



WELCOME TO
DIDCOT
HISTORIC RAILWAY TOWN

REVISED

Didcot Garden Town HIF 1 Scheme

Environmental Statement

Volume I

Chapter 10 – Noise and Vibration

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10. Noise and Vibration

10.1 Introduction

- 10.1.1 This chapter has been produced to assess the potential noise and vibration impacts during construction and operation of the Scheme, on receptors within the study area. This chapter should be read in conjunction with Chapters 1 to 5 of this Environmental Statement (ES).
- 10.1.2 Using the methodology outlined in Section 10.4, likely significant effects (adverse and beneficial) have been identified and are described in Section 10.10. A summary of these likely significant effects is provided in Section 10.12 but must be read in conjunction with the whole chapter.
- 10.1.3 Details of relevant noise and vibration terminology are provided in Appendix 10.1.
- 10.1.4 The results of the noise and vibration assessment have been used to inform the assessment of impacts on other topics considered within this ES, namely ES Chapter 7: Heritage, ES Chapter 8: Landscape and Visual (including tranquillity), ES Chapter 13: Population and Human Health and ES Chapter 17: Cumulative Effects.

Competent expertise

- 10.1.5 This ES chapter has been prepared by competent experts with relevant and appropriate experience. The Technical Lead for this noise and vibration chapter has 24 years of relevant experience and has professional qualifications as summarised in Appendix 1.1.

10.2 Legislative and policy framework

- 10.2.1 The following sub-sections provide specific details of the legislation and policies that are of most relevance to the noise and vibration assessment, namely where these have informed the identification of receptors and resources and their sensitivity; the assessment methodology; the potential for significant environmental effects; and required mitigation.

Legislation

Environmental Noise (England) Regulations

- 10.2.2 The UK Government Environmental Noise (England) Regulations 2006 (as amended 2008, 2009, 2010) (Ref 10.1) were introduced in England to implement European Union Assessment and Management of Noise Directive 2002/49/EC (known as the Environmental Noise Directive – END). The aims of the END are to define a common approach in order to avoid, prevent or reduce the harmful effects of environmental noise. Under the END, strategic noise mapping of major roads, railways, airports and agglomerations has been completed across England. The mapping includes the A34, the A4130 between the A34 and the B4493, the A415 between Abingdon and Clifton Hampden, the Great Western mainline railway and the Didcot-Oxford rail line (Cherwell Valley Line). Round 3 of the noise mapping process was completed in 2017. The END also contains provisions for Local Authorities to propose ‘quiet areas’ for formal designation. Such areas should be quiet or relatively quiet, and generate significant benefits (in terms of health, wellbeing, and quality of life) for the communities they serve because of their quietness.

Land Compensation Act 1973

- 10.2.3 In general noise and vibration are recognised as both a common law nuisance (either private or public) and a statutory nuisance. However, this does not apply to noise (and vibration) from road traffic. As a result, the UK Government Land Compensation Act 1973 (Ref 10.2) and the UK Government Noise Insulation Regulations 1975 (as amended 1988) (Ref 10.3) are used in respect of road traffic noise.
- 10.2.4 The Land Compensation Act 1973 Part I provides a means by which compensation can be paid to owners of land or property which has experienced a loss in value caused by the operation of public works, such as new or altered roads. Noise and vibration are two of the factors which will be considered in any claims for compensation; however, the claim should consider all changes and effects, including betterment.

Noise Insulation Regulations 1975 (as amended 1988)

- 10.2.5 The Noise Insulation Regulations 1975 were made under Part II of the Land Compensation Act 1973. Regulation 3 imposes a duty, and Regulation 4 a discretionary power, on the relevant Highway Authority to undertake or make a grant in respect of the cost of undertaking noise insulation work in eligible buildings affected by a new or altered highway. This is subject to meeting a range of criteria on road traffic noise levels as specified in the regulations. Regulation 5 also provides discretionary powers to undertake or make a grant in respect of the cost of undertaking noise insulation work in eligible buildings with respect to construction noise.

Highways Noise Payments and Movable Homes (England) Regulations 2000

- 10.2.6 The UK Government Highways Noise Payments and Movable Homes Regulations 2000 (Ref 10.4) provide the relevant Highway Authority with the power to make payments to persons living in caravans and other structures which are not buildings, which are affected by the construction or operation of a new or altered highway.

Environmental Protection Act 1990

- 10.2.7 Under Part III of the UK Government Environmental Protection Act 1990 (Ref 10.5), local authorities have a duty to investigate noise complaints in relation to premises (including land and buildings) and vehicles, machinery or equipment. The act does not apply to road traffic noise but is applicable to construction activities.
- 10.2.8 If a local authority's Environmental Health Officer is satisfied that a complaint amounts to a statutory nuisance, the authority must serve an abatement notice on the person responsible or, in certain cases, the owner or occupier of the property.

Control of Pollution Act 1974

- 10.2.9 Under Section 60 of the UK Government Control of Pollution Act 1974 (CoPA) (Ref 10.6) the local authority can serve a notice specifying how construction works should be carried out, including working hours and noise/vibration limits. Breaching the terms of the notice is an offence.
- 10.2.10 Section 61 of the CoPA can be used by contractors completing construction works to apply in advance to the local authority for 'prior consent'. Section 61 prior consent acts as a defence against a Section 60 notice. The application must detail how noise and vibration is to be managed on-site based on the principles of Best Practicable Means (BPM).

National planning policy

National Planning Policy Framework (NPPF)

10.2.11 The NPPF (Ref 10.7) sets out the Government's planning policies for England and how these are expected to be applied. The NPPF states that planning policies and decisions should *"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."

10.2.12 With regards to 'adverse impacts' and 'significant adverse impacts', the NPPF refers to the Noise Policy Statement for England (NPSE) (Ref 10.8).

Noise Policy Statement for England

10.2.13 The Explanatory Note within the NPSE introduces the following concepts to aid in the establishment of significant noise effects:

- No Observed Effect Level (NOEL): the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established;
- Lowest Observed Adverse Effect Level (LOAEL): the level above which adverse effects on health and quality of life can be detected; and
- Significant Observed Adverse Effect Level (SOAEL): the level above which significant adverse effects on health and quality of life occur.

10.2.14 The NPSE sets out the governments Noise Policy Vision to: *"Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development"*.

10.2.15 The long-term vision is supported by the Noise Policy Aims: *"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life."*

10.2.16 The NPSE recognises that *"it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations"*. The levels are likely to be different for different noise sources, for different receptors and at different times of the day.

Planning Practice Guidance on Noise

10.2.17 The web-based resource Department for Communities and Local Government Planning Practice Guidance on Noise (PPG-N) (Ref 10.9) supports the NPPF. The guidance provides additional details on the concepts of NOEL, LOAEL and SOAEL

in terms of the perception of noise at each level, example outcomes due to noise at each level, and the action which should be considered at each level, as detailed in Table 10.1, which is based on the guidance. It also introduces the additional concepts of No Observed Adverse Effect Level (NOAEL) and Unacceptable Adverse Effect Level (UAEL).

Table 10.1: Planning Practice Guidance on Noise – Noise Exposure Hierarchy

Response	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Unacceptable Adverse Effect Level			
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening, loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

Local planning policy

Vale of White Horse District Council (VoWHDC)

10.2.18 Development Policy 25: Noise Pollution of the Local Plan 2031 Part 2 Detailed Policies and Additional Sites (Ref 10.10) states:

“Noise-generating development that would have an impact on environmental amenity or biodiversity will be expected to provide an appropriate scheme of mitigation that should take account of:

- *the location, design and layout of the proposed development*
- *existing levels of background noise*
- *measures to reduce or contain generated noise, and*
- *hours of operation and servicing.*

Development will not be permitted if mitigation cannot be provided within an appropriate design or standard.”

South Oxfordshire District Council (SODC)

10.2.19 Policy ENV12: Pollution - Impact of Development on Human Health, the Natural Environment and/or Local Amenity (Potential Sources of Pollution) of the South Oxfordshire Local Plan 2035 adopted in December 2020 (Ref 10.11) states:

“1. Development proposals should be located in sustainable locations and should be designed to ensure that they will not result in significant adverse impacts on human health, the natural environment and/or the amenity of neighbouring uses.

2. The individual and cumulative impacts of development on human health, the natural environment and/or local amenity will be considered when assessing development proposals.

3. The consideration of the merits of development proposals will be balanced against the adverse impact on human health, the natural environment and/or local amenity, including the following factors:

noise or vibration; ...”

10.2.20 Policy DES6: Residential Amenity states:

“1. Development proposals should demonstrate that they will not result in significant adverse impacts on the amenity of neighbouring uses, when considering both individual and cumulative impacts, in relation to the following factors: ...

iii) noise or vibration; ...”

10.3 Consultation with relevant stakeholders

10.3.1 An EIA Scoping Opinion Request was submitted by OCC (as the promoter) to OCC in its capacity as the Local Planning Authority (LPA) in April 2020, which sought the opinion of the LPA regarding the approach for the assessment of environmental effects resulting from the construction and operation of the Scheme. In accordance with the EIA Regulations, the LPA consulted statutory stakeholders and non-statutory stakeholders where they considered it applicable. The consultation responses received in relation to noise and vibration are detailed in Table 10.2.

Table 10.2: Scoping Opinion and responses

Scoping Opinion	Where addressed within the ES
OCC Planning	
Please see the detailed advice of Burcot and Clifton Hampden Parish Council, Culham Parish Council, Sutton Courtenay Parish Council and the Vale of White Horse and South Oxfordshire District Council Environmental Health Officer set out in Annex 1. The Noise and Vibration assessment should include the matters in scope set out in Chapter 10 of the Scoping Report.	ES Chapter 10 follows the scope as set out in the Scoping Report.
The noise and vibration impacts of the proposed development on all sensitive receptors including local residents, businesses, other road users and users of Public Rights of Way and green infrastructure will need to be assessed. The noise and vibration assessments should cover all aspects of the proposed operations including noise generated and associated with the site preparation works, construction, landscaping and restoration works as well as when completed and operational. This should include noise and vibration generated by all vehicle movements generated by the development both on and off site and on the highway network, including the cumulative impacts with existing vehicle movements.	ES Chapter 10 Section 10.10 assesses the impact of the Scheme during both construction and operation on potentially sensitive receptors, as identified in Design Manual for Roads and Bridges (DMRB) LA 111.
Clifton Hampden Parish Council	
Paragraph 10.5.10 and 10.5.14 refers to sensitive locations for noise and vibration, including the Culham Science Centre and the residential area of Clifton Hampden village west of Watery Lane. No reference however is made to noise sensitive residential dwellings adjacent to the A415 by the Culham Science Centre, or at the northern end of the bypass on the B4015. The EIA should establish the noise and vibration on each of these residential dwellings during and after development.	ES Chapter 10 Section 10.10 considers the impact of the operation of the Scheme on all residential properties and other identified sensitive receptors in the study area, including those listed. ES Chapter 10 Section 10.10 considers the impact of the construction of the Scheme on a selection of the closest identified receptors to the works, including ones in the locations listed.
Culham Parish Council	
The quantitative assessment should include consideration of issues such as flood risk, landscape and visual impacts, permanent loss of agricultural land, light pollution, air quality impacts, noise and vibration , nature conservation impacts, fragmentation of agricultural land holdings, water quality and traffic impacts.	ES Chapter 10 assesses the noise and vibration impacts of the Scheme.
Vale of White Horse and South Oxfordshire District Council Environmental Health Officer	
The noise and air quality impacts of the proposed development will need to be investigated and impacts on noise sensitive receptors identified. Likewise, noise and vibration impact of the construction phase will also need to be identified.	ES Chapter 10 assesses the noise and vibration impacts of the Scheme.

Scoping Opinion	Where addressed within the ES
Natural England	
<p>Schedule 4 of the Town & Country Planning (Environmental Impact Assessment) Regulations 2017, sets out the necessary information to assess impacts on the natural environment to be included in an ES, specifically:</p> <p>Expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc.) resulting from the operation of the proposed development.</p>	<p>ES Chapter 10 assesses the noise and vibration impacts of the Scheme.</p>
Sutton Courtenay Parish Council	
<p>The Parish Council objects to the proposal. This is on the basis of unclear guidance on how the work will be implemented and the traffic impact on Sutton Courtenay both during construction and following the construction works. There are concerns over the cumulative impact of future developments following implementation. Council also objects regarding the negative impact on Sutton Courtenay in respect of noise and light pollution both during and after construction and also, vibrations caused by construction works.</p>	<p>ES Chapter 10 Section 10.10 assesses the noise and vibration impacts of the Scheme - this includes the impact of both operational and construction traffic in Sutton Courtenay.</p>

10.3.2 Consultation with the Environmental Health Officer (EHO) representing both SODC and VoWHDC was carried out in August and September 2020. A summary of the discussion is presented below:

- The scope, study area and assessment methodology set out in the latest version of the DMRB, LA 111 Noise and Vibration – Revision 2 (Ref 10.12) was discussed and agreed as appropriate.
- With regard to the construction assessment, the EHO advised standard working hours are 07:30 to 18:00 Monday - Friday and 08:00 to 13:00 Saturday with no working on evenings / nights / bank holidays, though there is some flexibility to these, such as for works which cannot be completed during the day. The EHO advised SODC and VoWHDC will prefer the Section 61 Prior Consent approach is only considered for out of hours works. The EHO stated a preference for non-impact type piling to be adopted where possible, dependent on ground conditions, and the need to consider vibration from ground improvement works.
- With regard to the operational traffic noise assessment, it was agreed to focus on the change in predicted traffic noise levels due to the Scheme. It was acknowledged that in some areas along the Scheme which are remote from existing main roads, but close to other existing noise sources such as the railway between Didcot and Oxford and industrial operations, ambient noise levels may be higher than indicated by a prediction of existing traffic noise levels. However, whilst the presence of other noise sources will be acknowledged in the assessment, given the different characteristics of railway and industrial noise to road traffic noise, in order to ensure a worst-case approach, no attempt to combine noise levels from different sources will be made.
- The EHO identified that they receive occasional noise complaints regarding the power station relating to steam release valves, freight trains to the west of Appleford and the quarry/landfill operations which are also west of Appleford.
- Potentially sensitive receptors were discussed. No ‘tranquil areas’ as referred to in the NPPF were identified beyond the public open space type receptors identified in the Scoping Report (Appendix 4.1) (Ref 10.13).

- The approach to considering proposed new developments was discussed and the inclusion of a range of such developments in the traffic data, on which the noise assessment is based, was acknowledged. For developments where a proposed building layout is not available it was noted that it will not be possible to include any future developments, either as receptors, or buildings which affect the propagation of noise from the Scheme. This is a worst-case approach with regard to the impact at existing receptors which will benefit from some shielding provided by the new developments once constructed. The potential impacts at receptors within the new developments will be discussed in the assessment.
- The scope and methodology of the baseline noise monitoring survey was discussed with details of the proposed monitoring locations provided.

10.4 Assessment methodology

10.4.1 This noise and vibration assessment has been undertaken in accordance with the following key guidance:

- DMRB LA 111: Noise and Vibration (Version 2) (Ref 10.12); and
- Calculation of Road Traffic Noise (CRTN), (Ref 10.14).

Construction noise

10.4.2 A quantitative assessment of Scheme construction noise impacts has been carried out. Monthly average construction noise levels have been estimated at a selection of 21 potentially noise sensitive receptors, which includes those closest to the Scheme construction works. These selected receptors are representative of neighbouring properties in their vicinity. By focusing on a selection of the closest identified potentially sensitive receptors, the reported impacts at these receptors are, therefore, typical of the worst affected receptors and all potentially significant effects are identified. At this stage a construction contractor has not been appointed to construct the Scheme, therefore precise information on the construction works is not available. However, a buildability advisor has been appointed to provide reasonable assumptions on the likely construction works (hereafter referred to as the Early Contractor Involvement (ECI)).

10.4.3 BS 5228:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites (Ref 10.15) contains several example methodologies for identifying significant construction noise effects based on fixed thresholds or noise level changes. For the purposes of this assessment the 'ABC' method, as set out in DMRB LA 111, is proposed. This approach is based on setting the threshold for the onset of potentially significant adverse effects (i.e. the SOAEL) depending on the existing ambient noise level. Receptors with low existing ambient noise levels (Category A) have a lower threshold than those with high existing ambient noise levels (Category C). Higher thresholds are set for normal daytime construction working hours, compared to the more sensitive evening/weekend and night-time periods. As a conservative approach, the threshold for the onset of any adverse effect (i.e. the LOAEL) is set at a construction noise level equal to the existing ambient noise level. Construction noise levels between the LOAEL and the SOAEL have the potential to result in adverse effects but will not normally be classed as significant adverse effects. However, noise mitigation measures will still be considered/ applied in such locations to seek to keep all effects to a minimum. Table 10.3, which is adapted from Table E.1 in BS 5228, sets out the construction noise SOAEL and LOAEL proposed for this assessment.

Table 10.3: Construction noise SOAEL and LOAEL for all receptors

Time of Day	SOAEL $L_{Aeq,T}$ dB (façade)			LOAEL $L_{Aeq,T}$ dB (façade)
	A ¹	B ²	C ³	
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75	Existing ambient
Evenings (19:00 – 23:00 weekdays) and Weekends (13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays)	55	60	65	Existing ambient
Night-time (23:00 – 07:00)	45	50	55	Existing ambient

¹ Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values

² Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as the category A values

³ Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than the category A values

NOTE: if the ambient noise level exceeds the Category C threshold values then the SOAEL and LOAEL are defined as equal to the existing ambient

10.4.4 To determine the SOAEL and LOAEL, ambient noise levels at the relevant façade of each of the selected receptors have been predicted based on the 2020 Baseline traffic data. This is potentially a conservative approach as other noise sources, such as rail noise, are not included.

Construction traffic noise

10.4.5 The Early Contractor Involvement (ECI) appointed to provide reasonable assumptions on the likely works has provided an estimate of the numbers of Heavy Duty Vehicles (HDVs) and cars/vans accessing the works at various points along the Scheme, on a monthly basis over the duration of the Scheme construction works. The distribution of the construction traffic across the surrounding road network has then been determined by the traffic team, focusing on 41 key links used in the transport assessment (ES Chapter 16, Figure 16.3).

10.4.6 The traffic noise impact of the addition of construction traffic onto the local road network has been assessed based on the change in the 18 hour CRTN Basic Noise Level (BNL) i.e. the traffic noise level at 10 m from the kerb, taking into account the flow, composition, speed and road surface. The construction traffic noise impacts are compared to both the 2020 Baseline scenario and the 2024 Do-Minimum scenario. This is the same approach as set out in DMRB LA 111 for the assessment of operational traffic noise impacts along roads which are remote from the Scheme, as discussed in paragraph 10.4.30.

10.4.7 The ECI has advised that no long-term road closures/diversions are anticipated at this stage. Only short-term closures will be required overnight to tie the Scheme into the existing road network. Therefore, no further assessment of the impact of night-time diversions has been completed.

Construction vibration

10.4.8 Construction vibration impacts have been assessed for all construction activities which are a potentially significant source of vibration proposed in close proximity of any identified potentially sensitive receptors. These construction works comprise piling, and works using vibratory rollers such as earthworks, pavement construction (e.g. roads, footpaths).

- 10.4.9 The ECI has advised that as at this stage it is envisaged that all piling works will adopt rotary bored piling methods, no impact or vibratory piling methods are anticipated to be required. Vibration associated with rotary bored piling is minimal. Further discussion of the potential vibration impacts from piling is provided in Section 10.10.
- 10.4.10 Vibration levels due to vibratory rollers have been estimated in accordance with the relevant methodologies in BS 5228. Source data for a typical range of vibratory rollers comparable to those proposed by the ECI have been taken from Transport Research Laboratory (TRL) Report 429 (Ref 10.16) and product data sheets provided by the ECI.
- 10.4.11 The transmission of ground-borne vibration is highly dependent on the nature of the intervening ground between the source and receptor and the activities being undertaken. BS 5228 provides data on measured levels of vibration for various construction works. Vibration impacts are considered herein for both damage to buildings and annoyance to occupiers.
- 10.4.12 Table 10.4 details peak particle velocity (PPV) vibration levels and provides a semantic scale for the description of construction vibration effects on human receptors, based on guidance contained in BS 5228.

Table 10.4: Construction vibration criteria for human receptors (annoyance)

Peak particle velocity level	Description
10 mms ⁻¹	Vibration is likely to be intolerable for any more than a very brief exposure to this level.
1.0 mms ⁻¹	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.
0.3 mms ⁻¹	Vibration might be just perceptible in residential environments.
0.14 mms ⁻¹	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.

