MetroWest

Portishead Branch Line (MetroWest Phase 1)

TR040011

Applicant: North Somerset District Council
6.16, Environmental Statement, Volume 2, Chapter 13 Noise and Vibration
The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009, Regulation 5(2)(a)
Planning Act 2008

Author: CH2M
Revision: Version 2
Date: ~~November~~ March 2021~~9~~

Notice

Document history

Project	Portishead Branch Line (MetroWest Phase 1) Development Consent Order Scheme
Planning Inspectorate Scheme Reference	TR040011
Part and Application Document Reference	6, 6.16
Document title	Environmental Statement, Volume 2, Chapter 13 Noise and Vibration
Regulation Number	Regulation 5(2)(a)
Applicant	North Somerset District Council
Lead Author	RS at CH2M

Version	Date	Status of Version
~~Rev:~~ 01	07/11/19	Application Issue
02	12/03/21	Update working hours during construction and acoustic fence proposed for old Portbury Station

Table of Contents

Tables

Figures

Appendices

CHAPTER 13

Noise and Vibration

13.1 Introduction

13.1.1 The Portishead Branch Line (MetroWest Phase 1) Development Consent Order Scheme (“the DCO Scheme”) has the potential to give rise to significant effects on noise and vibration. This Chapter:

- describes the relevant legal and policy framework which informs the undertaking of the assessment;
- describes the methodology proposed for the identification and assessment of likely significant noise and vibration effects in this Environmental Statement ("ES");
- describes the noise and vibration baseline having regard to the existing train movements and maintenance;
- describes the measures that have been adopted as part of the DCO Scheme;
- identifies and assesses the likely significant effects that could result from the DCO Scheme during construction and operation phases;
- considers mitigation of likely significant effects and assesses residual effects;
- considers the cumulative effects of other developments in combination with the DCO Scheme on noise and vibration;
- identifies the limitations encountered in compiling the ES; and
- provides a summary of the residual effects for the mitigated DCO Scheme.

13.1.2 This chapter should be read in conjunction with Chapter 4 Description of the Works (DCO Document Reference 6.7).

13.1.3 This chapter uses some technical acoustic terminology. These terms are presented and described in Appendix 13.1 (DCO Document Reference 6.25), which also provides a basic introduction to acoustics.

13.2 Legal and Policy Framework

EU and National Legislation

Environmental Noise Directive 2002/49/EC and The Environmental Noise (England) Regulations 2006 (as amended)

13.2.1 The Environmental Noise (England) Regulations 2006 (as amended) transpose the provisions of the Assessment and Management of Environmental Noise Directive 2002/49/EC. This Directive relates to the assessment and management of environmental noise in EU Member States. The production of strategic noise maps and action plans are legal requirements set out in the Environmental Noise (England) Regulations 2006. From these noise maps, certain areas alongside the major roads and

railways have been identified as 'Important Areas' (“IA”), where dwellings are subject to noise levels considered high enough to warrant further investigation. The investigations are the responsibility of the noise making authority who should report possible mitigation measures at each IA to Defra. The noise making authority for the railways is Network Rail.

Land Compensation Act 1973

13.2.2 Part I of the Land Compensation Act provides a means by which compensation can be paid to owners of land or property due to a loss in value of these assets caused by the public works, such as new or improved railways and roads. Noise and vibration are two of the factors which would be considered in any claims for compensation, but the claim should consider all changes and effects, including betterment. Part II of the Act imposes a duty on authorities to undertake or make a grant in respect of the cost of undertaking noise insulation work in or to eligible buildings. This is subject to meeting certain criteria given in the Noise Insulation Regulations.

The Noise Insulation Regulations 1975 (Amended 1988)

13.2.3 Where alterations are made to a highway, the Noise Insulation Regulations (1975) may apply. Specific circumstances need to be present for the Regulations to apply. Where there is an 'additional carriageway' the authority has a duty (i.e. they must) to carry out insulation work or to make grants. For an 'altered highway', the authority has a power (i.e. they can) to carry out insulation work or to make grants.

The Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996

13.2.4 The Noise Insulation (Railways and Other guided Transport Systems) Regulations 1996 (“NIRR”) were introduced to meet a need to consider the impact of railways, tram systems and other guided transport systems upon existing residential properties along their route, and to consider the need for noise insulation measures to those properties as a result of the development of the transport system. The NIRR provide a duty to install noise insulation for eligible dwellings affected by noise from the operation of a new or additional railway line or guided transport system, and powers to carry out similar works for properties affected by altered existing rail systems. The criteria for eligibility are defined in the NIRR.

13.2.5 It should be noted that the NIRR only apply to noise from moving railway vehicles, so no account is taken of noise from stationary rail vehicles when considering applicability.

