air Quality	=1 st	=1 st	3 rd
Noise and Vibration	3 rd	1 st	2 nd
Biodiversity	=1 st	=1 st	3 rd
Water Environment	2 nd	1 st	3 rd
Landscape and Visual	3 rd	2 nd	1 st
Soils and Geology	1 st	2 nd	3 rd
Cultural Heritage	No preference		
Materials and Waste	3 rd	1 st	2 nd
Population	3 rd	1 st	2 nd

Human Health	2 nd	1 st	3 rd
Climate Change Effects	1 st	2 nd	3 rd
Vulnerability of CC	No preference		

- 5.2.16. Option B was selected as the preferred option by the Air Quality, Noise and Vibration, Biodiversity, Water Environment, Materials and Waste, Population and Human Health topic areas. A more detailed summary of the individual reasoning for this is provided in each of the specific topic chapters within the PEAOR, but a summary of the reasoning for the selection of Option B by each topic area is outlined below:
- Air Quality – Options A and B were the preferred options in Zone 3. Options A and B were selected as preferred as they had less existing sensitive receptors in proximity to the new road than Option C.
 - Noise and Vibration – Option B was preferred as it avoided the NIAs around the junction with the A4 better than the other options and avoided existing residential developments and sensitive receptors (such as the school).
 - Biodiversity – Options A and B are considered to have similar impacts and benefits, in comparison to Option C. Route Option C runs through a pond which has previously recorded positive survey results for Great Crested Newt (GCN), as well as running close to other GCN ponds and bisecting two drains. Route Options A and B do run either side of Hither Farm which has good ecological potential for a range of species, but do not run through it and therefore are preferred.
 - Water Environment – Option B was preferred as it contained the fewest watercourse crossings and length of channel impacted. Option A had a much shorter route through Zone 3 than B or C, and therefore had a smaller impermeable surface area but fewer watercourse interactions meant Option B was preferred.
 - Materials and Waste – Option B is preferred for this zone as it has the lowest impact on materials and second lowest impact on waste. Less waste is produced on Option A due to the shorter route alignment and topographical setting of the option.
 - Population – Option B is the preferred option for this zone on the basis that it avoids the requirement for permanent land take at Stanley Park Sports Ground (as does Option A) and also avoids the potentially significant adverse effects that Option A would convey to properties close to the alignment on the A4 London Road. Option B also results in no significant residual effects relating to the agricultural land holdings assessment.
 - Human Health – Option B is preferred for this zone as it offers the ability to avoid negative health outcomes predicted on assessed communities in relation to the alternative route options, particularly users of Stanley Park Sports Ground, employees working at Forest Gate Business Park and pupils of Abbeyfield School.
 - Climate Change effects – Option B was preferred as it provided the most logical combination of a short route through Zone 3 whilst maintaining the ability to connect to Option C in Zone 4 without greatly increasing the length, whilst also having the lowest construction emissions. Option A was considered the worst despite being the shortest route since the effects of Option A in Zone 4 were extensive due to its longer route length in that zone, and there being no logical way of connecting the options.
- 5.2.17. The Landscape and Visual topic area found Option B and C were quite equal in effect, with Option C preferred as there is more opportunity to integrate the route alignment into the landscape owing to its lower elevation although neither would have significant residual effects. The alignment of Option A was deemed far worse in the assessment, with potential significant adverse residual effects anticipated from this option due to its highly visible location within the existing topography of the area.
- 5.2.18. The Soils and Geology topic area found Option C was the least preferred option as it required the loss of higher quality agricultural soils. Options A and B were both found to not take such agricultural land, with Option A being more favourable due to its smaller length in Zone 3.
- 5.2.19. The Cultural Heritage topic area displayed no preference in any options in this zone, as all options were found to have potentially significant effects on various receptors including medieval settlements, the 'outfarm', former settlement at New Leaze Farm, Ridge and Furrow earthworks, Important Hedgerows under the Hedgerow Regulations 1997 and upon the setting of existing Listed Buildings in the area.

5.2.20. Overall, the assessment in this PEAOR has found that the preferred option from an environment perspective in Zone 3 is **Option B**. Both Option C and A have considerable constraints regarding Biodiversity and Landscape and Visual effects respectively, with the effects identified by the Biodiversity assessment on Option C considered easier to mitigate in the Scheme design than the landscape and visual effects identified on Option A. Similarly, the Population and Human Health assessments found that effects at Stanley Park Sports Ground at Option C make B and A more preferable. However, in the wider context of the development of the Future Chippenham Masterplan Project, it is likely that effects from land-take at Stanley Park Sports Ground can be mitigated and even enhanced through additional provision. Therefore, the second preferred option is considered to be Option C due to the fact that identified effects are easily mitigatable, whilst the least preferred option is Option A.