- 10.4.13 Based on the above scale, DMRB LA 111 defines the LOAEL for human receptors as a PPV of 0.3 mms⁻¹ (millimetres per second), this being the point at which construction vibration is likely to become perceptible. The SOAEL is defined as a PPV of 1.0 mms⁻¹, this being the level at which construction vibration can be tolerated with prior warning.
- 10.4.14 In addition to human annoyance, building structures may be damaged by high levels of vibration. The levels of vibration that may cause building damage are far in excess of those that may cause human annoyance. Consequently, if vibration levels within buildings are controlled to those relating to annoyance (i.e. 1.0 mms⁻¹), then it is highly unlikely that buildings will be damaged by construction vibration.
- 10.4.15 BS 7385-2:1993 Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from ground borne vibration (Ref 10.17) provides guidance on vibration levels likely to result in cosmetic damage and is referenced in BS 5228 and DMRB LA 111. Guide values for transient vibration, above which cosmetic damage could occur, are given in Table 10.5.

Table 10.5: Transient vibration guide values for cosmetic damage

Type of building	Peak component particle velocity in frequency range of predominant pulse	
	4Hz to 15Hz	15Hz and above
Reinforced or framed structures. Industrial and heavy commercial buildings.	50 mms ⁻¹ at 4Hz and above	
Unreinforced or light framed structures. Residential or light commercial buildings.	15 mms ⁻¹ at 4Hz increasing to 20 mms ⁻¹ at 15Hz	20 mms ⁻¹ at 15Hz increasing to 50 mms ⁻¹ at 40Hz and above.

NOTE 1: Values referred to are at the base of the building.
 NOTE 2: For un-reinforced or light framed structures and residential or light commercial buildings, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.

10.4.16 BS 7385-2 states that for transient vibration, such as from individual impacts, the probability of building damage tends towards zero at levels less than 12.5 mms⁻¹ PPV. For continuous vibration, such as from vibratory rollers, the threshold is around half this value.

10.4.17 It is also noted that these values refer to the likelihood of cosmetic damage. ISO 4866:2010 'Mechanical Vibration and Shock. Vibration of Fixed Structures. Guidelines for the Measurement of Vibrations and Evaluation of their Effects on Structures' (Ref 10.18) defines three different categories of building damage, namely:

- Cosmetic: formation of hairline cracks in plaster or drywall surfaces and in mortar joints of brick or concrete block constructions.
- Minor: formation of large cracks or loosening and falling of plaster or drywall surfaces or cracks through brick or blocks.
- Major: damage to structural elements, cracks in support columns, loosening of joints, splaying of masonry cracks.

10.4.18 BS 7385-2 states that minor damage occurs at a vibration level twice that of cosmetic damage, and that major damage occurs at a vibration level twice that of minor damage. Therefore, this guidance has been used to define vibration criteria as detailed in Table 10.6 which can be used to assess continuous vibration impacts.

Table 10.6: Construction vibration criteria for assessing building damage

Damage risk	Continuous vibration level PPV mms ⁻¹
Major	30
Minor	15
Cosmetic	6
Negligible	<6

Construction significance of effect

10.4.19 The key factors in identifying construction noise and vibration annoyance significant effects are the magnitude of the impact and the duration. The magnitude of the impact is considered on a scale from negligible to major, as detailed in Table 10.7, adapted from DMRB LA 1111.

Table 10.7: Construction Magnitude of impact

Magnitude of impact	Construction noise level	Construction traffic increase in BNL	Construction vibration level
Major	Above or equal to the SOAEL +5.0 dB	Greater than or equal to +5.0 dB	Above or equal to 10 mms ⁻¹ PPV
Moderate	Above or equal to the SOAEL and below +5.0 dB	Greater than or equal to +3.0 dB and less than +5.0 dB	Above or equal to the SOAEL and below 10 mms ⁻¹ PPV
Minor	Above or equal to the LOAEL and below the SOAEL	Greater than or equal to +1.0 dB and less than +3.0 dB	Above or equal to the LOAEL and below the SOAEL
Negligible	Below LOAEL	Less than +1.0 dB	Below LOAEL

10.4.20 The advice in DMRB states that the sudden change in traffic noise levels on diversion routes as a result of night-time closures “*is highly likely to cause disturbance to receptors next to (within 25 m of) the road*”. However, as discussed in paragraph 10.4.7 the ECI has advised that no road closures/diversions are anticipated at this stage which will exceed the duration criteria detailed below. Therefore, no further assessment of the impact of night-time diversions has been completed.

10.4.21 With regards to duration DMRB states that construction noise, construction traffic noise or construction vibration shall constitute a significant effect where a major or moderate magnitude of impact will occur for a duration of:

- 10 or more days (or evenings/weekends or nights) in any 15 consecutive days; or
- more than 40 days (or evenings/weekends or nights) in any 6 consecutive months.

10.4.22 Given that the details of the nature, timing and duration of the construction activities will not be fully understood before the detailed design stage, a conservative approach has been adopted and all the identified levels at or above the SOAEL (i.e. moderate or major impacts) are assumed to be at risk of exceeding the duration criteria.

Operational traffic noise

10.4.23 Noise from a flow of road traffic is generated by both the vehicle engines and the interaction of tyres with the road surface. The traffic noise level at a receptor, such as an observer at the roadside or residents within a property, is influenced by a number of factors including traffic flow, speed, composition (percentage of HDVs), road gradient, the type of road surface, the distance from the road and the presence of any obstructions between the road and the receptor.

10.4.24 Noise from a stream of traffic is not constant, but to assess the traffic noise impact a single figure estimate of the overall noise level is necessary. The index adopted by the UK Government in CRTN to assess traffic noise is $L_{A10,18h}$. This value is determined by taking the highest 10% of noise readings in each of the 18 one-hour periods between 06:00 and 00:00, and then calculating the arithmetic mean.

10.4.25 CRTN provides the standard methodology for predicting the $L_{A10,18h}$ road traffic noise level. Noise levels are predicted at a point measured 1 m horizontally from the external façade of buildings. DMRB LA 111 provides some additional guidance on the application of the CRTN methodology, which is incorporated into the predictions.

10.4.26 Although the main focus of the assessment is on daytime impacts, DMRB LA 111 also requires an assessment of night-time traffic noise levels using the parameter L_{night} , outside, which is the traffic noise level over the period 23:00 to 07:00. However, this

parameter is not calculated by the standard CRTN methodology. Three methods for calculating night-time traffic noise levels have been developed by the Transport Research Laboratory (TRL) (Ref 10.19). The most widely used, and the one employed for this assessment, is 'Method 3' which factors the $L_{\text{night, outside}}$ from the $L_{A10,18h}$, based on the typical diurnal pattern of traffic flows in the UK.

- 10.4.27 The CRTN methodology applies a 'low flow' correction between 18-hour vehicle flows of 1,000 and 4,000. The low flow correction procedure amplifies the impact of changes in traffic flows which are already low, particularly at receptors very close to the road. The 1,000 18-hour flow cut off is the lower limit of the reliability of the CRTN prediction methodology.
- 10.4.28 Predicted daytime and night-time traffic noise levels within 600 m of the Scheme and existing roads physically changed or bypassed by the Scheme have been generated using noise modelling software. Predictions are carried out for the Scheme opening year assumed in the traffic modelling (2024) and the future assessment year 15 years later (2039). The model is based on traffic data generated by the Paramics Discovery microsimulation traffic model of the Scheme and the surrounding area, operated by SYSTRA on behalf of OCC. The noise model also includes the ground topography, ground type and buildings to form a 3D representation of the study area.
- 10.4.29 Different façades of the same property can experience different changes in traffic noise level depending on their orientation to the noise source. DMRB LA 111 requires that the assessment is based on the façade which experiences the greatest magnitude of noise change (beneficial or adverse). Where this is equal on more than one façade, the façade experiencing the highest do-something traffic noise level is chosen.
- 10.4.30 For other road links more remote from the Scheme i.e. outside the 600 m study area, DMRB LA 111 recommends an assessment based on the change in the CRTN BNL i.e. the traffic noise level at 10 m from the kerb, taking into account the flow, composition, speed and road surface. The presence of potentially sensitive receptors within the 50 m study area of such links is also determined.
- 10.4.31 The approach to road surfacing and its effects on traffic noise levels as set out in DMRB LA 111 has been adopted in the assessment. Low noise surfacing is proposed on key sections of the Scheme where it is in close proximity to sensitive receptors. However, the approach adopted in DMRB LA 111 is to only consider the benefits of low noise surfacing at speeds of ≥ 75 km/hr. Speeds of ≥ 75 km/hr are only anticipated on limited sections of the Scheme. Research confirms there is not a sharp cut-off at 75 km/hr in terms of the benefit of low noise surfacing, some benefits compared to standard Hot Rolled Asphalt (HRA) are achieved at lower speeds, with the benefit decreasing as the speed decreases. Therefore, whilst the results reported in the chapter are based on the adoption of the DMRB LA 111 methodology, a sensitivity test to demonstrate the likely benefit of the proposed adoption of low noise surfacing on selected sections of the Scheme has been completed using the methodology set out in the 2018 IOA paper 'Road Surface Corrections for Use with CRTN' (Ref 10.20). The results are detailed in Appendix 10.5 and discussed in Section 10.10.
- 10.4.32 As required by DMRB LA 111, a preliminary indication of any properties likely to qualify under the Noise Insulation Regulations is provided in the assessment. A full assessment will be completed once the detailed design of the Scheme is finalised and in accordance with the timescales set out in the Regulations.
- 10.4.33 The results of the assessment include noise mitigation measures embedded into the Scheme design e.g. through the choice of horizontal and vertical alignment, and

additional mitigation measures proposed, such as noise barriers, as detailed in Section 10.9.

10.4.34 The SOAEL and the LOAEL for road traffic noise used in this assessment are detailed in Table 10.8, as defined in DMRB LA 111. No special circumstances have been identified for the Scheme which suggests an alternative SOAEL or LOAEL should be adopted.

Table 10.8: Traffic noise SOAEL and LOAEL for all receptors

Time period	SOAEL	LOAEL
Daytime	68 dB $L_{A10,18h}$ (façade)	55 dB $L_{A10,18h}$ (façade)
Night	55 dB $L_{night,outside}$ (free-field)	40 dB $L_{night,outside}$ (free-field)

10.4.35 For daytime, the SOAEL is set at 68 dB $L_{A10,18h}$ (façade), which is consistent with the daytime trigger level in the Noise Insulation Regulations (Ref 10.3). The Noise Insulation Regulation threshold has a history of use in UK noise policy as it has previously been incorporated into planning guidance on the acceptability of sites for new residential developments. It is the external level which corresponds to an internal level, with a closed single glazed window, which will meet the internal daytime criteria of 35 dB $L_{Aeq,16h}$ specified in BS 8233:2014 ‘Guidance on sound insulation and noise reduction for buildings as desirable for resting in living rooms’ (Ref 10.21). It also correlates well with the results of Defra Study NANR316 (Ref 10.22) and is supported by the guidance in the Professional Practice Guidance: Planning and Noise (ProPG) produced by the Association of Noise Consultants, Institute of Acoustic and Chartered Institute of Environmental Health (2017) (Ref 10.23).

10.4.36 The daytime LOAEL is set at 55 dB $L_{A10,18h}$ (façade), which is comparable with 50 dB $L_{Aeq,16h}$ (free field), as set out in the guidance provided in the 1999 World Health Organisation (WHO) Guidelines for Community Noise (Ref 10.24) regarding the onset of moderate community annoyance. The WHO published the Environmental Noise Guidelines for the European Region in 2018 (Ref 10.25) which provides guidelines for specific noise sources including road traffic. The 2018 WHO Guidelines suggests a recommended 53 dB L_{den} (free field) for road traffic noise (note L_{den} correlates approximately to $L_{A10,18h}$) based on a 10% risk of being Highly Annoyed. The 2018 WHO guidelines state they are “*not meant to identify effect thresholds*”. Instead, they are based on the “*smallest relevant risk increase*” for various effects, and therefore lie slightly above the LOAEL. On this basis a LOAEL of 55 dB $L_{A10,18h}$ (free field) is consistent with the latest WHO Guidelines.

10.4.37 For night-time, the SOAEL is set at 55 dB $L_{night,outside}$ (free field) this corresponds to an internal level, with a closed single glazed window, which will be slightly below the night time criteria of 30 dB $L_{Aeq,8h}$ specified in BS 8233 as desirable for sleeping in bedrooms. It also correlates well with the results of Defra Study NANR316 and is supported by the ProPG guidance. The WHO 2009 Night Noise Guidelines for Europe (Ref 10.26) explicitly identify the night-time LOAEL as 40 dB $L_{Aeq,8h}$ (free field). Therefore, this LOAEL has been adopted in the assessment. Levels between 40 and 55 dB are identified in the guidelines as where ‘adverse’ but not significant adverse, health effects are observed among the exposed population. 55 dB is identified in the guidelines as when the risk of cardiovascular disease increases.

10.4.38 The 2018 WHO Guidelines complement the WHO 2009 Night Noise Guidelines and suggest a recommended 45 dB L_{night} for road traffic noise based on a 3% risk of being Highly Sleep Disturbed. However, as discussed above the 2018 WHO guidelines state they are “*not meant to identify effect thresholds*”. Instead, they are based on the “*smallest relevant risk increase*” for various effects, and therefore lie slightly above the LOAEL, as explicitly defined in the WHO 2009 Night Noise Guidelines.

10.4.39 The operational road traffic noise SOAELs and LOAELs have been used successfully for numerous road schemes in recent years. The same approach to the setting of SOAELs and LOAELs the been adopted on other major infrastructure schemes such as the High Speed 2 rail project.

Operational significance of effect

10.4.40 DMRB LA 111 provides two classifications for the magnitude of the traffic noise impact of a proposed road scheme, as shown in Table 10.9. These relate to both short-term changes in noise levels (i.e. comparing traffic noise levels in the opening year with and without the Scheme) and long-term changes in noise levels (i.e. comparing traffic noise levels in the opening year without the Scheme with levels 15 years after opening with the Scheme in operation).

Table 10.9: Magnitude of traffic noise impacts

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

10.4.41 As required by DMRB LA 111, an initial identification of significant environmental impact assessment effects has been carried out based on the magnitude of change in traffic noise levels due to the Scheme in the short term in the opening year.

10.4.42 Negligible changes in the short term will not cause changes to behaviour or response to noise, and as such, will not give rise to significant effects. For minor, moderate and major changes DMRB LA111 outlines a range of additional factors which are considered in identifying significant effects:

- Where the magnitude of change in the short-term lies relative to the boundaries between the bands outlined in Table 10.9. In some circumstances a change within 1 dB of the top of the minor range may be appropriate to be considered a likely significant effect. Conversely a change within 1 dB of the bottom of the moderate range, may in some circumstances be more appropriate to be considered as not a likely significant effect.
- If the magnitude of change in the long-term is different to that in the short-term. If the short-term change is minor (not significant), but the long-term change is moderate (significant) it may be more appropriate to be considered as a likely significant effect. Conversely, a smaller magnitude of change in the long term compared to the short term may indicate that it is more appropriate to be considered as not a likely significant effect.
- The absolute noise levels relative to the SOAEL. If the DS traffic noise levels are high i.e. above the SOAEL, a traffic noise change in the short-term opening year of 1.0 dB or more may be more appropriate to be considered as a likely significant effect.
- The location of noise sensitive parts of a receptor. A receptor may contain areas which are more or less sensitive than others e.g. office spaces or kitchens in a school will be considered less sensitive than classrooms. Or a residential property may have no windows/ doors on the worst affected facade. Alternatively, a receptor may be particularly vulnerable, such as a school for hearing impaired children, or

a residential property may have most of the windows/ doors on the most affected façade.

- The acoustic context. If a proposed scheme changes the acoustic character of an area. If a scheme introduces road noise into an area where road noise is not currently a major source, it may be appropriate to conclude a minor short-term change is a likely significant effect.
- The likely perception of a traffic noise change. If a proposed scheme results in obvious changes to the landscape or setting of a receptor it is likely the traffic noise level changes will be more acutely perceived, and it may be more appropriate to conclude a minor short term change is a likely significant effect. Conversely if a proposed scheme is not visible it can be more appropriate to conclude a moderate change is not a likely significant effect.

10.4.43 With regard to significant policy effects, the traffic noise SOAEL and LOAEL have been used to consider how the Scheme complies with the policy aims detailed in the NPSE as referenced by the NPPF, within the context of government policy on sustainable development, namely to:

- avoid significant adverse impacts on health and quality of life (i.e. reduce traffic noise levels at receptors to below the SOAEL);
- mitigate and minimise adverse impacts on health and quality of life (i.e. reduce traffic noise levels at receptors which are between the LOAEL and the SOAEL); and
- where possible, contribute to the improvement of health and quality of life.

10.4.44 To maintain consistency with the DMRB LA 111 the terminology used throughout this chapter, the compliance with policy discussion refers to adverse effects rather than impacts.

10.4.45 Section 10.9 sets out what mitigation measures have been incorporated into the Scheme to meet these aims, and also any measures which were not considered reasonable or practical to include. How the Scheme complies with them are discussed for both construction and operation in Section 10.10.

10.4.46 As set out in DMRB LA 111 the SOAEL is the level at which significant adverse effects on health and quality of life occur and the LOAEL is the level above which adverse effects on health and quality of life can be detected. Therefore, for the purpose of testing compliance with the NPSE/NPPF, it is necessary to demonstrate that all sustainable mitigation measures have been applied to avoid exceedances of the SOAEL and to mitigate and minimise exceedances of the LOAEL.

10.4.47 With regard to identifying sustainable noise mitigation measures, various factors have been considered – these include the nature/source of the adverse effect to be mitigated, the circumstances of the receptor, the cost versus the benefit, engineering practicality, safety considerations, generation of knock-on impacts (such as access issues, vegetation clearance, ecological impacts, landscape and visual impacts), and consultation and stakeholder engagement responses regarding the Scheme.

10.4.48 The compliance with policy discussion complements, but is separate to, the environmental impact assessment.

10.5 Assessment assumptions and limitations

10.5.1 The following assumptions or limitations are relevant to this noise and vibration impact assessment:

- Speed pivoting has not been applied to the traffic data used in the noise assessment. The Didcot Garden Town Paramics microsimulation traffic model, operated by SYSTRA on behalf of OCC, was validated against journey time data to WebTAG Unit M3.1 guidance (Ref 10.27) when built in 2017.
- A comparison of predicted traffic noise levels from the Scheme opening year to 15 years after opening, without the Scheme, has not been possible. This is normally completed as part of the assessment of baseline conditions and illustrates what is likely to happen over the long term if the Scheme is not built. OCC's traffic consultants have advised that due to the large number of developments in the area the traffic model reaches gridlock before the future assessment year in 2039, when the Scheme is not included. Therefore, it is not possible to provide meaningful traffic data for the without Scheme 2039 future assessment year scenario. As a consequence, only the long term change between the opening year and 15 years after opening with the scheme in place is included in the assessment. Therefore, when considering these results it must be borne in mind that some change in traffic noise levels will occur regardless of the Scheme. For example, on existing roads where an increase in traffic noise is predicted some of the increase may occur even without the Scheme.
- The assessment is based on the 2nd draft of the Scheme preliminary design.
- Two sections of the Scheme on the A4130 widening part of the Scheme are assumed to be in place in the opening year without Scheme scenario. These sections will be constructed by the Valley Park developer and consist of the western access signalised junction, and the Valley Park Link Road to the south east of the existing A4130, both of which will form accesses into the development site.
- A number of road links have very low flows, below the lower cut off of the CRTN prediction methodology of 1,000 vehicles over an 18-hour day in some scenarios. These mainly relate to minor side roads away from the Scheme e.g. in Didcot, or minor rural roads, or access routes into new developments which have not yet been constructed. As a conservative approach these road links have been retained in the traffic noise predictions. Road links with a flow of less than 1,000 vehicles in any scenario are not included in the identification of affected routes outside the noise calculation study area.
- The information on existing road surfacing on the A34 is based on the data in the Highways England Pavement Management System (HAPMS) database (formerly Highways Agency). It is assumed that this remains unchanged in the opening year (2024) and future assessment year (2039) both with and without the Scheme and following the proposed changes to Milton Interchange, see below.
- Minor realignment of some areas of the A34 Milton Interchange junction is proposed to be carried out between the 2024 and 2039 assessment years. This does not form part of the Scheme. No 3D scheme design of the proposed revised junction is available therefore the realigned areas of the junction have been set on the existing ground heights. As this location is relatively remote from the Scheme, the changes are minor, and the changes are proposed both with and without the Scheme in place, this is not considered to significantly affect the assessment.
- The information on existing road surfacing on OCC roads is based on the data provided by OCC. It is assumed that this remains unchanged in the opening year (2024) and future assessment year (2039) both with and without the Scheme. Where no information is available on the existing road surfacing, standard hot rolled asphalt has been assumed in all scenarios.
- Road surfacing corrections as follows have been assumed for the assessment reported in Section 10.10, are based on the requirements of DMRB LA 111:

- Standard Hot Rolled Asphalt (HRA), Dense Bitumen Macadam, Close Graded Macadam and Surface Dressing (i.e. ‘standard’ surfacing):
 - Speed <75 km/hr: -1.0 dB.
 - Speed ≥75 km/hr: -0.5 dB.
- Thin surfacing / Stone Mastic Asphalt (SMA) (i.e. low noise surfacing):
 - Speed <75 km/hr: -1.0 dB.
 - Speed ≥75 km/hr: -3.5 dB.
- As set out in paragraph 10.4.31 a sensitivity test to demonstrate the likely benefit of low noise surfacing as proposed on key sections of the Scheme has been completed using the methodology set out in the 2018 IOA paper ‘Road Surface Corrections for Use with CRTN’ (Ref 10.26).
- OS Address Base Plus data detailing building usage and OS Building Height Attribute data have generally been used as provided. However, the heights of residential buildings have been standardised, and a check for obvious errors (such as buildings with 0 m height) has been completed using information available online, and reasonable adjustments made accordingly.
- The construction assessment is based on the construction information currently available, with details being provided by the ECI. As with all construction assessments, the nature, timing and duration of the construction activities will not be fully understood before the detailed design stage when the construction methods and programme will be determined. Whilst the details may be subject to change, the overall picture of significant construction effects is unlikely to be materially worse, and therefore the conclusions of the assessment will not be affected. For example, the appointed ECI has adopted a conservative approach with regard to what works may be carried out during the evening and night. All tie-ins are assumed to occur during the evening/night, not just those at the junction of the Scheme with main roads (A4130, A415, B4016 and B4015) i.e. tie-ins to local accesses, footways etc. At the detailed design stage, it is likely to be determined that some of these tie-in works could be completed during the day. Given the robust approach adopted in the assessment, the number of significant effects may well be lower than as reported herein, thus ensuring the planning process is based on a conservative approach.
- The construction assessment assumes all piling will be completed using rotary bored methods. No impact or vibratory piling is currently proposed.
- The construction information provided by the appointed ECI is based on a five-day working week. It is likely that the Principal Contractor (PC) will adopt the Local Authority standard working hours which include Saturday morning. This results in the assessment being slightly more conservative in terms of the number of vehicle movements on the haul road and construction traffic off site, as it is likely to be spread over a slightly longer working week.
- A large number of new developments are proposed in the vicinity of the Scheme, including the extensive Valley Park development to the south of the A4130, and land at Culham Science Village located north of the proposed new A415 Abingdon roundabout. Further details on other developments are provided in ES Chapter 17: Assessment of Cumulative Effects. These developments have the potential to introduce new sensitive receptors and affect the propagation of traffic noise from the Scheme, as the closest new buildings to the road will shield existing and proposed buildings further back. However, building layouts of these developments are not available, and therefore they cannot be included in the operational traffic noise predictions. This is a worst-case approach with regard to the impact at existing receptors which will benefit from some shielding provided by the new

developments once constructed. The potential impacts at receptors within the new developments are discussed in Section 10.10 based on the noise change grid maps.