National Policy

Noise Policy Statement for England

13.2.6 The Government’s noise policy is set out in the Noise Policy Statement for England (“NPSE”). It contains the high level vision of promoting good health and good quality of life (wellbeing) through the effective management of noise. It is supported by three aims and together they provide the necessary clarity and direction to enable decisions to be made in any particular situation, both nationally and locally, regarding what is an acceptable noise burden to place on society. These three aims are:

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

13.2.7 In defining these aims, the terms 'significant adverse' and 'adverse' are used for which the NPSE (para 2.20) notes that:

"*There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation ("WHO"). They are:*

NOEL – No Observed Effect Level. This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur."

13.2.8 The three aims of the NPSE are reiterated in other relevant policy documents.

National Policy Statement for National Networks

13.2.9 The Planning Act 2008, Section 104(3) requires the Secretary of State to determine the application for the DCO Scheme in accordance with the National Policy Statement for National Networks ("NPSNN"), unless specified factors provide otherwise. The NPSNN advises on noise and vibration in the context of nationally significant infrastructure projects ("NSIP") on the road and rail networks. It sets out the policy and reasoning by which the Secretary of State for Transport will make decisions on NSIPs. Table 13.1 sets out advice on an applicant's assessment and the sections where the advice is considered in this ES.

Table 13.1: Summary of relevant NPSNN advice on the noise and vibration

Summary of NPSNN provision	Consideration within the ES
Paragraph 5.189 states that a noise assessment should be undertaken for Environmental Impact Assessment ("EIA") developments likely to result in significant noise impacts. The guidance includes advice for applicants to consider best available techniques to mitigate noise.	This chapter presents the noise assessment for the DCO Scheme, which includes the required mitigation.
Paragraph 5.190 states that the potential noise impacts elsewhere that is directly associated with the project should be assessed.	This chapter assesses noise arising from the additional rail on the existing network, the effect on regional road traffic, and changes in local transport to and from the

Table 13.1: Summary of relevant NPSNN advice on the noise and vibration

Summary of NPSNN provision	Consideration within the ES
	new stations at Portishead and Pill.
Paragraph 5.191 advises on appropriate assessment methodologies.	The assessment methodology for noise and vibration is explained in Section 13.3.
Paragraph 5.192 states that the applicant should consult with Natural England regarding the noise assessment as far as it affects protected sites and wildlife.	Consultation with Natural England is presented in Chapter 9 Ecology and Biodiversity (DCO Document Reference 6.12).

13.2.10 Paragraphs 5.186 to 5.188 of the NPSNN set out an introduction to noise and vibration in the context of NSIPs for National Networks. Advice on decision making in respect of noise is provided at paragraphs 5.193 to 5.196 whilst advice on mitigation is provided at 5.197 to 5.200. Of particular relevance is the advice in paragraph 5.195 of the NPSNN, which repeats the aims of the NPSE and states *"The Secretary of State should not grant development consent unless satisfied that the proposals will meet, the following aims, within the context of Government policy on sustainable development:*

- *avoid significant adverse impacts on health and quality of life from noise as a result of the new development;*
- *mitigate and minimise other adverse impacts on health and quality of life from noise from the new development; and*
- *contribute to improvements to health and quality of life through the effective management and control of noise, where possible*."

National Planning Policy Framework

13.2.11 The second associated policy document is the National Planning Policy Framework ("NPPF"), which was reissued in February 2019. Although the NPPF does not contain specific policies for NSIPs, NPPF paragraph 5 notes that applications for NSIPs are to be determined in accordance with the decision-making framework set out in the Planning Act 2008 and relevant national policy statements "*as well as any other matters that are relevant (which may include the National Planning Policy Framework)*." The NPPF paragraph 170(e) states that the planning system should contribute to and enhance the natural and local environment by, among other things, preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of noise pollution. Paragraph 180 goes on to advise that planning policies and decisions should "*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*".

Planning Practice Guidance – Noise

13.2.12 The Planning Practice Guidance ("PPG") – Noise (Department for Communities and Local Government, 2014), provides guidance on the application of government noise policy. This document reaffirms the effect levels set out in the NPSE and also adds an additional term of Unacceptable Adverse Effect Level ("UAEL") at which noise should be prevented from reaching at sensitive receptors. Table 13.2 is from Planning Practice Guidance – Noise (paragraph 005), and summarises the noise exposure hierarchy, based on the likely average response.

Table 13.2: Noise exposure hierarchy and effect levels

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Noise can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up the television volume; 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. Noise affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, 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

Table 13.2: Noise exposure hierarchy and effect levels

Perception	Examples of Outcomes	Increasing Effect Level	Action
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation / awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

13.2.13 None of the policy documents assign numeric values to the effect levels. This is because the effect level should reflect the nature of the noise source, the sensitivity of the receptor and also local context. The effect levels for this project are defined in Section 13.3, with the rationale behind each described in more detail in Appendix 13.2 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25).