Zone 4

5.2.21. A summary of options preference by topic area is shown below in Table 5-4. This table shows that, in respect of potential residual effects from the Scheme, Option C is the most commonly preferred option by each topic in Zone 4, with it only being considered the least preferred option by the soils and geology topic area. Option B had the second most 'preferred option' selections by topics, with the least preferred option being Option A which was the case for all but two topic assessments.

Table 5-4 - Zone 4 preferred option by topic area

	Option A	Option B	Option C
Air Quality	No route preference		
Noise and Vibration	3 rd	2 nd	1 st
Biodiversity	3 rd	1 st	2 nd
Water Environment	3 rd	2 nd	1 st
Landscape and Visual	3 rd	2 nd	1 st
Soils and Geology	2 nd	1 st	3 rd
Cultural Heritage	=2 nd	=2 nd	1 st
Materials and Waste	3 rd	2 nd	1 st
Population	2 nd	3 rd	1 st
Human Health	No route preference		
Climate Change Effects	3 rd	2 nd	1 st
Vulnerability of CC	No route preference		

5.2.22. Option C was selected as the preferred option by the Noise and Vibration, Water Environment, Landscape and Visual, Cultural Heritage, Materials and Waste, Climate Change Effects and Population topic areas. A more detailed summary of the individual reasoning for this is provided in each of the specific topic chapters within the PEAOR, but a summary of the reasoning for the selection of Option C by each topic area is outlined in the bullets below:

- Noise and Vibration – Option C was preferred as it maintains a route away from sensitive receptors.
- Water Environment – Option C had the lowest impermeable area, width of channel affected, fewest number of watercourse crossings and the shortest route length in Zone 4. Option B is preferred to Option A as a second preference as it has a lower width of watercourse crossed. Option A had the highest potential for effects from contamination due to the length of highway running parallel to the River Marden.
- Landscape and Visual – Option C is shortest route and avoids high ground. All routes in Zone 4 are in a high sensitivity area, meaning that Option A is the least preferred due to its much greater distance travelled in this zone. Option A and B are likely to have significant residual effects on local landscape character as screening of the options is not in-keeping with its existing open nature of the landscape.

- Cultural Heritage – Option A and B will both have a direct impact upon potentially complex known settlement remains at New Lease Farm. Option C has less known heritage constraints in this zone, although all three options are associated with potential significant effects.
- Materials and Waste – Option C is preferred for this zone as it has the lowest requirements for materials and lowest waste production owing to its shorter route alignment.
- Climate Change Effects – Option C is preferred as it has lower construction carbon emissions, and its shorter route makes it preferable from the operational period.
- Population – Option C is the preferred option within Zone 4, principally due to the ability to avoid significant adverse effects relating to agricultural land holdings that would arise under Options A and B. Option C also avoids severance of a strategic PRoW, making it preferable from a WCH perspective.

- 5.2.23. The Biodiversity topic area preferred Option B over Option C. Although Option B involves an additional new crossing required on an unnamed ditch, this option passes through a lower number of potential tree roosts for bats than Option C. Option A would see the greatest loss of overall habitat including the highest number of hedgerows fragmented and is therefore considered the least preferred option in Zone 4.
- 5.2.24. The Soils and Geology assessment found that Option C affected marginally more high quality agricultural land than Options A and B. Option B was preferred to Option A by virtue of having a lower land-take.
- 5.2.25. Overall, the assessment in this PEAOR has found that the preferred option from an environment perspective in Zone 4 is **Option C**. Option A is the least preferred option in all assessments except one, where the effects identified are of a similar significance to the other Options. Option B is therefore considered the second best option with effects largely similar to Option C, with slighter greater heritage effects anticipated with Option B, although in this respect, both options have maintained the same potential significance of effect in the assessment.

5.3. Overall Preferred Route

- 5.3.1. Table 5-5 below summarises the above to show the preferred route from an environment perspective in each Zone from the assessment undertaken and reported in this PEAOR.

Table 5-5 – Overall Environment preferred options per zone

	Option A	Option B	Option C
Zone 1	3 rd	1 st	2 nd
Zone 2	2 nd	3 rd	1 st
Zone 3	3 rd	1 st	2 nd
Zone 4	3 rd	2 nd	1 st