- Out of necessity, the baseline noise monitoring survey was completed during the coronavirus pandemic. However, the monitoring was completed in September and October 2020 when travel restrictions in England were relaxed, to minimise any impacts due to reduced travel. As set out in Section 10.3 the scope and methodology of the baseline survey were discussed in advance with the Local Authority.

10.6 Study area

Construction

- 10.6.1 The study area for the quantitative assessment of construction phase noise and vibration impacts focuses on 21 potentially sensitive receptors, which includes those closest to the Scheme construction works. Receptors have been chosen based on their potential sensitivity (as defined in DMRB LA 111) and receptor proximity to the various works. The selected receptors are also representative of neighbouring properties in their vicinity. By focussing on a selection of the closest identified potentially sensitive receptors, the reported impacts are, therefore, typical of the worst affected receptors such that all potentially significant effects have been identified.
- 10.6.2 As detailed in DMRB LA 111, it is standard practice to consider noise impacts from construction up to a distance of approximately 300 m from the works and vibration impacts from construction works up to a maximum distance of approximately 100 m from the works, as no impacts will be anticipated beyond these distances.
- 10.6.3 A study area consisting of sensitive receptors along existing roads affected by construction traffic, has been adopted.

Operation

- 10.6.4 DMRB LA 111 defines the study area for the assessment of operational phase noise impacts as consisting of an area within 600 m of the Scheme and existing routes bypassed by the Scheme, plus 50 m each side of existing roads that are predicted to be subject to a change in traffic noise level as a result of the Scheme of:
- 1.0 dB or more in the short-term (Do-Minimum (DM) i.e. without the Scheme opening year to Do-Something (DS) i.e. with the Scheme opening year); or
 - 3.0 dB or more in the long-term (DM opening year to DS 15 years after Scheme opening).
- 10.6.5 For the purposes of the assessment, these roads are defined as ‘affected routes’ and are identified by the analysis of the operational phase traffic data. The identification of affected routes considered all roads with 18-hour (06:00 - 00:00) weekday traffic flows above the lower cut off of the CRTN prediction methodology in all scenarios.
- 10.6.6 Analysis of the traffic data identified two potentially significant affected routes which extend outside the 600 m study area and are outside the extents of the Scheme and existing routes bypassed by the Scheme. Both are at the north-east end of the Scheme:
- A415 Abingdon Road between Clifton Hampden and the A4074; and
 - B4015 Oxford Road between the end of the Scheme and the A4074.

- 10.6.7 The standard DMRB approach is to complete detailed traffic noise predictions for those areas of an affected route which fall within 600 m of the Scheme and/or routes bypassed by the Scheme. With a more proportionate approach adopted for those areas of an affected route which fall outside this area, based on estimating the CRTN BNL with and without the Scheme and completing a count of the number of dwellings and other sensitive receptors within 50 m.
- 10.6.8 Adopting this approach will result in the south-west end of the two selected affected routes being included in the detailed noise predictions and the remainder included in BNL approach. However, in order to ensure a consistent approach for all receptors located on these routes, and ensure the most detailed assessment of the impacts was completed, the study area of the detailed traffic noise predictions has been extended to include the full length of these routes.
- 10.6.9 With regard to routes bypassed by the Scheme, there is not a single dominant route, therefore existing routes to the west of the Scheme through Sutton Courtenay / Culham and to the east through Long Wittenham have been included.
- 10.6.10 The 600 m calculation area is illustrated in Figure 10.1, including the two affected routes at the north-east end of the Scheme and the routes bypassed by the Scheme.
- 10.6.11 An estimated total of 5,936 residential properties and 36 non-residential potential sensitive premises are located within the study area.

10.7 Baseline conditions

Potentially noise sensitive receptors

- 10.7.1 DMRB LA 111 lists residential properties, educational buildings, medical buildings, community facilities (such as places of worship), END quiet areas or potential END quiet areas, designated ecological sites (such as SAC, SPA and SSSI), cultural heritage assets (such as scheduled monuments (SM) – discussed in ES Chapter 7: Cultural Heritage) and public rights of way (PRoW) as potentially sensitive to noise and/or vibration. Commercial uses such as offices and industrial premises are not normally considered to be noise or vibration sensitive. Sensitive receptors within the study area that are most likely to be impacted by the Scheme have been determined from OS mapping and discussions with OCC, SODC and VoWHDC.
- 10.7.2 Figure 10.1 illustrates the 600 m operational noise study area and associated receptors.
- 10.7.3 No END quiet areas or potential END quiet areas have been identified in the study area, similarly no ‘tranquil areas’ as referred to in the NPPF have been identified. However, publicly accessible open spaces, which may be prized for their recreational and amenity value, have been identified based on the national OS green space and Parks and Gardens data sets and Local Authority ‘accessible countryside’ areas.
- 10.7.4 The southern section of the Scheme follows the route of the existing A4130 and runs directly adjacent to the Great Western mainline railway. To the north of the A4130 and the railway is a range of commercial premises within Milton Park Estate, which is a Science Vale Enterprise Zone (EZ) Area, including a number of potentially noise sensitive uses such as a nursery, education centre and therapy centre. The edge of the residential area of Milton Heights including a school, which falls within the 600 m study area, south of the A34. Other receptors in this area include two hotels close to Milton Interchange (the only non-residential sensitive receptors identified as being potentially sensitive at night), and the individual property New Farm to the south of the A4130. The recently constructed Great Western Park housing development is

located to the south-east of the Scheme before it crosses the A4130 and railway and includes two schools and two community centres in the study area. The majority of the existing open land between Milton interchange and Great Western Park is allocated for development, including a commercial development site adjacent to the Premier Inn and the extensive Valley Park development which is predominantly residential. Based on the current indicative land use plan the access road within the development adjacent to the Premier Inn, will run next to the south side of the hotel.

- 10.7.5 The Valley Park development includes the area of land between the closest existing housing in Great Western Park and the Scheme - based on the current land use masterplan for the Valley Park development this area is allocated for housing and an area of open space. These future houses will provide some shielding of noise from the Scheme at the existing houses in Great Western Park. The western access signalised junction must be built before any houses are occupied, a limited number of properties can then be occupied before the Valley Park Link Road to the south east of the existing A4130 is in place, though no details on their location is currently confirmed. Therefore, the majority of the development will be in place after the Scheme is open. As set out in Section 10.5, the two sections of the Scheme which form accesses into the Valley Park site will be constructed by the Scheme opening year.
- 10.7.6 The Scheme crosses over the A4130 and the Great Western mainline railway via the new Didcot Science Bridge and runs to the west of the Didcot-Oxford rail line (Cherwell Valley Line). The Scheme runs through the former Didcot A Power Station site and the Didcot Growth Accelerator EZ Area, before progressing in a north-easterly direction to re-join the route of the existing A4130. Immediately to the south is the Southmead Industrial Estate and a sewage works. Such commercial premises are not considered to be sensitive in terms of noise or vibration. The North East Didcot proposed housing area is located to the east, to the north of the northern edge of the existing Didcot residential area. This area of existing housing is included in the study area as it is located along the eastern existing route bypassed by the Scheme, a number of non-residential sensitive receptors, including a health centre and school, are also located in this residential area.
- 10.7.7 The Scheme progresses north on an existing minor road past two individual properties Hill Farm and Hartwright House, and a Wood Recycling business. Some uncertainty exists over whether these will remain residential in the future due to the proposed D-Tech commercial development. Hill Farm is within the development boundary and Hartwright House just outside the boundary. The access route (haul road) to the FCC landfill and Hanson quarry sites passes to the east of these properties and to the rear of Level Crossing Cottage at the southern end of Appleford. The Didcot-Oxford rail line (Cherwell Valley Line) also passes to the east of Hill Farm and Hartwright House and adjacent to the front of Level Crossing Cottage. A spur from the rail line extends to the west onto the Hanson site as a private sidings.
- 10.7.8 Residential properties, a village hall and a place of worship are located in Appleford which is located beyond the Didcot-Oxford rail line (Cherwell Valley Line) to the east of the Scheme. North of Appleford the Scheme crosses the River Thames and is not close to any potentially sensitive buildings, the eastern edge of Sutton Courtenay is over 650 m to the west and Zouch Farm over 500 m to the east. The Europa School is located to the north-west of the northern end of the Didcot to Culham River Crossing section of the Scheme on the A415, over 300 m from the closest approach of the Scheme.
- 10.7.9 A small number of residential properties are located around Culham Railway station to the west of the Clifton Hampden Bypass section of the Scheme. Culham Science Centre Nursery and Preschool is located off the new roundabout at the south-western

end of the bypass. A small number of properties are located to the south of the A415 and two properties (Fullamoor Cottages) between the A415 and the Scheme. The bypass runs to the south of the Culham Science Centre and to the north of a sewage works. Discussions between OCC and Culham Science Centre have confirmed they do not have any specific concerns regarding noise or vibration during the construction or operation of the Scheme. The north-eastern end of the Scheme passes to the north of residential properties in Clifton Hampden village, with two individual properties to the north of the eastern end of the Scheme (The Coppice).

- 10.7.10 The western existing route, which is bypassed by the Scheme, passes through the villages of Sutton Courtenay and Culham with residential properties and several non-residential sensitive receptors including schools, a village hall, and a place of worship.
- 10.7.11 The eastern existing route, which is bypassed by the Scheme, passes through the villages of Long Wittenham and the centre of Clifton Hampden both of which contain residential properties and a number of non-residential sensitive receptors, including schools, village halls, places of worship, and the Pendon Museum in Long Wittenham.
- 10.7.12 A small number of individual properties are located on the affected route along the B4015 to the north east of the scheme at Rough Lodge and Golden Balls. Residential properties in the village of Burcot are located on the affected route along the A415 to the east of the Scheme.
- 10.7.13 Three scheduled monuments in the vicinity of Appleford are located within the study area. A scheduled monument area to the east of Clifton Hampden Village is also located on the edge of the study, and a further scheduled monument site is located to the south of Sutton Courtenay. No designated ecological sites (SSSI, SPA, or SAC) are located within the study area. The edge of the North Wessex Downs Area of Outstanding Natural Beauty (AONB) just falls within the very eastern edge of the study area. A small part of the Nuneham Courtenay grade I listed registered park/garden falls partly within the northern part of the study area, mainly along the B4015 affected route. A grade II listed registered park/garden falls within the study area, at Sutton Courtenay Manor along the western existing route bypassed by the Scheme. Several public open green spaces are designated within or partly within the study area, including allotments, playing fields and public parks. These are largely concentrated in residential and commercial areas. Two areas designated as accessible countryside fall completely or partly within the study area. Clifton Meadow is located along the A415 affected route east of Clifton Hampden. Ladygrove Park & Lakes is located in the residential area on the northern edge of Didcot.
- 10.7.14 Within the study area, PRowS are located in residential areas, commercial areas, across agricultural land, and adjacent to the River Thames. In some places the Scheme crosses existing PRowS, including the Thames Path which passes underneath the Didcot to Culham River Crossing section of the Scheme.
- 10.7.15 Two 'Noise Important Areas' (NIA) (those areas most exposed to noise) for road noise and one for rail noise were identified in round three of the DEFRA noise mapping in the study area. The two road noise NIAs are located on the A415 in Clifton Hampden to the west of the junction with Watery Lane (ID 13243) and on the A34 to the south of the junction with the A4130 at Milton Interchange (ID 4187). Responsibility for assessing the potential for implementing cost effective noise mitigation measures within road NIAs rests with either Highways England or the local Highways Authority, depending on who is responsible for the road. Regarding the NIA on the A34, responsibility lies with Highways England, the NIA on the A415 is the responsibility of OCC. The rail NIA (ID 564) encompasses two houses at the southern end of

Appleford and is the responsibility of the DfT and the rail operator. As this NIA relates to rail noise it is not considered further in the assessment.

Baseline noise survey

10.7.16 A baseline noise survey was completed in September and October 2020. Noise monitoring locations are detailed on Figure 10.1. These locations were selected to focus on some of the closest receptors to the Scheme and were agreed with the Local Authorities.

10.7.17 The majority of the locations consisted of long-term unattended monitoring over a week. At one location (M1 – Premier Inn) which was a secure location at which equipment could be left was not available therefore a single monitoring session was completed in accordance with the CRTN shortened measurement procedure. A summary of the key noise monitoring results and a comparison with the predicted traffic noise levels are provided in Table 10.10. Further details are provided in Appendix 10.2.

Table 10.10: Baseline noise monitoring 2020 (for locations refer to Figure 10.1)

Ref.	Location	Short-term (ST)/ Long-term (LT)	Measured	Predicted
			L _{A10,18h} dB	L _{A10,18h} dB
M1	Premier Inn, A4130	ST	64.4	62.7
M2	New Farm, A4130	LT	61.5	60.6
M3	Taylor Wimpey Site (Great Western Park)	LT	53.4	52.6
M4	Hartwright House (south of Appleford)	LT	53.5	47.4
M5	Main Road, Appleford	LT	50.5	50.0
M6	Bridge House, Appleford	LT	49.5	51.8
M7	Zouch Farm, A415	LT	51.8	49.9
M8	Fullamoor Farm, A415	LT	47.6	45.3
M9	Fullamoor Cottages, A415	LT	50.8	51.8
M10	Woodfield House, Clifton Hampden	LT	47.6	49.4
M11	Europa School, A415	LT	56.2	58.4
M12	Appleford Crossing, Appleford	LT	52.0	45.4

10.7.18 Table 10.10 indicates that the highest measured and predicted noise levels were recorded at locations close to the existing A4130. The four locations on the A415 were all set back from the road, the closest to the road being M11. At M8 and M9 the monitoring position was at the rear of the property, shielded from the A415.

10.7.19 At all the monitoring locations except M4 and M12 the predicted L_{A10,18h} traffic noise levels match well with the measured levels, within 3 dB, supporting on-site observations that road traffic noise is the dominant noise source in the study area. Train noise, industrial noise, vegetation rustling in the wind, birdsong and occasional aircraft overhead were also observed during the survey. The time histories in Appendix 10.2 also indicate some noisy events localised to the monitoring location occurred at most sites, for example, around lunchtime at the Europa School. At M4, M6, and in particular M5 and M12 regular train passbys on the Didcot to Oxford rail line (Cherwell Valley Line) are apparent. At M4, M5 and M12 the rail line also includes movements to the Hanson site private rail sidings. The short duration of some of the train passbys, means they do not have a large effect on the measured L_{A10,18h} values.

- 10.7.20 At M4 and M12 the average measured levels are around 6 dB higher than the levels predicted solely due to road traffic. At both locations the rail line, in particular freight trains are a factor however, as indicated by the results at M5 which match more closely, this is unlikely to be the main reason for the difference. Both M4 and M12 are located close to the access route for HDVs into the FCC landfill and Hanson quarry site, in particular at M12 the route is close to the rear of the property where the monitoring was carried out. Industrial type noise e.g. clanks and bangs were also occasionally noted at M4 and M12. At M4 occasional noise from the Wood Recycling business to the south was noted while on site. The FCC landfill and Hanson quarry sites are both also potential sources of occasional industrial type noise.
- 10.7.21 Overall, the comparisons provide confidence that the noise model developed to estimate the traffic noise impacts of the Scheme is robust with regards to the contribution from road traffic noise. The baseline survey also highlights the influence of other non-public road traffic related noise sources in some locations along the Scheme, in particular south of Appleford.

Construction year baseline (2023)

- 10.7.22 The baseline detail as reported in the section above describes the noise climate in 2020, the year that the baseline noise survey was undertaken, and for which baseline traffic data is available. The section below reports anticipated baseline conditions in 2024, the Scheme opening year assumed in the traffic modelling.
- 10.7.23 Works associated with the Scheme are anticipated to start in 2023, subject to securing planning permission.
- 10.7.24 As detailed in ES Chapter 17: Assessment of Cumulative Effects, several allocated development projects are ongoing, or are planned, that have the potential to change baseline conditions. The impact of these developments in terms of traffic flows are included within the traffic data used in the noise assessment.
- 10.7.25 As detailed in Section 10.4, ambient noise levels used to set significance criteria in the construction noise assessment are based on 2020 traffic data. The construction traffic assessment compares the impact of the construction traffic with the 2020 and 2024 baseline traffic data.

Opening year baseline (2024)

- 10.7.26 As detailed in ES Chapter 17: Assessment of Cumulative Effects, a number of additional allocated development projects in the area will have been completed by 2024. These are captured by the 2024 traffic data used in the operational traffic noise assessments.
- 10.7.27 Figure 10.2 illustrates the predicted traffic noise levels in the study area in the Do-Minimum 2024 scenario. This plot is based on free-field traffic noise levels at first floor level (4.0 m above ground) using a 10 m x 10 m grid and is provided for illustration purposes. As identified above, the baseline survey highlighted that in some locations along the Scheme other non-public road traffic related noise sources are present, such as rail noise.

Future assessment year baseline (2039)

- 10.7.28 As detailed in ES Chapter 17: Assessment of Cumulative Effects, several additional allocated development projects in the area will have been completed by 2039. These are captured by the 2039 traffic data used in the operational traffic noise assessments.

10.7.29 As set out in Section 10.5, a comparison of predicted traffic noise levels from the opening year to 15 years after opening, without the Scheme, is normally completed, to illustrate what is likely to happen over the long term if the Scheme is not built. This normally shows a slight increase in traffic noise levels due to the typical gradual increase in traffic over time. However, SYSTRA, who operate the Paramics traffic model on behalf of OCC, have advised that due to the large number of developments in the area the traffic model reaches gridlock before the future assessment year in 2039, when the scheme is not included. Therefore, it is not possible to provide meaningful traffic data for the Do-Minimum future assessment year scenario. As a consequence, only the long-term change between the opening year and 15 years after opening with the scheme in place is included in the assessment. Therefore, when considering these results, it must be borne in mind that some change in traffic noise levels will occur regardless of the Scheme. For example, on existing roads where an increase in traffic noise is predicted some of the increase may occur even without the Scheme.

10.8 Potential impacts

10.8.1 Mitigation measures incorporated in the Scheme design and measures to be taken to manage Scheme construction are set out in Section 10.9. Prior to implementation of defined mitigation measures, the Scheme has the potential to affect noise and vibration levels during construction, and noise levels once it is in operation – potential impacts are detailed in the sections below.

Construction

10.8.2 The main activities that will take place during the Scheme construction phase include site clearance, earthworks bridge construction and road construction works. These construction activities have the potential to result in temporary noise impacts at the receptors closest to the works.

10.8.3 The potential for temporary construction vibration impacts is dependent on the need for construction activities which are a potentially significant source of vibration, such as earthworks and pavement works (roads, footpaths etc) using vibratory rollers. Piling will be required at the three new bridges. Based on the information provided by the ECI, rotary bored piling is proposed for all piling works on the Scheme. Vibration associated with rotary bored piling is minimal.

10.8.4 Construction traffic can have a temporary impact on sensitive receptors located along existing roads used by these vehicles, as can night-time closures/diversions. The potential for construction traffic impacts is dependent on the volume and route of construction traffic generated by the works, and the volume and route of any diverted traffic. At this stage the ECI has advised that no road closures/diversions are anticipated beyond very short term works for a couple of days to tie in the Scheme to the existing road network.

Operation

10.8.5 The operation of the Scheme has the potential to result in both beneficial and adverse permanent traffic noise impacts. The Scheme will alleviate traffic flows on the existing routes to the east and west through the villages of Appleford, Sutton Courtenay / Culham and Long Wittenham, plus the A415 between the Culham Science Centre and the A4074 i.e. through Burcot and the centre of Clifton Hampden. Conversely, the Scheme increases traffic on the B4015 at the north-east end of the Scheme to the A4074. In addition, the offline sections of the Scheme where the route is not in close proximity to an existing road, in particular the Didcot to Culham River Crossing and Clifton Hampden Bypass, introduce a new noise source close to some receptors.

However, some of these receptors already experience noise from other sources which are not included in the noise model, such as the railway near Appleford.

- 10.8.6 A large amount of development is proposed in the area which will increase traffic flows on routes used to access these new developments.
- 10.8.7 The magnitude of operational traffic noise impacts at a receptor is dependent on a range of factors, including the traffic flow, composition, speed, road surface, ground topography, the presence of intervening buildings and structures, and the distance to the road.
- 10.8.8 In accordance with DMRB LA 111 operational vibration impacts are scoped out of the assessment as a maintained road surface will be free of irregularities as part of project design and general maintenance. Therefore, operational vibration does not have the potential to lead to significant adverse vibration effects.

10.9 Design, mitigation and enhancement measures

Embedded mitigation

- 10.9.1 The Scheme has been designed, as far as practicable, to avoid and minimise impacts and effects on receptors sensitive to noise through the process of design-development (see ES Chapter 3: Assessment of Alternatives) considering good design principles. Embedded mitigation is defined within the DMRB as '*design measures which are integrated into a project for the purpose of minimising environmental effects.*'

Construction

- 10.9.2 Construction of the Scheme will be subject to measures and procedures as defined within the Outline Environmental Management Plan (OEMP) for the Scheme (see Appendix 4.2). The OEMP includes a range of good practice measures associated with mitigating potential environmental impacts. The measures detailed within the OEMP will be developed into a Construction Environmental Management Plan (CEMP) by the selected construction contractor which will be implemented for the duration of the Scheme construction phase. As part of the CEMP a specific Noise and Vibration Management Plan (NVMP) will be developed.
- 10.9.3 The NVMP will include a range of industry standard best practice construction phase noise mitigation measures required during all works undertaken where there is a potential for adverse noise effects on sensitive receptors (e.g. residential properties, schools etc.). The NVMP will include relevant noise criteria, proposed surveys and a range of range of Best Practicable Means (BPM) associated with mitigating potential noise and vibration impacts. Such measures include:
- Implementation of a system of community engagement to communicate with local residents, parish councils etc. including online, a newsletter and works notices.
 - Implementation of a complaints management system to investigate any noise and vibration complaints and ensure appropriate action is taken as required.
 - Implementation of a noise insulation and temporary re-housing policy.
 - Selection of quiet and low vibration equipment and methodologies.
 - Selection of appropriate piling methods – at this stage, piling is envisaged to adopt rotary bored methods, no impact or vibratory piling is anticipated to be required.
 - Review of construction programme and methodology to consider low noise and low vibration methods (including non-vibratory compaction plant where required).

- Optimal location of equipment on site to minimise noise disturbance.
- The provision of acoustic enclosures around static plant, where necessary.
- Installation of operational traffic noise barriers as soon as is reasonably practicable in order to provide noise mitigation during the construction works.
- Use of less intrusive alarms, such as broadband vehicle reversing warnings.
- Compliance with working hours agreed with the Local Authority and set out in the OEMP
 - 07:30 – 18:00 Monday to Friday; and
 - 08:00 – 13:00 Saturday with no working on Sundays and Bank Holidays.
- Limiting out of hours works to those that cannot be reasonably carried out during the daytime.
- Designation and enforcement of appropriate routes for construction traffic (HDVs and staff) including restricting HDV movements, outside the immediate vicinity of the works, to the strategic highway network.

10.9.4 During the Scheme construction phase, surveys will be required which will include physical measurements and observational checks and audits to ensure that BPM are being employed at all times. The contractor will undertake, and report noise and vibration surveys as is necessary to ensure and demonstrate compliance with all noise and vibration commitments and the requirements of the NVMP. Proposals for all survey locations will be set out in the NVMP.

10.9.5 The survey and compliance assurance process will be set out in the NVMP. Site reviews will be logged, and any remedial actions recorded. Such checks will report:

- Compliance with hours of working.
- Presence of mitigation measures e.g. engine doors closed, air lines not leaking and site hoarding in place.
- Compliance with agreed working methods.
- Compliance with any specific requirements of the CEMP.

Operation

10.9.6 The alignment of the A4130 section of the Scheme closely follows the existing road for the majority of its length and is also adjacent to another significant noise source, namely the Great Western railway. Closely aligning with existing noise sources reduces the potential increase in noise levels due to the Scheme.

10.9.7 The Didcot Science Bridge passes through an industrial/commercial area where the surrounding land uses are not sensitive to road traffic noise. A short section is on the route of the existing A4130.

10.9.8 The Didcot to Culham River Crossing section of the Scheme has been relocated further west, away from Appleford and Zouch Farm, compared with the proposed alignment consulted on in 2018, see ES Chapter 3: Assessment of Alternatives for further details.

10.9.9 Similarly, in response to the 2020 public consultation, the eastern end of the Clifton Hampden Bypass section of the Scheme has been relocated slightly further north away from the village and the speed limit reduced from 60 mph to 50 mph. In addition, the originally proposed farm access underpass has been replaced with an at-grade

priority junction which allows the alignment of the Scheme to be constructed at a lower level. See ES Chapter 3: Assessment of Alternatives for further details.

Essential mitigation

Construction

10.9.10 There is potential for additional attenuation of noise from construction activities to be achieved through the use of localised temporary site hoardings or noise barriers. These have not been included in the assessment of construction noise in order to represent a worst-case scenario. BS 5228 (Ref 10.15) advises that such barriers can provide a reduction in noise levels of 5 dB when the top of the plant is just visible over the noise barrier, and 10 dB when the plant is completely screened from a receptor. The effectiveness of a noise barrier depends upon its length, effective height, position relative to the noise source and to the receptors, and the material from which it is constructed. Therefore, the potential attenuation provided by any such additional localised barriers cannot be quantified accurately at this stage. Proposals for the use of localised temporary site hoardings or noise barriers will be developed at the detailed design stage and implemented during the construction works. Based on the proximity of some of the works to sensitive receptors, temporary hoarding/barriers are likely to be essential in some locations.

10.9.11 The following mitigation is essential to minimise impacts from vibratory rollers:

- No operation of large vibratory rollers within 15 m of any building, 10 m of any building for medium rollers and 5 m of any building for small rollers, unless the vibration is turned off.

Operation

10.9.12 Following initial noise modelling of the Scheme, proposals for potential noise barriers and low noise surfacing were developed. With regard to noise barriers the proposals were developed in conjunction with the Scheme's landscape architect (see ES Chapter 8: Landscape and Visual Impacts) to achieve an overall balance of impacts. The following noise barriers / solid bridge parapets have been included within the Scheme design as illustrated on Figure 10.1 and detailed in the OEMP:

- 3.0 m high reflective noise barrier on the east side of the Scheme as it passes close to the southern end of Appleford, including over the rail sidings bridge. Small gap for access track south of Level Crossing Cottage.
- 2.5 m high reflective noise barrier on the east side of the Scheme north of the rail sidings bridge to just south of the junction with the B4016 into Appleford. The noise model includes a small gap for an access point to a potential attenuation pond. This has been removed from the latest scheme design and an alternative access provided, therefore the noise model represents a potentially slightly more conservative approach.
- 1.5 m high reflective solid parapet on the east side of the Dicot to Culham River Crossing bridge. The parapet extends approximately 12 m south at the southern edge of the bridge.
- 3.0 m high reflective noise barrier on the south side of Scheme as it passes close to Fullamoor Cottages. The barrier extends southwards along the new connection to the A415 to the south.
- 3.0 m high reflective noise barrier on the south side of Scheme as it passes close to Clifton Hampden. The barrier extends southwards at each end along the access track at the west end and the realigned B4015 at the east end, and includes a small gap for the public footpath to cross the Scheme, though to minimise the

impact of the gap the barrier also extends southwards slightly along each side of the footpath.

10.9.13 Low noise surfacing is proposed on the following key sections of the Scheme, as illustrated on Figure 10.1:

- Didcot to Culham River Crossing from approximately 100 m north of the A4130 roundabout to approximately 100 m south of the roundabout north of Appleford i.e. past Hill Farm, Hartwright House and Appleford;
- Clifton Hampden Bypass from approximately 100 m east of the new Culham Science Centre roundabout to approximately 55 m east of the centre of the junction with the connection south to the A415 i.e. past Fullamoor Cottages; and
- Clifton Hampden Bypass from the access track crossing to approximately 150 m east of the centre of the new junction with the B4015 i.e. past the properties on the northern edge of Clifton Hampden to the south of the Scheme and the properties to the north of the scheme (The Coppice).

10.9.14 Approximately 100 m from roundabout junctions has not been assumed to be low noise surfacing to allow for the option of high friction surfacing to be deployed in these locations for safety reasons.

Enhancements

10.9.15 No enhancements in relation to noise and vibration are considered appropriate, in the context of sustainable development.

10.10 Assessment of likely significant effects

Construction noise

10.10.1 Predicted monthly noise levels during the construction phase have been calculated over the Scheme construction period, taking into account applicable embedded mitigation measures as detailed in Section 10.9.

10.10.2 Predicted monthly noise levels at each selected representative receptor during the construction phase are shown in Appendix 10.3. Receptor locations are marked on Figure 10.1. Results are reported for the façade facing the Scheme at the top floor for the day, evening and night. Based on analysis of the results using the top floor ensures a conservative approach. The maximum predicted construction noise level for each period (day, evening, night) at each receptor, and whether the construction levels are predicted to be at or above the LOAEL and/or SOAEL, is summarised in Table 10.11. The predicted noise levels shown are based on the area over which each activity is likely to occur over the course of each month during the construction programme. As detailed in Section 10.4, to define the SOAEL and LOAEL, ambient noise levels at the relevant façade of each of the selected receptors has been determined based on predicted 2020 Baseline traffic flows. This is a conservative approach as other noise sources, such as rail noise, are not included.

10.10.3 R4 has been included to represent the closest approach of the works to the Valley Park development. Only a limited number of properties will be occupied in the Valley Park development during Scheme construction, however no details regarding their location are currently available. Therefore, a worst-case approach has been adopted by including a receptor position representative of the closest approach of any Valley Park properties to the works.

10.10.4 R2, R13 and R17 are non-residential receptors which are not normally in use during the evening/weekend and night and therefore no results are provided for these periods.

Table 10.11: Summary of predicted construction noise levels (levels at or above the SOAEL/LOAEL in bold/underline)

Receptor ID	Daytime L _{Aeq} dB (façade)			Evening/ weekend L _{Aeq} dB (façade)			Night L _{Aeq} dB (façade)		
	SOAEL	LOAEL	Max Level	SOAEL	LOAEL	Max Level	SOAEL	LOAEL	Max Level
R1 Premier Inn, A4130	65	59	<u>69</u>	60	56	<u>65</u>	55	51	<u>65</u>
R2 Milton Park Nursery	65	56	<u>62</u>	-	-	-	-	-	-
R3 New Farm, A4130	65	58	<u>66</u>	60	55	<u>61</u>	55	50	<u>61</u>
R4 Valley Park, A4130	65	62	<u>77</u>	65	59	<u>70</u>	55	54	<u>70</u>
R5 Great Western Park	65	55	<u>64</u>	55	52	<u>54</u>	50	47	<u>54</u>
R6 Hill Farm	65	51	<u>74</u>	55	47	<u>72</u>	50	43	<u>62</u>
R7 Hartwright House	65	47	<u>72</u>	55	44	<u>63</u>	45	40	<u>61</u>
R8 Level Crossing Cottage	65	47	<u>73</u>	55	43	<u>72</u>	45	39	<u>62</u>
R9 Main Road Appleford, south	65	51	<u>60</u>	55	47	<u>61</u>	50	43	<u>61</u>
R10 Chambrai Close, Appleford, centre	65	48	<u>59</u>	55	45	<u>52</u>	45	40	<u>52</u>
R11 Main Road Appleford, north-west	65	62	61	65	59	55	55	53	48
R12 Sutton Courtenay, east	65	52	<u>54</u>	55	49	<u>51</u>	50	44	<u>51</u>
R13 Europa School, A415	65	58	57	-	-	-	-	-	-
R14 Zouch Farm, A415	65	54	<u>62</u>	55	51	<u>61</u>	50	46	<u>60</u>
R15 Culham Station, A415	65	60	<u>66</u>	60	57	<u>67</u>	55	52	<u>66</u>
R16 Fullamoor Barns, A415	75	69	<u>71</u>	66	66	<u>72</u>	60	60	<u>72</u>
R17 Nursery Culham Science Centre	65	57	<u>74</u>	-	-	-	-	-	-
R18 Fullamoor Cottages, A415	65	55	<u>70</u>	55	52	<u>73</u>	50	47	<u>67</u>
R19 Clifton Hampden, north west	65	46	<u>64</u>	55	43	<u>58</u>	45	39	<u>52</u>
R20 Clifton Hampden, north-east	65	58	<u>70</u>	60	54	<u>72</u>	55	49	<u>72</u>

Receptor ID	Daytime L _{Aeq} dB (façade)			Evening/ weekend L _{Aeq} dB (façade)			Night L _{Aeq} dB (façade)		
	SOAEL	LOAEL	Max Level	SOAEL	LOAEL	Max Level	SOAEL	LOAEL	Max Level
R21 The Coppice House, north of Clifton Hampden	65	53	<u>61</u>	55	50	<u>60</u>	50	45	<u>54</u>

10.10.5 A discussion of the construction noise assessment data as summarised in Table 10.11 is provided below. With regard to duration, a conservative approach has been adopted in reporting the number of months during which noise levels at or above the SOAEL are anticipated. The noise level at or above the SOAEL may not be for every working day within each month identified; it may be for a much shorter period within a month.

- At receptor R1 (Premier Inn, A4130) daytime levels at or above the SOAEL are predicted in five months (moderate impact) and are related to the creation of the adjacent site compound, earthworks and roadworks on the Scheme mainline to the north and earthworks and roadworks on the access into the new development to the south. Evening levels above the SOAEL are predicted in three months (moderate impact in one-month, major impact in two months). Night-time levels above the SOAEL are predicted in two months (major impact). These evening and night-time impacts relate to tie-ins between the Scheme and the A4130. The anticipated duration of evening and night-time tie-in works in this area is very low, well below the DMRB criterion of 10 or more working days (or evenings/weekends or nights) in any 15 consecutive days. However, for the purposes of this assessment a conservative approach has been adopted and a risk of exceeding the duration criteria identified.
- At receptor R3 (New Farm, A4130) daytime levels at or above the SOAEL are predicted in four months (moderate impact) and are related to site clearance, earthworks, drainage and roadworks on the Scheme mainline to the north. Evening levels above the SOAEL are predicted in two months (moderate impact). Night-time levels above the SOAEL are predicted in two months (major impact). These evening and night-time impacts relate to tie-ins between the Scheme and the A4130. The anticipated duration of evening and night-time tie-in works in this area is very low, well below the DMRB criterion of 10 or more working days (or evenings/weekends or nights) in any 15 consecutive days. However, for the purposes of this assessment a conservative approach has been adopted and a risk of exceeding the duration criteria identified.
- At receptor R4 (Valley Park, A4130) daytime levels above the SOAEL are predicted in six months (major impact) and are related to site clearance, use of the haul road, earthworks, drainage and roadworks on the Scheme mainline to the north. Evening levels above the SOAEL are predicted in two months (major impact). Night-time levels above the SOAEL are predicted in four months (moderate impact in two months, major impact in two months). These evening and night-time impacts relate to tie-ins between the Scheme and the A4130. The anticipated duration of evening and night-time tie-in works in this area is very low, well below the DMRB criterion of 10 or more working days (or evenings/weekends or nights) in any 15 consecutive days. However, for the purposes of this assessment a conservative approach has been adopted and a risk of exceeding the duration criteria identified. As outlined above in paragraph 10.10.3, R4 represents the closest approach of the works to the Valley Park development. Only a limited number of properties will be occupied during the Scheme construction, however no details regarding their location are currently available, therefore these impacts may not occur.

- At receptor R5 (Great Western Park) night-time levels at or above the SOAEL are predicted in two months (moderate impact) and relate to tie-ins between the Scheme and the A4130 and works at the new Didcot Science Bridge over the existing railway and roads. The anticipated duration of night-time tie-in works in this area and the Didcot Science Bridge works are very low, well below the DMRB criterion of 10 or more working days (or evenings/weekends or nights) in any 15 consecutive days. However, for the purposes of this assessment a conservative approach has been adopted and a risk of exceeding the duration criteria identified.
- At receptor R6 (Hill Farm) daytime levels above the SOAEL are predicted in 10 months (moderate impact in three months, major impact in seven months) and are related to site clearance, use of the haul road, earthworks, drainage and roadworks on the Scheme mainline to the east. Evening levels at or above the SOAEL are predicted in seven months (moderate impact in four months and major impact in three months). Night-time levels above the SOAEL are predicted in six months (moderate impact in two months, major impact in four months). These evening and night-time impacts relate to tie-ins between the Scheme and the existing minor access road between the A4130 on the northern edge of Didcot and the southern edge of Appleford, and works at the new Appleford rail sidings bridge (including vehicles on the haul route). The anticipated duration of some of the evening and night-time tie-in works in this area potentially meets the DMRB criterion of 10 or more working days (or evenings/weekends or nights) in any 15 consecutive days (the duration of the bridge works is very low). However, for the purposes of this assessment a conservative approach has been adopted and a risk of exceeding the duration criteria identified. In addition, given the minor nature of the existing access road there is potential for some or all of the tie-in works to be completed during the daytime, therefore removing/reducing these evening and night-time impacts. Though for the purposes of this assessment a conservative approach has been adopted and the risk of exceeding the evening and night criteria identified.
- At receptor R7 (Hartwright House) daytime levels above the SOAEL are predicted in 13 months (moderate impact in six months, major impact in seven months) and are related to site clearance, use of the haul road, earthworks, drainage and roadworks on the Scheme mainline to the west. Evening levels above the SOAEL are predicted in four months (moderate impact in two months and major impact in two months). Night-time levels above the SOAEL are predicted in 11 months (moderate impact in six months, major impact in five months). These evening and night-time impacts relate to tie-ins between the Scheme and the existing minor access road between the A4130 on the northern edge of Didcot and the southern edge of Appleford, and works at the new Appleford rail sidings bridge (including vehicles on the haul route). The anticipated duration of some of the evening and night-time tie-in works in this area potentially meets the DMRB criterion of 10 or more working days (or evenings/weekends or nights) in any 15 consecutive days (the duration of the bridge works is very low). However, for the purposes of this assessment a conservative approach has been adopted and a risk of exceeding the duration criteria identified. In addition, given the minor nature of the existing access road there is potential for some or all of these tie-in works to be completed during the daytime, therefore removing/reducing these evening and night-time impacts. Though for the purposes of this assessment a conservative approach has been adopted and the risk of exceeding the evening and night criteria identified.
- At receptor R8 (Level Crossing Cottage) daytime levels at or above the SOAEL are predicted in 15 months (moderate impact in 10 months, major impact in five months) and are related to site clearance, use of the haul road, earthworks, and roadworks on the Scheme mainline to the west. Evening levels above the SOAEL are predicted in four months (moderate impact in two months and major impact in two months). Night-time levels at or above the SOAEL are predicted in five months

(moderate impact in two months, major impact in three months). These evening and night-time impacts relate to tie-ins between the Scheme and the existing minor access road that heads north from Collett Roundabout on the A4130 on the northern edge of Didcot, and works at the new Appleford rail sidings bridge (including vehicles on the haul route). The anticipated duration of some of the evening and night-time tie-in works in this area potentially meets the DMRB criterion of 10 or more working days (or evenings/weekends or nights) in any 15 consecutive days (the duration of the bridge works is very low). Given the minor nature of the existing access road there is potential for some or all of these tie-in works to be completed during the daytime, therefore removing/reducing these evening and night-time impacts. Though for the purposes of this assessment a conservative approach has been adopted and the risk of exceeding the evening/weekend and night criteria identified.

- At receptor R9 (Main Road Appleford, south) evening levels above the SOAEL are predicted in two months (moderate impact in one month and major impact in one month). Night-time levels above the SOAEL are predicted in two months (major impact). These evening and night-time impacts relate to works at the new Appleford rail sidings bridge (including vehicles on the haul route). The anticipated duration of the evening and night-time Appleford rail sidings bridge works are very low, well below the DMRB criterion of 10 or more working days (or evenings/weekends or nights) in any 15 consecutive days. Though for the purposes of this assessment a conservative approach has been adopted and the risk of exceeding the evening/weekend and night criteria identified.
- At receptor R10 (Chambrai Close, Appleford, centre) night-time levels at or above the SOAEL are predicted in three months (moderate impact in two months, major impact in one month) and relate to tie-ins between the Scheme and the B4016, and works at the new Appleford rail sidings bridge (including vehicles on the haul route). The anticipated duration of night-time tie-in works in this area and works at the Appleford rail sidings bridge are both very low, well below the DMRB criterion of 10 or more working days (or evenings/weekends or nights) in any 15 consecutive days. However, for the purposes of this assessment a conservative approach has been adopted and a risk of exceeding the duration criteria identified.
- At receptor R12 (Sutton Courtenay, east) night-time levels at or above the SOAEL are predicted in two months (moderate impact) and relate to tie-ins between the Scheme and the B4016. The anticipated duration of night-time tie-in works in this area is very low, well below the DMRB criterion of 10 or more working days (or evenings/weekends or nights) in any 15 consecutive days. However, for the purposes of this assessment a conservative approach has been adopted and a risk of exceeding the duration criteria identified.
- At receptor R14 (Zouch Farm, A415) evening levels at or above the SOAEL are predicted in three months (moderate impact in one month and major impact in two months). Night-time levels at or above the SOAEL are predicted in three months (moderate impact in one-month, major impact in two months). These evening and night-time impacts relate to tie-ins between the Scheme and the A415. The anticipated duration of some of the evening tie-in works in this area potentially meets the DMRB criterion of 10 or more working days (or evenings/weekends or nights) in any 15 consecutive days. The anticipated duration of the night-time tie-in works in this area is very low. However, for the purposes of this assessment a conservative approach has been adopted and a risk of exceeding the duration criteria identified for both the evening and night.
- At receptor R15 (Culham Station, A415) daytime levels at or above the SOAEL are predicted in four months (moderate impact) and are related to site clearance and roadworks on the Scheme mainline to the south. Evening levels above the SOAEL are predicted in four months (moderate impact in two months, major

impact in two months). Night-time levels above the SOAEL are predicted in four months (moderate impact in two months, major impact in two months). These evening and night-time impacts relate to tie-ins between the Scheme and the A415 plus a number of local accesses/footways. The anticipated duration of some of the evening and night-time tie-in works in this area potentially meets the DMRB criterion of 10 or more working days (or evenings/weekends or nights) in any 15 consecutive days. However, given the minor nature of some of the existing access roads/footways which tie-into the scheme there is potential for some of these tie-in works to be completed during the daytime, therefore reducing these evening/night-time impacts. Though for the purposes of this assessment a conservative approach has been adopted and the risk of exceeding the evening and night criteria identified.

- At receptor R16 (Fullamoor Barns, A415) evening levels above the SOAEL are predicted in four months (moderate impact in two months, major impact in two months). Night-time levels above the SOAEL are predicted in four months (moderate impact in two months, major impact in two months). These evening and night-time impacts relate to tie-ins between the Scheme and the A415 plus a number of local accesses/footways. The anticipated duration of some of the evening and night-time tie-in works in this area potentially meets the DMRB criterion of 10 or more working days (or evenings/weekends or nights) in any 15 consecutive days. However, given the minor nature of some of the existing access roads/footways which tie-into the scheme there is potential for some of these tie-in works to be completed during the daytime, therefore reducing these evening/night-time impacts. Though for the purposes of this assessment a conservative approach has been adopted and the risk of exceeding the evening and night criteria identified.
- At receptor R17 (Nursery Culham Science Centre) daytime levels at or above the SOAEL are predicted in 18 months (moderate impact in 10 months, major impact in eight months) and are related to site clearance, use of the haul road, earthworks, drainage and roadworks on the Scheme to the south.
- At receptor R18 (Fullamoor Cottages, A415) daytime levels above the SOAEL are predicted in 11 months (moderate impact in eight months, major impact in three months) and are related to site clearance, use of the haul road, earthworks, drainage and roadworks on the Scheme to the north and the new connection to the A415. Evening levels at or above the SOAEL are predicted in five months (moderate impact in two months and major impact in three months). Night-time levels above the SOAEL are predicted in seven months (moderate impact in two months, major impact in five months). These evening and night-time impacts relate to tie-ins between the Scheme and the A415 plus several local accesses/footways. The anticipated duration of some of the evening and night-time tie-in works in this area potentially meets the DMRB criterion of 10 or more working days (or evenings/weekends or nights) in any 15 consecutive days. However, given the minor nature of some of the existing access roads/footways which tie-into the scheme there is potential for some of these tie-in works to be completed during the daytime, therefore reducing these evening/night-time impacts. Though for the purposes of this assessment a conservative approach has been adopted and the risk of exceeding the evening and night criteria identified.
- At receptor R19 (Clifton Hampden, north-west) evening levels above the SOAEL are predicted in two months (moderate impact). Night-time levels above the SOAEL are predicted in two months (major impact). These evening and night-time impacts relate to tie-ins between the Scheme and several local accesses. The anticipated duration of some of the evening and night-time tie-in works in this area potentially meets the DMRB criterion of 10 or more working days (or evenings/weekends or nights) in any 15 consecutive days. However, given the minor nature of the existing accesses which tie-into the scheme there is potential

for these tie-in works to be completed during the daytime, therefore reducing/removing these evening/night-time impacts. Though for the purposes of this assessment a conservative approach has been adopted and the risk of exceeding the evening and night criteria identified.

- At receptor R20 (Clifton Hampden, north-east) daytime levels at or above the SOAEL are predicted in eight months (moderate impact in seven months, major impact in one month) and relates to site clearance, earthworks, drainage and roadworks on the Scheme to the north. Evening levels above the SOAEL are predicted in four months (moderate impact in two months and major impact in two months). Night-time levels above the SOAEL are predicted in four months (moderate impact in two months, major impact in two months). These evening and night-time impacts relate to tie-ins between the Scheme and the B4015. The anticipated duration of some of the evening and night-time tie-in works in this area potentially meet the DMRB criterion of 10 or more working days (or evenings/weekends or nights) in any 15 consecutive days.
- At receptor R21 (The Coppice House, north of Clifton Hampden) evening levels above the SOAEL are predicted in two months (major impact). Night-time levels above the SOAEL are predicted in four months (moderate impact). These evening and night-time impacts relate to tie-ins between the Scheme and the B4015. The anticipated duration of some of the evening and night-time tie-in works in this area potentially meets the DMRB criterion of 10 or more working days (or evenings/weekends or nights) in any 15 consecutive days.
- At R2 (Milton Park Nursery), R11 (Main Road Appleford, north-west) and R13 (Europa School, A415) construction noise levels at or above the SOAEL are not anticipated, and therefore do not constitute a significant effect.

10.10.6 As detailed in Section 10.5, the construction assessment is based on the construction information that is currently available, with advice being provided by the appointed ECI. Given that the details of the nature, timing and duration of the construction activities will not be fully understood before the detailed design stage, a conservative approach has been adopted and all the identified levels at or above the SOAEL (i.e. moderate or major impacts) are assumed to be at risk of exceeding the duration criteria set out in Section 10.4 of 10 or more days (or 10 evenings, weekends or nights) in any consecutive 15, or 40 or more days (or 40 evenings, weekends or nights) in any consecutive six month period. On this basis, significant adverse daytime construction noise effects are identified at the closest receptors to the construction works on the existing A4130 (R1, R3 and R4), the existing minor access road between the A4130 on the northern edge of Didcot and the southern edge of Appleford (R6, R7 and R8), close to the Culham Science Centre (R17 and R18) and the north-east edge of Clifton Hampden (R20). Significant evening and night-time construction noise effects are more widespread along the Scheme and relate to tie-ins and bridge works at the new Science Bridge and Appleford rail sidings bridge.

10.10.7 The duration of the tie-in works is limited, at some locations the duration is anticipated to be below the DMRB criterion of 10 or more working days (or evenings/weekends or nights) in any 15 consecutive days. In addition, a conservative approach to tie-in works has been taken, and at some locations there is potential for the works to be carried out during the daytime. The duration of the evening/weekend and night works at both new bridges over existing railways is limited, below the DMRB criterion of 10 or more working days (or evenings/weekends or nights) in any 15 consecutive days.

10.10.8 At the detailed design stage, once a contractor has been appointed and specific details of the construction works are available, the construction noise assessment will be revisited. The Noise and Vibration Management Plan required by the CEMP will set out how the requirement to adopt best practicable means has been met through

the choice of working methods and plant, and, where appropriate, site hoarding. This process has the potential to reduce the magnitude of the construction noise impacts. In some locations where the exceedances of the SOAEL are small, this may result in the removal of significant effects. Where exceedances of the SOAEL are larger, the provisions of the noise insulation and temporary re-housing policy may apply.

Construction vibration

- 10.10.9 The activities with the potential to generate vibration during Scheme construction are works using vibratory rollers including earthworks and road construction; and use of a rotary bored piling rig during bridge construction.
- 10.10.10 Vibration levels during works using vibratory rollers have been calculated in accordance with the procedures set out in BS 5228-2 Table E.1 (Ref 10.15). Source data for a range of typical rollers has been taken from TRL Report 429 (Ref 10.16) and product data sheets provided by the ECI. These include large rollers such as a Bomag BW 6 towed roller and a Ingersoll-Rand SD-150D single drum roller, medium sized rollers such as a Bomag BW 161 twin drum roller and small rollers such as Bomag BW 120 and Bomag BW 135 twin drum rollers.
- 10.10.11 For human receptors the LOAEL for vibration annoyance is defined as a PPV of 0.3 mms^{-1} , this being the point at which construction vibration is likely to become perceptible. The SOAEL is defined as a PPV of 1.0 mms^{-1} , this being the level at which construction vibration can be tolerated with prior warning.
- 10.10.12 The predicted PPV due to the steady state operation of vibratory plant is estimated to exceed the SOAEL for vibration annoyance within approximately 50 m of works using a large roller, approximately 35 m for a medium roller and 15-20 m for a small roller. Based on the information from the ECI, approximately 15 residential buildings and two non-residential potentially sensitive buildings are located within these distances. These consist of the Premier Inn hotel near Milton Interchange, Hill Farm, Hartwright House and Level Crossing Cottage south of Appleford, a single property on the western edge of Appleford on the realigned B4016, a single property north of the A415 at Culham Station, the Nursery at the Culham Science Centre, four properties at Fullamoor Barns south of the A415, Fullamoor Cottages and the two properties to the east of Fullamoor Cottages north and south of the A415, and the closest two properties on the northern edge of Clifton Hampden to the realigned B4015. The magnitude of the potential vibration annoyance impact is moderate at these receptors. Potential significant construction vibration annoyance effects are, therefore, identified at approximately 15 residential buildings and two non-residential potentially sensitive buildings.
- 10.10.13 With regard to structural damage, to ensure vibration levels are below the lowest criteria of 6 mms^{-1} , which relates to cosmetic damage, vibratory rolling using large rollers will not be carried out within 15 m of any building, 10 m of any building for medium rollers and 5 m of any building for small rollers. Any ground compaction required within these distances will be carried using alternative means, such as rollers with the vibration turned off.
- 10.10.14 Rotary bored piling will be required for the three proposed new bridges. The measured piling vibration data in BS 5228 (Ref 10.15) indicates that at a distance of more than 10 m typical PPV levels from the boring works do not exceed the LOAEL. PPV levels due to ancillary works, such as driving in the pile casing, do not exceed the SOAEL at distances of more than 10 m. No rotary bored piling works are anticipated within 10 m of a potentially sensitive receptor, the closest approach of such works to any identified potentially sensitive receptor is just over 100 m (properties at the southern end of Appleford east of the rail sidings bridge). On this

basis, vibration impacts due to rotary bored piling at new bridges are not anticipated to result in significant adverse effects.

10.10.15 Given the above, there is the potential for combined significant effects from construction noise and vibration during the construction works at the following receptors located in close proximity to the works: the Premier Inn hotel near Milton Interchange, Hill Farm, Hartwright House and Level Crossing Cottage south of Appleford, a single property north of the A415 at Culham Station, the Nursery at the Culham Science Centre, four properties at Fullamoor Barns south of the A415, Fullamoor Cottages and the two properties to the east of Fullamoor Cottages north and south of the A415, and the closest two properties on the northern edge of Clifton Hampden to the realigned B4015.

10.10.16 As discussed above, the construction noise and vibration impact assessment will be revisited at the detailed design stage when a specific contractor is appointed. The Noise and Vibration Management Plan required by the CEMP will set out how the requirement to adopt best practicable means has been met through the choice of working methods and plant, and, where appropriate, site hoarding. This process has the potential to reduce the magnitude of the construction noise and vibration impacts.

Construction traffic

10.10.17 During the Scheme construction phase, additional traffic will be directly generated by the construction works. The ECI appointed to provide reasonable assumptions on the likely works has provided an estimate of the numbers of HDVs and cars/vans accessing the works at various points along the Scheme, on a monthly basis over the duration of the Scheme construction works. The distribution of the construction traffic across the surrounding road network has then been determined by the traffic team, focussing on 41 key links used in the transport assessment (ES Chapter 16, Figure 16.3).

10.10.18 The traffic noise impact of the addition of construction traffic onto the local road network has been assessed based on the change in the 18 hour CRTN Basic Noise Level (BNL) i.e. the traffic noise level at 10 m from the kerb, taking into account the flow, composition, speed and road surface. The construction traffic noise impacts are compared to both the 2020 Baseline and the 2024 Do-Minimum scenarios. The assessment of the addition of construction traffic onto the local road network is based on estimated construction traffic for the busiest month of the construction works for each of the 41 selected links.

10.10.19 The assessment indicates that the anticipated increase in traffic noise levels along existing roads during the busiest month of the construction works is negligible (< 1.0 dB) at 40 of the 41 selected links. At one link, the southbound on slip to the A34 at Milton Interchange the increase is 1.0 dB i.e. at the very bottom of the minor increase band (1.0 to 2.9 dB). No residential properties or other potentially sensitive receptors are located adjacent to this sliproad and the adjacent A34 mainline is the dominant traffic noise source in the area. These results indicate that no significant adverse traffic noise effects are anticipated due to the addition of construction traffic to the existing local road network.

10.10.20 The ECI has advised that no long-term road closures/diversions are anticipated at this stage. Only short-term closures will be required overnight to tie the Scheme into the existing road network. Therefore, no significant effects due to changes in traffic noise from night-time diversions have been identified.

Operation

- 10.10.21 All the operational traffic noise comparisons reported in Tables 10.12 to 10.14 are based on the floor/façade at each building which undergoes the greatest magnitude of change (adverse or beneficial), as required by DMRB LA 111. As appropriate, further discussion is provided in the text where only considering the floor/facade which undergoes the greatest magnitude of change does not illustrate the full nature of the impact at the receptor. Details of the noise model set-up and assumptions are provided in Appendix 10.4.
- 10.10.22 Traffic noise contour plots for the Do-Something (DS) scenario in the opening year (2024) and future assessment year (2039) are provided in Figure 10.3 and 10.4. Traffic noise change contour plots for the short term and long term are provided in Figure 10.5 and 10.6.
- 10.10.23 All the noise contour plots are based on free-field traffic noise levels at first floor level (4.0 m above ground) using a 10 m x 10 m grid and are provided for illustration purposes. As identified in Section 10.7, the baseline survey highlighted that in some locations along the Scheme other non-public road traffic related noise sources are present, such as rail noise

Short-term changes

- 10.10.24 Table 10.12 summarises the short-term change in predicted traffic noise levels in 2024 between the DM (without Scheme) and the DS (with Scheme) scenarios at both residential buildings and other sensitive receptors. The total number of receptors falling into each band is shown. As detailed in Section 10.7 of all the potentially sensitive non-residential buildings, only the two hotels have been identified as potentially sensitive at night.
- 10.10.25 Appendix 10.5 provides a comparable table of results for the sensitivity test of the likely benefit of the proposed adoption of low noise surfacing on selected sections of the Scheme using the methodology set out in the 2018 IOA paper 'Road Surface Corrections for Use with CRTN'. This methodology applies a benefit from low noise surfacing at speeds <75 km/hr, with the benefit decreasing as the speed decreases, rather than a sharp cut off of full benefit at or above 75 km/hr and no benefit below 75 km/hr, as adopted in DMRB LA 111.

Table 10.12: Short-term change in predicted Do-Something traffic noise levels (DM 2024 to DS 2024)

Change in traffic noise level		Daytime		Night-time	
		Number of residential buildings	Number of other sensitive receptors	Number of residential buildings	Number of other sensitive receptors
Increase in noise level Daytime L _{A10,18h} dB Night-time L _{night,outside} dB	0.1 - 0.9	1318	1	1324	0
	1.0 - 2.9	176	54	167	19
	3.0 - 4.9	5	04	4	04
	≥5	6	0	5	0
No change	0	8	0	9	0
Decrease in noise level Daytime L _{A10,18h} dB Night-time L _{night,outside} dB	0.1 - 0.9	2560	14	2663	1
	1.0 - 2.9	1092	6	1153	0
	3.0 - 4.9	589	7	484	0
	≥5	181	3	126	0

10.10.26 In the daytime in the Scheme opening year of 2024, 65% of residential buildings within the study area are anticipated to experience no change or a negligible change (-0.9 to +0.9 dB) in traffic noise levels due to the Scheme. 3% are anticipated to experience a minor (1.0 - 2.9 dB) increase in traffic noise levels. 11 properties (<1%) are anticipated to experience a moderate (3.0 – 4.9 dB) or major (≥ 5 dB) increase in traffic noise levels. 18% are anticipated to experience a minor decrease and 13% a moderate or major decrease. In total, 187 (176+5+6) residential buildings in the study area are anticipated to experience a minor, moderate or major increase in traffic noise levels in the opening year, and 1,862 a decrease (1092+589+181), based on the façade with the greatest magnitude of change.

10.10.27 No non-residential receptors are anticipated to experience a moderate or major increase in traffic noise levels.

10.10.28 10 non-residential receptors are anticipated to experience a moderate or major decrease in traffic noise consisting of three educational buildings (Clifton Hampden C of E Primary School, Long Wittenham C of E primary School and The Matrix Music School & Arts Centre in Sutton Courtenay), a medical building (The Surgery in Clifton Hampden), two places of worship (St Marys Church in Long Wittenham and Church of St Michael All Angels in Clifton Hampden), and four community facilities (Village Hall and Athletics Club in Long Wittenham, and Village Hall and Scout Hut in Clifton Hampden).

10.10.29 Overall, many more receptors in the study area are anticipated to experience a potentially significant reduction in traffic noise than an increase in the Scheme opening year. This is due to the diversion of traffic off existing routes through villages including Sutton Courtenay, Culham, Long Wittenham, individual properties on the A415 east of Culham Station, the centre of Clifton Hampden along the A415 and B4015, and Burcot. Moderate and major noise increases are concentrated in locations which are close to the Scheme and which are more remote from major existing roads including Hill Farm, Hartwright House, the southern end of Appleford and the northern edge of Clifton Hampden (including two properties north of the Scheme).

10.10.30 The sensitivity test reported in Appendix 10.5 indicates that during the daytime in the short term the low noise surfacing is likely to reduce the number of moderate and major increases at residential properties from 11 to seven (located on the northern edge of Clifton Hampden, including the two properties north of the Scheme).

Long-term changes

10.10.31 Table 10.13 summarises the long-term change in predicted traffic noise levels between the 2024 DM (without Scheme) and the 2039 DS (with Scheme) scenarios at both residential buildings and other sensitive receptors. As detailed in Section 10.7 of all the potentially sensitive non-residential buildings, only the two hotels have been identified as potentially sensitive at night. As noted in Section 10.5 and 10.7, due to the large number of developments in the area the traffic model reaches gridlock before the future assessment year in 2039, when the scheme is not included and it is not possible to provide meaningful traffic data for the Do-Minimum future assessment year scenario. Therefore, when considering the long-term change results, it must be borne in mind that some change in traffic noise levels will occur regardless of the Scheme. For example, on existing roads where an increase in traffic noise is predicted some of the increase may occur even without the Scheme.

10.10.32 Appendix 10.5 provides a comparable table of results for the sensitivity test of the likely benefit of the proposed adoption of low noise surfacing on selected sections of the Scheme using the methodology set out in the 2018 IOA paper 'Road Surface Corrections for Use with CRTN'. This methodology applies a benefit from low noise surfacing at speeds <75 km/hr, with the benefit decreasing as the speed decreases, rather than a sharp cut off of full benefit at or above 75 km/hr and no benefit below 75 km/hr, as adopted in DMRB LA 111.

Table 10.13: Long-term change in predicted Do-Something traffic noise levels (DM 2024 to DS 2039)

Change in traffic noise level		Daytime		Night-time	
		Number of residential buildings	Number of other sensitive receptors	Number of residential buildings	Number of other sensitive receptors
Increase in noise level Daytime L _{A10,18h} dB Night-time L _{night,outside} dB	0.1 - 2.9	4115	16	4162	1
	3.0 - 4.9	148	54	109	10
	5.0 - 9.9	30	12	26	4
	≥10	3	0	3	0
No change	0	0	0	0	0
Decrease in noise level Daytime L _{A10,18h} dB Night-time L _{night,outside} dB	0.1 - 2.9	1298	6	1351	0
	3.0 - 4.9	247	4	218	0
	5.0 - 9.9	94	4	66	0
	≥10	0	0	0	0

10.10.33 In the long-term (2024 DM to 2039 DS) the same general pattern of traffic noise level change is observed as in the short-term as described above. In the daytime, 61% of residential buildings within the study area are anticipated to experience a negligible change (-0.9 to +0.9 dB) in traffic noise levels due to the Scheme. 11% are anticipated to experience a minor (1.0 - 2.9 dB) increase in traffic noise levels. 34 properties (<1%) are anticipated to experience a moderate (3.0 – 4.9 dB) or major (≥ 5 dB) increase in traffic noise levels. 22% are anticipated to experience a minor decrease and 6% a moderate or major decrease. In total, 181 (148+30+3) residential

buildings in the study area are anticipated to experience a minor, moderate or major increase in traffic noise levels in the long term, and 341 a decrease (247+94+0), based on the façade with the greatest magnitude of change. As described above, this is comparing 2024 without the Scheme to 2039 with the Scheme, so it must be borne in mind that some change in traffic noise levels will occur regardless of the Scheme due to the 15 years of growth. For example, on existing roads where an increase in traffic noise is predicted some of the increase may occur even without the Scheme.

10.10.34 ~~As for the short term the Premier Inn on the A4130 near Milton Interchange is anticipated to experience a moderate increase in both the daytime and night time. In addition, t~~The Culham Science Centre nursery is ~~also~~ anticipated to experience a moderate increase in the long term only. Four non-residential receptors are anticipated to experience a moderate decrease in the long term consisting of a school (Clifton Hampden C of E Primary School), medical building (The Surgery) and two community facilities (Village Hall and Scott Association), all in the centre of Clifton Hampden.

10.10.35 As for the short term, more receptors in the study area are anticipated to experience a potentially significant decrease in traffic noise than an increase in the long term, though the number of receptors experiencing a decrease is lower due to the growth in traffic from 2024 to 2039. As for the short term, this is due to the diversion of traffic off existing routes through villages including Sutton Courtenay, Culham, individual properties on the A415 east of Culham Station, the centre of Clifton Hampden on the A415 and B4015 and Burcot. Moderate and major increases are concentrated in locations close to the Scheme and more remote from major existing roads including Hill Farm, Hartwright House, the southern end of Appleford, the northern edge of Clifton Hampden (including two properties north of the Scheme) and four properties on the B4015 north-east of the Scheme at Rough Lodge and Golden Balls.

10.10.36 The sensitivity test reported in Appendix 10.5 indicates that during the daytime in the long term the low noise surfacing is likely to reduce the number of moderate and major increases at residential properties from 33 to 19 (located at the south end of Appleford, and north edge of Clifton Hampden, including the two properties north of the Scheme).

Discussion and Summary of operational traffic environmental effects

10.10.37 A summary of the identified traffic noise environmental effects, including a summary of the justification for the significance of effect conclusions are provided in Table 10.14. In accordance with the DMRB LA111 methodology the initial identification of significant effects is based on the magnitude of change in traffic noise levels due to the Scheme in the short term (ST) in the opening year. Other factors, including the Long Term (LT) 2024 DM to 2039 DS change in traffic noise levels, are then considered as appropriate. Both the Short Term (ST), 2024 DM to 2024 DS change, and Long Term (LT), 2024 DM to 2039 DS change in traffic noise levels is discussed as appropriate.

10.10.38 Details are provided for residential properties and other non-residential sensitive buildings. As noted above, due to the large number of developments in the area the traffic model reaches gridlock before the future assessment year in 2039, when the scheme is not included and it is not possible to provide meaningful traffic data for the Do-Minimum future assessment year scenario. Therefore, when considering the long-term change results it must be borne in mind that some change in traffic noise levels will occur regardless of the Scheme. For example, on existing roads where an increase in traffic noise is predicted some of the increase may occur even without the Scheme.

Table 10.14: Summary of operational traffic environmental effects

Receptor	Magnitude of impact ST	Significance of effect	Justification
Milton Heights properties and School south of A34	Negligible change	Not significant	Magnitude of change negligible in ST and LT and remote from the Scheme. Unlikely to change residents' response to traffic noise.
Milton properties, medical building, 2 educational buildings and hotel at Milton Park	Negligible change or minor increase/decrease	Not significant	Magnitude of change negligible/minor in ST, negligible in LT, and remote from the Scheme. Unlikely to change residents'/users' response to traffic noise.
Hotel (Premier Inn), A4130 Milton Interchange	Moderate-Minor increase	Not significant	Magnitude of change minor in ST and LT on worst affected façades. Unlikely to change users' response to traffic noise. Moderate increase in both ST and LT limited to the southern elevation of the hotel facing away from the Scheme mainline. However, this elevation faces directly onto a new access road of an adjacent commercial development site. Impact related to development traffic, however as a conservative approach classed as significant.
New Farm, south of A4130	Minor increase	Not significant	Negligible change in LT. Scheme is online widening in this location, unlikely to change residents' response to traffic noise.
Didcot 57 properties along existing A4130 east of the Didcot Science Bridge	Moderate decrease	Significant beneficial	Moderate decrease in ST, negligible change or minor decrease in LT. Reduction in traffic noise at eastern end of existing A4130 east of the Didcot Science Bridge as bypassed by the Scheme. Potential to change residents' response to traffic noise.
Remainder of Didcot properties, 4 educational buildings, 2 medical buildings, and 3 community facilities	Negligible change or minor increase/decrease	Not significant	Great Western Park closest properties to the Scheme minor increase at worst affected façade in ST and LT. Single façade of one property at bottom end of moderate increase band, minor in LT. Future Valley Park development roads and traffic included in the traffic noise predictions but no building layout available, therefore shielding provided by new buildings located between the Scheme and Great Western Park not included in the predictions, therefore very much a worst case approach. Minor increases and decreases in ST at some locations in Didcot due to changes in traffic flows with the Scheme in operation. LT negligible at vast majority of receptors. Unlikely to change residents'/users' response to traffic noise.

Receptor	Magnitude of impact ST	Significance of effect	Justification
Hill Farm & Hartwright House between Didcot and Appleford	Major increase	Significant adverse	Very large increases at both properties in both ST and LT as currently remote from existing roads and Scheme follows alignment of existing access track in front of the properties. Low noise surfacing included on this section of the Scheme, though sensitivity test indicates major increase remains. Introduction of new road adjacent to the property has the potential to change residents' response to traffic noise. Noted existing noise climate includes the Didcot-Oxford rail line (Cherwell Valley Line), including trains to the Hanson site private rail sidings, the Wood Recycling Business and the access route into the FCC and Hanson sites. Therefore, ambient noise levels in this location are higher than indicated by the predicted Do-Minimum traffic noise levels, and the change in overall noise levels due to the Scheme will be smaller than indicated by the increase in traffic noise alone. Also noted some uncertainty exists over whether these will remain residential in the future due to the proposed D-Tech commercial development. Hill Farm is within the development boundary and Hartwright House just outside the boundary.
Level Crossing Cottage, Appleford	Major increase	Significant adverse	Large increases in both ST and LT on rear façade of property facing the Scheme. Low noise surfacing included on this section of the Scheme sensitivity test indicates potential reductions of up to around 2 dB. Also, 3 m noise barrier along the Scheme provides up to around 8 dB reduction. Introduction of new road adjacent to the property has potential to change residents' response to traffic noise. Noted existing noise climate includes the Didcot-Oxford rail line (Cherwell Valley Line), including trains to the Hanson site private rail sidings to the east, the access route into the FCC and Hanson sites to the west and the operation of the FCC landfill and Hanson quarry site. Therefore, ambient noise levels in this location are higher than indicated by the predicted Do-Minimum traffic noise levels, and the change in overall noise levels due to the Scheme will be smaller than indicated by the increase in traffic noise alone.
B4016 Appleford 19 properties south of allotments	Major decrease east façade, minor to major increase west façade	Significant adverse	Reduction in traffic on B4016 through centre of Appleford results in major decrease on east facades, reduces to minor decrease in the LT. Increases on west facades due to introduction of the Scheme in both ST (minor/moderate/major) and LT (minor/moderate). Low noise surfacing included on this section of the Scheme sensitivity test indicates potential reductions of up to around 2 dB. Also, 3 m noise barrier along the Scheme provides up to around 5 dB reduction minimising the number of properties anticipated to experience a moderate or major increase. Introduction of new road close to the property has potential to change residents' response to traffic noise. Noted existing noise climate includes the Didcot-Oxford rail line (Cherwell Valley Line) to the west, including the Hanson site private rail sidings, which may reduce residents' perception of the increase in traffic noise at the rear facades.

Receptor	Magnitude of impact ST	Significance of effect	Justification
B4016 Appleford 79 properties close to the B4016	Major /moderate decrease facing B4016, negligible change or minor increase/decrease on other facades	Significant beneficial	Reduction in traffic on B4016 through centre of Appleford results in moderate/major decreases on facades facing the B4016 in the ST, reduces to negligible change or minor decrease in the LT. Negligible change or minor increases/decreases on other façades in ST and LT. Low noise surfacing included on this section of the Scheme, sensitivity test indicates potential reductions of up to around 1 dB. Also 2.5 m noise barrier along the Scheme north of the rail bridge to junction with B4016 provides up to around 4 dB reduction. Introduction of new road to west beyond railway unlikely to change residents' response to traffic noise. Noted existing noise climate includes contribution from the Didcot-Oxford rail line.
Remainder of properties in Appleford and 2 community facilities	Negligible change or minor increase/decrease	Not significant	Reduction in traffic on B4016 through centre of Appleford, combined with contribution from the Scheme results in a negligible change or minor increases and decreases in traffic noise at receptors further back from the B4016 in both the ST and LT. Low noise surfacing included on this section of the Scheme, sensitivity test indicates potential reductions of up to just over 1 dB. Also 2.5 m noise barrier between junction with B4016 and the rail bridge provides 2-4 dB reduction at properties on the western side of the village. The solid parapet on the eastern side of the River Crossing also provides a reduction in traffic noise at properties on the northern edge of the village. Introduction of new road beyond railway unlikely to change residents' response to traffic noise. Noted existing noise climate includes contribution from the Didcot-Oxford rail line.
New housing eastern edge of Sutton Courtenay	Negligible change or minor increase	Not significant	Closest approach of Sutton Courtenay (Skylark Fields etc. on B4016) over 650 m from mainline of the Scheme. Impact remains negligible change or minor increase in LT. Introduction of the Scheme unlikely to change residents' response to traffic noise.
Sutton Courtenay and Culham 228 properties and 1 educational building	Major/moderate decrease	Significant beneficial	Reduction in traffic on route through centre of both villages, as Scheme provides an alternative and faster route, results in moderate/major benefits on facades facing the road in the ST, negligible change or moderate/minor decrease in the LT. Negligible change or minor decreases on other façades in ST. Reduction in traffic noise has potential to change residents' response to traffic noise.
Remainder of Sutton Courtney and Culham, 2 schools, and 3 community facilities	Negligible change or minor decrease/increase	Not significant	Reduction in traffic on route through centre of both villages, as Scheme provides an alternative and faster route, results in minor reductions or negligible change at receptors further back from the road in the ST. Minor increase at small number of properties on eastern edge of Sutton Courtenay in ST. Majority negligible change in the LT. Unlikely to change residents' response to traffic noise.
Properties to west of Europa School, A415	Negligible change or minor decrease	Not significant	Changes in traffic on local roads and A415 result in negligible change or minor decreases in the ST, negligible change in the LT. Unlikely to change residents' response to traffic noise.

Receptor	Magnitude of impact ST	Significance of effect	Justification
Europa School, A415	Negligible change or minor increase	Not significant	Some minor increases in traffic noise in both the ST and LT on the eastern façades facing the new development site west of Culham Science Centre, which extends up to the school boundary. Future development roads and traffic included in the traffic noise predictions but no building layout available, therefore shielding provided by new buildings located between the Scheme and the school not included in the predictions, therefore very much a worst-case approach.
Warren Cottage, Thame Lane north of A415	Major/moderate increase	Significant adverse	Individual property located over 450m north of the Scheme roundabout on the A415. Major/moderate increases in both ST and LT, however the absolute traffic noise levels are low, L _{A10,18h} traffic noise levels are below the LOAEL both with and without the Scheme. Property located within a new development site west of Culham Science Centre therefore new buildings will be constructed to the south between the property and the Scheme/A415. Future development roads and traffic included in the traffic noise predictions but no building layout available, therefore shielding provided by new buildings located between the Scheme and the property not included in the predictions, therefore very much a worst-case approach.
Zouch Farm south of A415	Minor increase/decrease	Not significant	Minor increase on worst affected facades facing west in both the ST and LT, approximately 500 m from the River Crossing mainline to the west. Unlikely to change residents' response to traffic noise.
Culham Station properties	Negligible change or minor decrease	Not significant	Negligible change or minor decrease in the ST, negligible change in the LT, A415 directly to the south largely unchanged by the Scheme. Unlikely to change residents' response to traffic noise.
Culham Science Centre Nursery	Minor increase	Significant adverse	Minor increase in the ST, however, moderate increase in the LT on some northern facades. Scheme located to the south and only minor increases anticipated on southern facades, however, large increase in traffic on access road into the Science Centre to the north-east of the nursery in the future year (2039 DS) due to proposed development at that site. The UK Atomic Energy Association received full planning permission in November 2022 to demolish the Nursery and create a replacement main gate facility under planning application P22/S0211/FUL (South Oxfordshire District Council). Outline planning permission was granted in September 2022 to replace the nursery. The receptor as assessed is not likely to exist in the same location when the Scheme is operational, and the impact is related to development traffic, however as a conservative approach classed as significant.

Receptor	Magnitude of impact ST	Significance of effect	Justification
Fullamoor Cottages, A415 (2 properties)	Minor/moderate increase north façades, major decrease south façades	Significant adverse	Large reduction in traffic on the A415 to the south of the properties as bypassed by the Scheme, and introduction of the Scheme to the north. Minor/moderate increase on north façades in ST and LT, major decrease on south façade in ST and moderate in LT. Low noise surfacing included on this section of the Scheme, sensitivity test indicates potential reductions of around 1 dB which will reduce the ST change on the north façades to minor at both properties, the moderate increase remains in the LT. Also, 3 m noise barrier to the north provides around 5 dB reduction reducing the magnitude of the ST impact from major. Given the orientation of the properties with the potentially more sensitive rear garden areas to the north a conservative approach has been taken.
9 individual properties on the A415 east of Culham Station	Major decrease	Significant beneficial	Large reduction in traffic on the A415 as bypassed by the Scheme. Major decrease in ST, moderate in LT. Reduction in traffic noise has potential to change residents' response to traffic noise.
Clifton Hampden northern edge 7 properties	Major/moderate increase on façades facing Scheme, major/moderate/minor decrease on façades facing B4015	Significant adverse	Introduction of new road to north west of the edge of the village results in moderate/major increases at some façades facing the Scheme. Major/moderate/minor reduction on façades facing B4015 to the east, this section of which is bypassed by the Scheme. Moderate increase in LT. Low noise surfacing included on this section of the Scheme sensitivity test indicates potential reductions of up to around 2 dB. Also, 3 m noise barrier to the north provides up to around 5 dB reduction reduces the number of major/moderate increases in the ST. Introduction of new road close to the properties has potential to change residents' response to traffic noise.
Clifton Hampden centre and south 91 properties, 3 community facilities, 1 medical building, and 1 school	Major/moderate decrease	Significant beneficial	Reduction in traffic on routes through the village, as Scheme provides an alternative and faster route results in moderate/major benefits at receptors in the vicinity of the A415 and B4015 in the ST. Range of impacts in the LT from minor increase to moderate decrease. Reduction in traffic noise has potential to change residents' response to traffic noise.
Remainder of Clifton Hampden	Negligible change or minor increase/decrease	Not significant	Balance between introduction of the Scheme to the north-east and reductions in traffic on the A415 and B4015 results in minor increase/decreases and negligible changes at a small number of properties in the ST. Negligible change or minor increase in the LT. Unlikely to change residents' response to traffic noise.

Receptor	Magnitude of impact ST	Significance of effect	Justification
2 properties north of Clifton Hampden at north-east end of scheme	Moderate increase	Significant adverse	Introduction of new road to north west of the edge of the village results in moderate increases at some facades of these two properties (The Coppice and The Old Stables) in the ST and LT. Minor increases at other facades in ST and LT. Low noise surfacing included on this section of the Scheme, sensitivity test indicates potential reductions of around 1.5 dB which will reduce the magnitude of impact to minor in the ST and LT. Introduction of new road has potential to change residents' response to traffic noise.
Long Wittenham and individual properties to north and south (207 properties), 3 community facilities and 1 school	Major/moderate decrease	Significant beneficial	Reduction in traffic on existing local roads between Didcot and Clifton Hampden which are bypassed by the Scheme, results in major/moderate decreases on facades facing the road in the ST. Majority minor decrease or negligible change in the LT. Reduction in traffic noise has potential to change residents response to traffic noise.
Remainder of Long Wittenham and individual properties to north and south, and 1 community facility	Negligible change or minor decrease	Not significant	Reduction in traffic on existing local roads between Didcot and Clifton Hampden which are bypassed by the Scheme, results in minor decreases at properties further back from the road in the ST. All negligible change in the LT. Reduction in traffic noise unlikely to change residents' response to traffic noise.
4 individual properties on B4015 between Clifton Hampden and A4074	Minor increase	Significant adverse	Minor increase in the ST at 2 properties at Rough Lodge and 2 properties at Golden Balls but increases to moderate in the LT. The properties are remote from the scheme, the moderate increase in the LT is due to anticipated traffic growth on the B4015 from other developments in the area, not the Scheme directly. Increase in traffic noise in the long term has potential to change residents' response to traffic noise.
Remainder of Individual properties on B4015 between Clifton Hampden and A4074	Minor increase	Not significant	Minor increase in the ST and LT at the remaining properties. The properties are remote from the scheme the minor increase is due to anticipated traffic growth on the B4015 from other developments in the area, not the Scheme directly. Unlikely to change residents' response to traffic noise.
Burcot 75 properties	Major/moderate decrease	Significant beneficial	Major/moderate decrease in the ST at properties on the A415. Moderate/minor decreases or negligible change in the LT. The introduction of the Scheme transfers traffic from the A415 onto the B4015 to the north, which connects to the north-east end of the Scheme. Reduction in traffic noise has potential to change residents' response to traffic noise.

Receptor	Magnitude of impact ST	Significance of effect	Justification
Remainder of properties in Burcot and 1 community facility	Negligible change or minor decrease	Not significant	Minor decrease or negligible change in the ST at properties set further back from the A415. Negligible change in the LT. The introduction of the Scheme transfers traffic from the A415 onto the B4015 to the north, which connects to the north-east end of the Scheme. Reduction in traffic noise is unlikely to change residents' response to traffic noise.

- 10.10.39 The edge of the North Wessex Downs AONB just falls within the south-east edge of the study area, north of Didcot. In this area remote from the Scheme a negligible change in traffic noise levels is anticipated in the short and long term. A significant effect is therefore not anticipated.
- 10.10.40 The impact of the Scheme on Scheduled Monuments is reported in ES Chapter 7: Cultural Heritage. Chapter 7 also considers the impact at the two listed Registered Parks and Gardens at Nuneham Courtenay and Sutton Courtenay Manor. Significant effects are not anticipated.
- 10.10.41 Several public open green spaces are designated within or partly within the study area, including allotments, playing fields and public parks. These are largely concentrated in residential and commercial areas. The impact on traffic noise levels in these areas varies, however, none are located in close proximity to the offline sections of the Scheme where moderate or major increases in traffic noise levels are anticipated. Therefore, no significant effects have been identified at public open green spaces.
- 10.10.42 Two areas designated as accessible countryside fall completely or partly within the study area. A minor reduction / negligible change in traffic noise is anticipated at the Clifton Meadow designated accessible countryside south of Burcot in the short term and a negligible change in the long term. At the Ladygrove Park & Lakes designated accessible countryside in the residential area on the northern edge of Didcot, a negligible change in traffic noise levels is anticipated in the short and long term. Therefore, no significant effects have been identified at designated accessible countryside sites.
- 10.10.43 Within the study area, PRowS are located in residential areas, commercial areas, across agricultural land and along the River Thames. In some places the Scheme crosses existing PRow, including the Thames Path which passes underneath the Didcot to Culham River Crossing section of the Scheme. Moderate and major increases in traffic noise levels are anticipated in the short and long term on some sections of PRow which cross the offline sections of the Scheme at Clifton Hampden, Didcot to Culham River Crossing, including the Thames Path, and around Appleford. The solid parapet on the eastern side of the River Crossing provides some reduction in the impact at the Thames Path east of the crossing. Conversely some sections of PRow pass through areas anticipated to experience moderate or major reductions in traffic noise. However, given the linear nature of PRow, the range of noise impacts along them, the absolute traffic noise levels, and the transient usage of a PRow, a material change in the experience of using the PRow as a whole, which could affect people's health or quality of life, is not anticipated and no significant adverse or beneficial effects on PRow have been identified.
- 10.10.44 A large number of new developments are proposed in the vicinity of the Scheme, including the extensive Valley Park development to the south of the A4130 and land at Culham Science Village located north of the A415 and the proposed new Abingdon roundabout. Figure 10.5 illustrates that in the short term the majority of the Valley Park site which falls within the study area is predicted to experience a negligible change or minor increase in traffic noise levels. As the A4130 section of the Scheme is primarily an online widening in this area the extent of moderate and major increases in traffic noise are limited. In the long term, Figure 10.6 illustrates that in the long term the extent of moderate and major increases in traffic noise is larger, though this is primarily due to traffic on the new roads within the development itself. At the large development site to at Culham Science Village located north of the A415 and the proposed new Abingdon roundabout, the impact of the Scheme is primarily a negligible change or minor increase with limited areas experiencing a moderate or

major increase in the short term. In the long term (Figure 10.6), a larger area north of the A415 is predicted to experience a moderate increase though this is related to traffic on the internal roads within the development therefore, receptors within the site will not experience this change.

10.10.45 The road NIA on the A415 in Clifton Hampden to the west of the junction with Watery Lane (ID 13243) is anticipated to experience a major reduction in traffic noise in both the short and long term as this section of the A415 is bypassed by the Scheme. The road NIA on the A34 to the south of the junction with the A4130 at Milton Interchange (ID 4187) is anticipated to experience a negligible change in the short and long term, as traffic on the A34 is not significantly affected by the Scheme.

Compliance with policy

10.10.46 As set out in Section 10.2 the key policy documents are the NPPF and NPSE. The discussion below demonstrates how the Scheme complies with the three aims in the NPSE during construction and operation, within the context of government policy on sustainable development (NPPF Section 2, Achieving Sustainable Development). These aims are as follows:

- avoid significant adverse impacts on health and quality of life (i.e. reduce traffic noise levels at receptors to below the SOAEL);
- mitigate and minimise adverse impacts on health and quality of life (i.e. reduce traffic noise levels at receptors which are between the LOAEL and the SOAEL); and
- where possible, contribute to the improvement of health and quality of life.

10.10.47 This compliance with policy discussion complements but is separate to the environmental impact assessment reported above. In this context the three overarching objectives of the planning system must be considered, the economic (i.e., build a strong, responsive and competitive economy), the social (i.e., to support strong, vibrant and healthy communities) and the environmental objective (i.e., to protect and enhance our natural and built environment). The selection of noise mitigation requires consideration of all three objectives, for example the most effective noise mitigation for a highways development could be to provide a tunnel or deep false cuttings, but these solutions require large amounts of earth to be moved and relocated and often conflict with existing utilities requiring their diversion, both of which are extremely costly to undertaken and could lead to a development being unviable economically. This is therefore not sustainable. Additionally, higher barriers (earth or man-made) could provide greater noise reduction and could therefore have a greater beneficial impact on health and quality of life and a better economic case than tunnels or deep cuttings, but the presence of large structures within the landscape setting could have adverse impacts on the natural and historical environment; this is therefore not a sustainable solution. Sustainable development must consider all objectives and must aim to achieve the best balance between them all. The selection of noise mitigation measures has been considered against these three strands of sustainable development and it is considered that an appropriate balance has been struck when considering all factors. More detail is provided below.

Construction

10.10.48 Significant adverse effects occur for construction noise and vibration levels above the SOAEL which potentially occur for 10 or more days in 15 consecutive days, or 40 days in six consecutive months. Adverse effects occur at construction noise or vibration levels between the LOAEL and SOAEL. The requirement to effectively control and manage noise applies to all construction noise levels.

- 10.10.49 With regard to the first NPSE aim, a significant adverse effect is predicted at a range of locations in close proximity to the Scheme construction works. At this stage a conservative approach has been taken i.e. any exceedances of the noise/vibration criteria are assumed to potentially exceed the duration criteria applied to identifying significant effects, and the potential benefit of additional essential mitigation such as site hoarding/enclosures for specific locations/activities/plant has not been included.
- 10.10.50 The assessment identifies a range of embedded mitigation measures as detailed in Section 10.9 which will constitute BPM including: selection of quiet and low vibration equipment; review of construction programme and methodologies to consider low noise and low vibration methods; optimal location of equipment on site to minimise noise disturbance; the provision of acoustic enclosures around static plant and site hoarding around specific locations/activities, where necessary; use of less intrusive alarms, such as broadband vehicle reversing warnings; no use of vibrating rollers within 15 m of any building for large vibrating rollers, 10 m of any building for medium rollers and 5 m of any building for small rollers, unless the vibration is turned off, implementation of a construction noise insulation and temporary re-housing policy, and compliance with the working hours as specified within the Local Authority working hours of 8am - 6pm Monday - Friday and 8am - 1pm Saturday, with no working on Sundays and Bank Holidays. These mitigation measures will be set out in the CEMP, as based upon the OEMP.
- 10.10.51 As detailed above, the construction contractors will review the proposed working methods to consider all sustainable mitigation measures, including identifying locations/activities/plant where site hoarding/enclosures will be installed to reduce the magnitude of the construction noise impact, with the aim of avoiding significant noise and vibration effects. However, there is the potential for some significant temporary adverse noise and/or vibration effects to remain. This is acceptable in the context of sustainable development as factors including engineering practicality, cost versus benefit etc., must also be considered. On this basis, it is considered that, with the implementation of the mitigation measures outlined in the CEMP and in the context of sustainable development, the first aim of the NPSE will be met during Scheme construction.
- 10.10.52 With regard to the second NPSE aim, adverse effects between the LOAEL and SOAEL are predicted at a range of receptors. The mitigation measures outlined in Section 10.9 will be applied throughout the Scheme construction works, and therefore will benefit all receptors experiencing construction noise or vibration, including those with levels between the LOAEL and SOAEL. Construction impacts between the LOAEL and SOAEL are acceptable in the context of sustainable development as factors including engineering practicality, cost versus benefit etc. must also be considered. Based on the above, with the effective implementation of the defined mitigation and minimisation measures, it is considered that the second NPSE aim will be met during Scheme construction.
- 10.10.53 With regard the NPSE third aim, construction by its nature introduces a new noise or vibration source into the existing environment and is temporary in duration. Therefore, the opportunities to improve existing noise levels during the Scheme construction phase are very limited.

Operation

- 10.10.54 For the purpose of assessing policy compliance, DMRB LA 111 directs that significant adverse effects on health and quality of life from noise occur above the SOAEL (aim 1 of the NPSE), whilst adverse effects occur where traffic noise levels are between the LOAEL and SOAEL (aim 2). The requirement of the third aim of the NPSE to

contribute to the improvement of health and quality of life where possible applies to all traffic noise levels.

10.10.55 The first aim of the NPSE is to avoid significant adverse impacts on health and quality of life from noise as a result of a new development. The DMRB LA 111 defines the SOAEL as being the level at which significant adverse effects on health and quality of life occur. However, many properties will experience noise levels above the SOAEL with or without the Scheme, so it is important to consider the extent to which these noise levels are occurring as a result of the Scheme. To help assess policy compliance with aim 1, this section explains which properties will experience noise levels above the SOAEL or a change in noise levels from above the SOAEL to below it once the Scheme is operational.

10.10.56 Table 10.15 details the number of residential buildings in the noise calculation area which are anticipated to have one or more facades above the daytime or night-time SOAEL for the three assessment scenarios. As discussed in Section 10.5, OCC's traffic consultants have advised that due to the large number of developments in the area the traffic model reaches gridlock before the future assessment year in 2039, when the scheme is not included. Therefore, it is not possible to provide meaningful traffic data for the without Scheme future assessment year scenario (DM 2039).

10.10.57 Appendix 10.5 provides a comparable table of results for the sensitivity test of the likely benefit of the adoption of low noise surfacing on selected sections of the Scheme, using the methodology set out in the 2018 IOA paper 'Road Surface Corrections for Use with CRTN'. This methodology applies a benefit from low noise Surfacing at speeds <75 km/hr, with the benefit decreasing as the speed decreases, rather than a sharp cut off of full benefit at or above 75 km/hr and no benefit below 75 km/hr, as adopted in DMRB LA 111. The low noise surfacing is proposed in locations which experience the greatest increase in traffic noise due to the Scheme, however, the absolute levels are generally not above the SOAEL in these areas, therefore the results for the sensitivity text reported in Appendix 10.5 are virtually identical to Table 10.15.

Table 10.15: Number of residential buildings above the SOAEL

Scenario	Day	Night
2024 Do-Minimum opening year (DM 2024)	351	349
2024 Do-Something opening year (DS 2024)	164	160
2039 Do-Something future year (DS 2039)	224	219

10.10.58 An overall reduction in the number of residential buildings above the SOAEL is anticipated due to the Scheme.

10.10.59 With regard to the first NPSE aim, the Scheme is anticipated to reduce traffic noise levels from above the SOAEL in DM 2024 to below the SOAEL in DS 2024 at 160 residential buildings - these are located throughout the study area at residential buildings in close proximity to existing roads which are bypassed by the Scheme, including the A4130 east of the Scheme in Didcot, Sutton Courtenay, Culham, the B4016 Appleford, Clifton Hampden, Long Wittenham and the A415 through Burcot.

10.10.60 153 residential buildings are above the SOAEL both with and without the Scheme in operation in 2024, therefore the exceedance of the SOAEL is not due to the Scheme. These are at residential buildings in close proximity to existing roads, including Milton Heights close to the A34, the A4130 along the northern edge of Didcot, Sutton Courtenay and a small number of individual residential buildings across the study area.

- 10.10.61 A total of 11 residential buildings are anticipated to experience an increase in traffic noise which takes them from below the SOAEL in DM 2024 to above the SOAEL in DS 2024. These are all located on existing roads, not close to the Scheme, predominately on the A4130 along the northern edge of Didcot where the magnitude of the increase is negligible. The introduction of noise mitigation measures such as noise barriers along existing roads away from the Scheme to mitigate slight (non-significant) increases in traffic noise at a small number of properties is not considered to be in line with the principle of sustainable development.
- 10.10.62 The increase in traffic flows from DS 2024 to DS 2039 results in an overall increase in the number of residential buildings above the SOAEL in 2039 compared to 2024 of 61. But in the absence of results for the DM 2039 scenario it is not possible to confirm how many of these will have occurred anyway without the Scheme. However, the majority are located away from the Scheme mainly in Didcot and Sutton Courtenay and are therefore not directly related to the Scheme. Two are located on the Scheme between Didcot and Appleford (Hill Farm and Hartwright House), which experience an increase from just under to just over the SOAEL from DS 2024 to DS 2039 (a significant increase due to the introduction of the Scheme is also predicted at these properties). A small number are also located on the B4015 between the Scheme and the A4074 (Rough Lodge and Golden Balls) which is anticipated to undergo a significant increase in traffic due to housing growth in the future year only, increasing traffic noise levels to slightly over the SOAEL.
- 10.10.63 In the vicinity of the two individual properties - Hill Farm and Hartwright House - the speed limit is 30 mph. In general lower traffic speeds result in lower traffic noise levels, though reducing the speed limit below 30 mph is not considered practicable. Although the benefit of low noise surfacing reduces at lower speeds, it has nevertheless been included on this section of the Scheme. In this location there is insufficient width for false cuttings to be incorporated in the Scheme design due to the adjacent properties and landfill site. Barriers are not considered to be a practicable option due to the need to maintain access into the properties. At Hartwright House the access is directly off the Scheme therefore the necessary gap in the barrier would compromise the effectiveness of a barrier. Similarly at Hill Farm, the pedestrian/cycleway connection to the bridleway east of the property would compromise any barrier on the west side of the scheme. As demonstrated by the baseline noise survey, the existing noise climate includes the Didcot-Oxford rail line (Cherwell Valley Line) - including trains to the Hanson site private rail sidings, the Wood Recycling Business and the access route into the FCC and Hanson sites. Therefore, ambient noise levels in this location are higher than indicated by the predicted Do-Minimum traffic noise levels, and the change in overall noise levels due to the Scheme will be smaller than indicated by the increase in traffic noise alone. Some uncertainty exists over whether these properties will remain residential in the future due to the proposed D-Tech commercial development. Hill Farm is within the development boundary and Hartwright House just outside the boundary. If these two properties remain in residential use once the Scheme is in operation, they have been identified as likely to qualify for additional noise mitigation in the form of noise insulation under the Noise Insulation Regulations (see next section). On the basis of the above discussion, no additional mitigation, beyond that included in the Scheme, is considered appropriate at these properties.
- 10.10.64 Noise barriers are also not considered to be a sustainable option at the small number of properties on the B4015 between the north-east end of the Scheme and the A4074 which experience a significant increase in traffic noise levels in the long term to slightly over the SOAEL. The effect is limited to a small number of individual properties remote from the Scheme in the long term only. It is due to anticipated traffic growth on the B4015 from other developments in the area, not the Scheme

directly. Therefore, noise mitigation within the Scheme design would not change the impact at these properties.

10.10.65 Based on the above discussion, it is considered that the first NPSE aim to avoid exceedances of the SOAEL as a result of the Scheme, within the context of sustainable development, has been met.

10.10.66 With regard to the second aim, a range of mitigation measures have been incorporated into the Scheme design as outlined in Section 10.9. These include the alignment of the Scheme, the speed limit, use of low noise surfacing on key sections of the Scheme and noise barriers/solid bridge parapets at Appleford, the River Thames crossing, Fullamoor Cottages and Clifton Hampden. The inclusion of these mitigation measures demonstrates that, within the context of sustainable development, at receptors between the LOAEL and the SOAEL, the Scheme meets the requirements of the second NPSE aim.

10.10.67 Further discussion of mitigation at receptors where traffic noise levels are between the LOAEL and the SOAEL, and are identified as experiencing a significant increase in traffic noise levels due to the Scheme, is provided below:

10.10.68 *Level Crossing Cottage, Appleford* - Large increases in traffic noise are predicted at the rear façade of the property, which faces the Scheme. Mitigation in the form of low noise surfacing is included on this section of the Scheme, and the sensitivity test indicates potential reductions of up to around 2 dB. Additional mitigation in the form of a 3 m noise barrier along the Scheme to the west of Appleford and extending past this dwelling is included in the Scheme design. The barrier provides up to around 8 dB reduction in traffic noise from the Scheme at the property. Increasing the barrier height to 4 m was considered but 3 m was concluded to be an appropriate balance between noise and landscape/visual impacts, noting that the additional benefit of a 4 m barrier is limited at up to around 1.5 dB. The landscape architect for the Scheme advised that a significant adverse visual effect is likely at the property, and the larger the barrier the greater the magnitude of the impact. The barrier extends a considerable distance to both the north and south of the property, extending the barrier would not provide appreciable noise benefits. The speed limit on this section of the Scheme is 50 mph, in general lower traffic speeds result in lower traffic noise levels, though the benefit of low noise surfacing also reduces at lower speeds. The Scheme speed limit is 50 mph in some locations to support achievement of the Scheme objectives. Additionally, a lower speed limit for a long section of the Scheme would be difficult to enforce without active enforcement. In this location there is insufficient width for false cuttings to be incorporated in the Scheme design due to the adjacent property, landfill site and the need for the Scheme to bridge over the private rail sidings. As demonstrated by the baseline noise survey, the existing noise climate in this location includes the Didcot-Oxford rail line (Cherwell Valley Line) - including trains to the Hanson site private rail sidings to the east, the access route into the FCC and Hanson sites to the west and the operation of the FCC landfill and Hanson quarry site. Therefore, ambient noise levels at this property are higher than indicated by the predicted Do-Minimum traffic noise levels and the change in overall noise levels due to the Scheme will be smaller than indicated by the increase in traffic noise alone. On the basis of the above discussion, no additional mitigation, beyond that included in the Scheme, is considered appropriate at this property in the context of sustainable development.

10.10.69 *B4016 Appleford (19 properties south of allotments)* – A reduction in traffic on the B4016 through the centre of Appleford results in a major decrease in traffic noise levels on eastern facades in the short term, this reduces to a minor decrease in the long term. Increases on the western facades due to the introduction of the Scheme are predicted in both the short term (minor/moderate/major) and long term

(minor/moderate). Low noise surfacing is included on this section of the Scheme, and the sensitivity test indicates potential reductions of up to around 2 dB. Additional mitigation in the form of a 3 m noise barrier along the Scheme to the west of the southern end of Appleford, provides up to around 5 dB reduction in traffic noise from the Scheme, reducing the number of properties anticipated to experience a moderate or major increase. As set out in the ES, increasing the barrier height to 4 m was considered but 3 m was concluded to be an appropriate balance between noise and landscape/visual impacts, noting that the additional benefit of a 4 m barrier is limited at up to around 1 dB. The landscape architect expressed a preference for a 3 m barrier over a 4 m barrier in this location due to the greater landscape/visual impact of a higher barrier. The barrier extends a considerable distance to both the north and south of the properties, extending the barrier would not provide appreciable noise benefits. The speed limit on this section of the Scheme is 50 mph, in general lower traffic speeds result in lower traffic noise levels, though the benefit of low noise surfacing also reduces at lower speeds. The Scheme speed limit is 50 mph in some locations to support achievement of the Scheme objectives. Additionally, a lower speed limit for a long section of the Scheme would be difficult to enforce without active enforcement. In this location a false cutting is not feasible due to historic landfill site and vertical clearance required at the rail sidings. The existing noise climate in this area includes the Didcot-Oxford rail line (Cherwell Valley Line) to the west, including the Hanson site private rail sidings, which may reduce residents' perception of the increase in traffic noise at the rear facades. On the basis of the above discussion, no additional mitigation, beyond that included in the Scheme, is considered appropriate in this location in the context of sustainable development.

10.10.70 Warren Cottage, Thame Lane north of A415 – This individual property is located a considerable distance (over 450 m) north of the proposed roundabout on the A415 at the north-west edge of the Scheme. Major/moderate increases in traffic noise levels are predicted in both the short and long term, however the daytime absolute traffic noise levels are low, $L_{A10,18h}$ traffic noise levels are below the LOAEL both with and without the Scheme (night time levels at some facades are slightly above the LOAEL). In any situation a barrier to protect a single property will have a poor cost/benefit ratio, and given the large distance between the A415 and the property any barrier would need to be a considerable length and would provide a limited reduction. Due to the introduction of the new roundabout on the A415 traffic speeds on the closest approach of the Scheme are low, therefore low noise surfacing in this location would provide very little benefit. The property is located within a new development site west of Culham Science Centre, therefore new buildings will be constructed to the south between the property and the Scheme/A415. Future development roads and traffic are included in the traffic noise predictions but no building layout is available, therefore the shielding provided by new buildings located between the Scheme and the property is not included in the predictions, therefore the predictions are very much a worst-case approach. On the basis of the above discussion, no additional mitigation is considered appropriate at this property in the context of sustainable development.

10.10.71 Culham Science Centre nursery – A minor increase in operational traffic noise is predicted in the opening year at the nursery, however in the long term a moderate increase is anticipated on the northern facades. A large increase in traffic on the access road into the Science Centre to the north-east of the nursery is anticipated in the future year due to proposed development at the Science Centre. Therefore, the moderate increase in the long term is driven by noise from traffic associated with the future development of the Science Centre, and not the Scheme directly. The Scheme is located to the south and only minor increases are reported on the southern facades (i.e. facing the Scheme) in the long term. The UK Atomic Energy Association received full planning permission in November 2022 to demolish the Culham Science Centre Nursery and Preschool and create a replacement main gate facility under

planning application P22/S0211/FUL (South Oxfordshire District Council). Additionally, the UK Atomic Energy Association received outline planning permission in September 2022 to replace the nursery. Given that the UK Atomic Energy Association has sought planning permission to demolish and replace the nursery, the receptor as assessed is not likely to exist in the same location when the Scheme is operational. On the basis that the moderate increase in traffic noise in the long term is driven by development traffic unrelated to the Scheme, and the receptor is not likely to exist when the Scheme is operational, no additional mitigation as part of the Scheme is considered appropriate in the context of sustainable development.

10.10.72 *Fullamoor Cottages, A415 (two properties)* – A large reduction in traffic on the A415 to the south of the properties is anticipated, as it is bypassed by the Scheme, resulting in major decreases in traffic noise levels in the short term and moderate decreases in the long term, on the southern façades. The introduction of the Scheme to the north results in minor/moderate increases on northern facades in both the short and long term. Mitigation in the form of low noise surfacing is included on this section of the Scheme, and the sensitivity test indicates potential reductions of around 1 dB which would reduce the short term change on the northern facades to minor at both properties, though the moderate increase would remain in the long term. The speed limit on this section of the Scheme is proposed to be 40 mph, reduced from the existing 60 mph. Though anticipated traffic speeds are lower than this on a number of sections of the Scheme in the vicinity of the properties, close to the new link to the A415 and the new roundabout at Culham Science Centre. In general lower traffic speeds result in lower traffic noise levels, though the benefit of low noise surfacing also reduces at lower speeds. Changes in the Scheme speed limit in this location would not be an effective form of mitigation. In this location false cuttings could not be incorporated into the Scheme design due to utility and drainage constraints. Additional mitigation in the form of a 3 m noise barrier to the north is included in the Scheme and provides around 5 dB reduction in traffic noise from the Scheme, reducing the magnitude of the short term impact from major with no mitigation in place. Increasing the barrier height to 4 m was considered but 3 m was concluded to be an appropriate balance between noise and landscape/visual impacts, noting that the additional benefit of a 4 m barrier is limited at up to around 2 dB. To maximise the benefit from the barrier, and avoid the need for a gap in the barrier for the link road to the A415, to the east of the properties, it is positioned along the link to the A415 rather than the Scheme. Extending the barrier would not provide appreciable noise benefits. On the basis of the above discussion, no additional mitigation, beyond that included in the Scheme, is considered appropriate at this location in the context of sustainable development.

10.10.73 *Clifton Hampden northern edge (seven properties)* – The introduction of the Scheme to the north west of the edge of the village results in moderate/major increases in traffic noise levels in the short term, and moderate increases in the long term at some facades facing the Scheme. Major/moderate/minor reductions are anticipated on facades facing the B4015 to the east as this section of road is bypassed by the Scheme. Mitigation in the form of low noise surfacing is included on this section of the Scheme, and the sensitivity test indicates potential reductions of up to around 2 dB. The speed limit on this section of the Scheme is 50 mph, reduced from 60 mph at the preliminary design stage. In general lower traffic speeds result in lower traffic noise levels, though the benefit of low noise surfacing also reduces at lower speeds. The reduction in the speed limit also allowed the Scheme alignment to be relocated further north maximising the distance from Clifton Hampden. The Scheme speed limit is 50 mph in some locations to support achievement of the Scheme objectives. Additionally, a lower speed limit for a long section of the Scheme would be difficult to enforce without active enforcement. In this location false cuttings could not be incorporated into the Scheme design due to utility and drainage constraints. Additional mitigation in the form of a 3 m noise barrier to the north provides up to

around 5 dB reduction in traffic noise from the Scheme and reduces the number of major/moderate increases in the short term. As set out in the ES, increasing the barrier height to 4 m was considered but 3 m was concluded to be an appropriate balance between noise and landscape/visual impacts, noting that the additional benefit of a 4 m barrier is limited at up to around 1.5 dB. The landscape architect noted that a significant adverse visual effect was anticipated in this location and any noise barrier would be out of character in the context of both landscape and views. They expressed a strong preference for a 3 m barrier rather than 4 m. To maximise the benefit from the barrier, and avoid the potential for a gap in the barrier for the access track to the west, the barrier has been extended southwards at each end along the access track to the west and the B4015 to the east. Extending the barrier further would not provide appreciable noise benefits. On the basis of the above discussion, no additional mitigation, beyond that included in the Scheme, is considered appropriate at this location in the context of sustainable development.

- 10.10.74 *Two properties north of Clifton Hampden at north-east end of Scheme* – The introduction of the Scheme to the north west of the edge of the village results in moderate increases in traffic noise levels at some facades of these two properties (The Coppice and The Old Stables) in the short term and long term. Minor increases are anticipated at other facades. Mitigation in the form of low noise surfacing is included on this section of the Scheme, the sensitivity test indicates potential reductions of around 1.5 dB in traffic noise from the Scheme which would reduce the magnitude of impact to minor in the short and long term, removing the significant adverse effect. The speed limit on this section of the Scheme is 50 mph, reduced from 60 mph at the preliminary design stage. In general lower traffic speeds result in lower traffic noise levels, though the benefit of low noise surfacing also reduces at lower speeds. The Scheme speed limit is 50 mph in some locations to support achievement of the Scheme objectives. Additionally, a lower speed limit for a long section of the Scheme would be difficult to enforce without active enforcement. In this location false cuttings could not be incorporated into the Scheme design due to utility, drainage constraints and the need to tie in with the B4015 which is not in cutting. An additional barrier on the north side of the Scheme at Clifton Hampden was considered but due to the distance between the Scheme and the two properties to the north and the location of the properties at the end of the Scheme, a barrier would have very limited effect and was therefore discounted. On the basis of the above discussion, no additional mitigation, beyond that included in the Scheme, is considered appropriate at this location in the context of sustainable development.
- 10.10.75 As set out above, no areas where additional mitigation would be appropriate, within the context of sustainable development, have been identified i.e. considering the nature/source of the adverse effect, the circumstances of the receptor, the cost versus the benefit, engineering practicality, safety considerations, generation of knock-on impacts (such as access issues, vegetation clearance, ecological impacts, landscape and visual impacts), plus consultation and stakeholder engagement responses regarding the Scheme.
- 10.10.76 With regard to the third NPSE aim to ‘*contribute to the improvement of health and quality of life*’ the Scheme results in reductions in traffic noise levels along existing roads which are bypassed by the Scheme including individual properties along the existing minor roads to the east and west of the Scheme through the villages of Sutton Courtenay, Culham and Long Wittenham, and the A415 east of Culham Station and the A415 and B4015 in Clifton Hampden. In addition, the Scheme results in a reduction in traffic noise east of Clifton Hampden through the village of Burcot, and in the centre of Appleford at facades of properties facing onto the B4016, both of which experience a reduction in traffic with the Scheme in operation. On this basis, it is considered that the third NPSE aim has been met.

Noise Insulation Regulations

- 10.10.77 A preliminary consideration of properties which may qualify for noise insulation works under the Noise Insulation Regulations has identified two residential buildings as potentially qualifying: Hill Farm and Hartwright House. Both of these are located on the Didcot to Culham River Crossing section of the Scheme between Didcot and Appleford. The Scheme follows the alignment of the existing access route to the properties. Mitigation in the form of low noise surfacing is included in the Scheme. In this area the speeds are below the 75 km/hr cut off adopted in the DMRB LA 111 methodology for assuming a benefit of low noise surfacing. The sensitivity test to estimate the likely benefit of low noise surfacing indicates some reduction in traffic noise levels is likely, however, this will not be sufficient to remove qualification for noise insulation.
- 10.10.78 As discussed in Section 10.7, Some uncertainty exists over whether these properties will remain residential in the future due to the proposed D-Tech commercial development. Hill Farm is within the development boundary and Hartwright House just outside the boundary.
- 10.10.79 A Noise Insulation Regulations assessment will be completed within the timescales set out in the Regulations.

10.11 Monitoring

Construction

- 10.11.1 Given the potential significant construction noise and vibration effects as reported in Section 10.10, it is necessary for monitoring to be undertaken during the construction of the Scheme to ensure that the mitigation measures as detailed in Section 10.9 are being appropriately implemented. During the construction phase, surveys will be required which will include physical measurements and observational checks and audits to ensure that BPM are always being employed. The contractor will undertake, and report noise and vibration surveys as is necessary to ensure and demonstrate compliance with all noise and vibration commitments and the requirements of the NVMP. Proposals for all survey locations will be set out in the NVMP.

Operation

- 10.11.2 As detailed in Section 10.10, the performance specification of specific operational mitigation measures will be confirmed at the Scheme detailed design stage to ensure the performance assumed in the assessment is achieved. Surveys will be undertaken to ensure that measures are installed as required. No further monitoring is proposed.

10.12 Summary

- 10.12.1 The construction assessment is based on the construction information that is currently available, with advice being provided by the appointed ECI. Given that the details of the nature, timing and duration of the construction activities will not be fully understood before the detailed design stage, a conservative approach has been adopted and all the identified levels at or above the SOAEL (i.e. moderate or major impacts) are assumed to be at risk of exceeding the duration criteria set out in Section 10.4 of 10 or more days (or 10 evenings, weekends or nights) in any consecutive 15, or 40 or more days (or 40 evenings, weekends or nights) in any consecutive six month period. On this basis, significant adverse daytime construction noise effects are identified at the closest receptors to the construction works on the existing A4130, the existing minor access road between the A4130 on the northern edge of Didcot and the southern edge of Appleford, close to the Culham Science Centre and the north-

east edge of Clifton Hampden. Significant evening and night-time construction noise effects are more widespread along the Scheme and relate to tie-in works and bridge works at the new Didcot Science Bridge and Appleford rail sidings bridge. However, the duration of the tie-in works is limited, at some locations the duration is anticipated to be below the DMRB LA111 criterion of 10 or more working days (or evenings/weekends or nights) in any 15 consecutive days. In addition, a conservative approach to tie-in works has been taken, and at some locations there is potential for the works to be carried out during the daytime. The duration of the evening/weekend and night works at the two new bridges over existing railways is limited, below the DMRB LA 111 criterion of 10 or more working days (or evenings/weekends or nights) in any 15 consecutive days.

10.12.2 Based on the information from the ECI, potentially significant construction vibration annoyance effects have been identified at approximately 15 residential buildings and two non-residential potentially sensitive buildings located close to works involving vibratory rollers.

10.12.3 No significant adverse traffic noise effects are anticipated due to the addition of construction traffic to the existing local road network.

10.12.4 The Scheme operation is anticipated to result in reductions in traffic noise levels along existing roads which are bypassed by the Scheme including at individual properties along the existing minor roads to the east and west of the Scheme through the villages of Sutton Courtenay, Culham and Long Wittenham, and the A415 east of Culham Station and the A415 and B4015 in Clifton Hampden. In addition, the Scheme results in a reduction in traffic noise along the A415 to the east of Clifton Hampden through the village of Burcot, and in the centre of Appleford at facades of properties facing onto the B4016, both of which experience a reduction in traffic with the Scheme in operation. At 746 residential properties which are closest to the roads in these areas a significant beneficial effect has been identified. Significant beneficial effects are also identified at 10 non-residential sensitive receptors. The magnitude of the reduction in traffic noise levels in these locations is greatest in the Scheme opening year, in the long term the reductions are smaller due to the growth in traffic across the area.

10.12.5 Scheme operation is anticipated to result in significant adverse noise effects at:

- two residential properties located close to the offline sections of the Scheme between Didcot and Appleford (Hill Farm and Hartwright House - Some uncertainty exists over whether these properties will remain residential in the future due to the proposed D-Tech commercial development. Hill Farm is within the development boundary and Hartwright House just outside the boundary;
- 20 properties at the southern end of Appleford including Level Crossing Cottage;
- two properties (Fullamoor Cottages) north of the A415;
- seven properties on the northern edge of Clifton Hampden; and
- two properties located north of the Scheme at Clifton Hampden.

10.12.6 Following a conservative approach significant adverse effects have also been identified at:

- ~~the Premier Inn near Milton Interchange, though the increase in noise levels relates to the new access road into the adjacent development;~~
- Warren Cottage north of the A415, though the impact is associated with traffic within the new development surrounding the property, the buildings of which will

shield the property from both the Scheme/A415 and the internal development roads;

- Culham Science Centre nursery, though the increases are primarily due to future development traffic at the Science Centre in the long term only; and
- four properties at Rough Lodge and Golden Balls north-east of the Scheme in the long term only, due to anticipated traffic growth on the B4015 from other developments in the area.

10.12.7 In total significant operational adverse effects are anticipated at 38 residential buildings and ~~one~~^{two} non-residential sensitive receptors, compared to significant beneficial effects at 746 residential buildings and 10 non-residential sensitive receptors.

10.12.8 Embedded mitigation has been incorporated into the alignment of the Scheme and additional mitigation included in the form of low noise surfacing and noise barriers at key locations, to avoid or reduce the magnitude of significant adverse effects. The results presented in this chapter are based on the approach to low noise surfacing set out in DMRB LA 111 i.e. only applying a benefit at speeds ≥ 75 km/hr, of which there are only very limited sections on the selected areas of the Scheme. A sensitivity test has been completed to demonstrate the likely benefit of the adoption of low noise surfacing on the selected sections of the Scheme using the methodology set out in the 2018 IOA paper 'Road Surface Corrections for Use with CRTN'. This method applies a benefit at speeds < 75 km/hr, with the benefit decreasing as the speed decreases. The number of moderate/major increases in traffic noise is slightly reduced applying this method.

10.12.9 Table 10.16 provides a summary of likely significant noise and vibration effects during construction and operation of the Scheme.

Table 10.16: Summary of likely significant effects during construction and operation

Receptor	Receptor Sensitivity	Impact Description	Design and Mitigation Measures	Impact Magnitude	Residual Effect
Construction					
Hotel (Premier Inn), Milton Interchange, A4130	High	Construction noise and vibration	Use of BPM and compliance with the control measures detailed in the NVMP	Moderate/major (noise) Moderate (vibration)	Significant adverse
New Farm, A4130	High	Construction noise	Use of BPM and compliance with the control measures detailed in the NVMP	Moderate/major	Significant adverse
Valley Park, A4130 (closest approach if constructed/occupied)	High	Construction noise	Use of BPM and compliance with the control measures detailed in the NVMP	Moderate/major	Significant adverse
Great Western Park (closest approach)	High	Construction noise	Use of BPM and compliance with the control measures detailed in the NVMP	Moderate	Significant adverse
Hill Farm, Hartwright House and Level Crossing Cottage between Didcot and Appleford	High	Construction noise and vibration	Use of BPM and compliance with the control measures detailed in the NVMP	Moderate/major (noise) Moderate (vibration)	Significant adverse
Appleford western edge (Main Road, south, and Chambrai Close)	High	Construction noise	Use of BPM and compliance with the control measures detailed in the NVMP	Moderate/major	Significant adverse
Appleford north west (single property)	High	Construction vibration	Use of BPM and compliance with the control measures detailed in the NVMP	Moderate	Significant adverse
Sutton Courtenay east	High	Construction noise	Use of BPM and compliance with the control measures detailed in the NVMP	Moderate	Significant adverse
Zouch Farm, A415	High	Construction noise	Use of BPM and compliance with the control measures detailed in the NVMP	Moderate/major	Significant adverse
Culham Station south, A415	High	Construction noise and vibration	Use of BPM and compliance with the control measures detailed in the NVMP	Moderate/major (noise) Moderate (vibration)	Significant adverse
Fullamoor Barns, A415	High	Construction noise and vibration	Use of BPM and compliance with the control measures detailed in the NVMP	Moderate/major (noise) Moderate (vibration)	Significant adverse
Culham Science Centre Nursery, A415	High	Construction noise and vibration	Use of BPM and compliance with the control measures detailed in the NVMP	Moderate/major (noise) Moderate (vibration)	Significant adverse

Receptor	Receptor Sensitivity	Impact Description	Design and Mitigation Measures	Impact Magnitude	Residual Effect
Fullamoor Cottages and 2 cottages to east, A415	High	Construction noise and vibration	Use of BPM and compliance with the control measures detailed in the NVMP	Moderate/major (noise) Moderate (vibration)	Significant adverse
Northern edge of Clifton Hampden	High	Construction noise and vibration	Use of BPM and compliance with the control measures detailed in the NVMP	Moderate/major (noise) Moderate (vibration)	Significant adverse
2 properties north of Scheme north of Clifton Hampden	High	Construction noise	Use of BPM and compliance with the control measures detailed in the NVMP	Moderate/major	Significant adverse
Operation					
Hotel (Premier Inn), Milton Interchange, A4130	High	Increase in traffic noise	N/A impact relates to traffic on new access road in adjacent development	Moderate	Significant adverse
Hill Farm and Hartwright House between Didcot and Appleford (2 properties)	High	Increase in traffic noise	Low noise surfacing (Some uncertainty exists over whether these properties will remain residential in the future due to the proposed D-Tech commercial development. Hill Farm is within the development boundary and Hartwright House just outside the boundary)	Major	Significant adverse
B4016 Appleford 20 properties south of allotments including Level Crossing Cottage	High	Increase in traffic noise	Low noise surfacing and 3 m noise barrier	Major/moderate/minor	Significant adverse
Warren Cottage north of A415	High	Increase in traffic noise	N/A impact associated with new development to south which once built will shield the property from the Scheme/A415 and the internal development roads included in the traffic noise predictions	Major/moderate	Significant adverse
Culham Science Centre Nursery, A415	High	Increase in traffic noise	N/A increases are primarily due to future development traffic at the Science Centre in the long term	Moderate (long term only)	Significant adverse
Fullamoor Cottages, A415 (2 properties)	High	Increase in traffic noise	Low noise surfacing and 3 m noise barrier	Moderate/minor	Significant adverse
Northern edge of Clifton Hampden (7 properties)	High	Increase in traffic noise	Low noise surfacing and 3 m noise barrier	Major/moderate	Significant adverse

Receptor	Receptor Sensitivity	Impact Description	Design and Mitigation Measures	Impact Magnitude	Residual Effect
North of Clifton Hampden (2 properties)	High	Increase in traffic noise	Low noise surfacing	Moderate	Significant adverse
Rough Lodge and Golden Balls on B4015 north-east of Scheme (4 properties)	High	Increase in traffic noise	N/A beyond end of Scheme, increases due to anticipated traffic growth on the B4015 from other developments in the area in the long term	Moderate (long term only)	Significant adverse
Didcot 57 properties along existing A4130 east of the Didcot Science Bridge	High	Decrease in traffic noise	Reduction in traffic on A4130 east of Didcot Science Bridge as bypassed by the scheme	Moderate	Significant beneficial
B4016 Appleford 79 properties close to the B4016	High	Decrease in traffic noise	Reduction in traffic on B4016 through village due to Scheme	Major/moderate	Significant beneficial
Sutton Courtenay and Culham 228 properties and 1 educational building	High	Decrease in traffic noise	Reduction in traffic through the villages as route bypassed by the Scheme	Major/moderate	Significant beneficial
9 individual properties on the A415 east of Culham Station	High	Decrease in traffic noise	Reduction in traffic on A415 as route bypassed by the Scheme	Major	Significant beneficial
Clifton Hampden 91 properties, 3 community facilities, 1 medical building and 1 school	High	Decrease in traffic noise	Reduction in traffic on A415 and B4015 in village as bypassed by the Scheme	Major/moderate	Significant beneficial
Long Wittenham and individual properties to north and south (207 properties, 3 community facilities and 1 school)	High	Decrease in traffic noise	Reduction in traffic on minor roads as bypassed by the Scheme	Major/moderate	Significant beneficial
Burcot 75 properties	High	Decrease in traffic noise	Reduction in traffic on A415 as traffic transfers to B4015	Major/moderate	Significant beneficial

10.13 References

- Ref 10.1 Environmental Noise (England) Regulations 2006 (as amended).
- Ref 10.2 Land Compensation Act 1973.
- Ref 10.3 Noise Insulation Regulations 1975 (as amended 1988).
- Ref 10.4 Highways Noise Payments and Movable Homes (England) Regulations 2000.
- Ref 10.5 Environmental Protection Act 1990.
- Ref 10.6 Control of Pollution Act 1974.
- Ref 10.7 Ministry of Housing, Communities and Local Government (2018) National Planning Policy Framework.
- Ref 10.8 Department for Environment, Food and Rural Affairs (Defra) (2010) Noise Policy Statement for England (NPSE).
- Ref 10.9 Department for Communities and Local Government (2019) Planning Practice Guidance - Noise (PPG-N).
- Ref 10.10 Vale of White Horse District Council (2017) Local Plan 2031 Part 2 Detailed Policies and Additional Sites.
- Ref 10.11 South Oxfordshire District Council (2020) South Oxfordshire Local Plan 2011-2035
- Ref 10.12 Highways Agency (2020) Design Manual for Roads and Bridges LA 111 Noise and Vibration Revision 2.
- Ref 10.13 AECOM (2020) Didcot Garden Town HIF 1 Scheme EIA Scoping Report
- Ref 10.14 Department of Transport, Welsh Office (1988) Calculation of Road Traffic Noise (CRTN).
- Ref 10.15 British Standards Institution (2014) BS 5228: 2009+A1: 2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites.
- Ref 10.16 Transport Research Laboratory (TRL) (2000) Report 429 Ground borne vibration caused by mechanised construction work.
- Ref 10.17 British Standards Institution (1993) BS 7385-2: 1993 Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from ground borne vibration.
- Ref 10.18 ISO (2010) ISO 4866:2010 Mechanical vibration and shock. Vibration of fixed structures. Guidelines for the measurement of vibrations and evaluation of their effects on structures.
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