Local Policy

13.2.14 An overview of the local policy framework is provided in Chapter 6 Planning Framework (DCO Document Reference 6.9). The local planning development framework for North Somerset and Bristol City Council are relevant. Table 13.3 shows how the local policies on noise are aligned with national policies.

Table 13.3: Summary of how local noise policy is aligned with national noise policy

Local policy	National policy
Policy CS3 in the North Somerset Council Core Strategy Adopted January 2017 (North Somerset Council, 2017). Related to noise, in paragraph 3.42 of the strategy, it is stated that *"In applying this policy the council will have regard to the scale, nature and type of existing land uses in the surrounding area".*	The North Somerset Council Core Strategy acknowledges that the NPPF and NPSE set the planning policy context for noise sensitive / related developments.
In the Bristol City Council Core Strategy adopted in June 2011 (Bristol City Council, 2011), Policy BCS23 states that development should be sited and designed in a way as to avoid adversely impacting upon environmental amenity or biodiversity of the surrounding area by reason of fumes, dust, noise, vibration, smell, light or other forms of air, land, water pollution, or creating exposure to contaminated land.	This would align with the first aim of the government noise policy (NPSE para 1.7): *"avoid significant adverse impacts on health and quality of life from noise as a result of the new development."*

Table 13.3: Summary of how local noise policy is aligned with national noise policy

Local policy	National policy
Within the Site Allocations and Development Management Policies Local Plan (Bristol City Council, 2014) is policy DM35 – Noise Mitigation. This Policy states (para 2.35.3) that for a noise generating development, *"Development will not be permitted if mitigation cannot be provided to an appropriate standard with an acceptable design, particularly in proximity to sensitive existing uses or sites"*.	This would align with the first aim of the government noise policy (NPSE para 1.7): *"avoid significant adverse impacts on health and quality of life from noise as a result of the new development."*

13.3 Methodology

Guidance and Best Practice

13.3.1 The noise and vibration assessment has been based on guidance and best practice published by government and professional bodies:

- Design Manual for Roads and Bridges ("DMRB") Volume 11, Section 3, Part 7 (HD213/11), Noise and Vibration
- Department of Transport Calculation of Road Traffic Noise 1988
- Department of Transport Calculation of Railway Noise ("CRN") 1995
- British Standard 5228-1:2009 +A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 1 (Noise).

13.3.2 The Noise Action Plan: Railways (Including Major Railways), Defra January 2014 (Department for Environment Food and Rural Affairs, 2014a) is also relevant in terms of mitigation options. This Action Plan is designed to address the management of noise issues and effects from existing railways and it provides a summary of the impact from railway noise as determined by the strategic noise mapping undertaken in 2012. The Action Plan also describes possible mitigation measures for railway noise.

Consultations

13.3.3 A summary of consultations undertaken to date is presented in Table 13.4. Further information on the consultation process is presented in Chapter 5 Approach to the Environmental Assessment (DCO Document Reference 6.8). Responses to consultation exercises undertaken in 2015 and 2017 are available on the MetroWest project website at the following address http://travelwest.info/metrowest while the Consultation Report is provided in the DCO Document Reference 5.1.

Table 13.4: Summary of consultation responses

Organisation and date	Summary of response	Consideration within ES
Scoping Opinion Responses (August 2015)		
Planning Inspectorate	Paragraph 2.44 requires that the ES includes a description of the trains and emissions, including noise and vibration.	Noise and vibration emissions associated with the trains are presented within Appendix 13.3 of the ES Volume 4 Technical Appendices (DCO Document Reference 6.25).
	Paragraph 3.29 states that insufficient data were provided to scope out cumulative effects of the DCO Scheme in combination with other works required for MetroWest Phase 1 on noise and vibration.	The cumulative impact assessment is provided in Section 13.8 and in Chapter 18 In-Combination and Cumulative Effects Assessment (DCO Document Reference 6.21) and Appendices 18.1 and 18.2 (DCO Document Reference 6.25).
	Paragraph 3.73 requires the noise assessment to consider the impacts of all construction activities for the proposed development and any associated/ancillary and consequential development.	Construction noise is assessed in Section 13.6 and covers all construction activities.
	Paragraph 3.74 includes the need to assess the potential noise from train wheels, especially if there is a risk of wheel squeak.	Train rolling noise during operation (i.e. that from the wheels) is included in the input data for the Class 166 Diesel Multiple Unit ("DMU") provided in the CRN (Department of Transport, 1995). The risk of rail squeal is addressed in Table 3.1 of Appendix 13.3 of the ES Volume 4 Technical Appendices (DCO Document Reference 6.25).
	Paragraph 3.75 states that all potential noise sources from the development are to be described.	All potential noise sources are described in Section 13.6.
	Paragraph 3.76 states that the assessment methodology and choice of receptors should be agreed with the relevant authorities.	The assessment methodology and selection of receptors was discussed with the relevant planning authorities' Environmental Health Officers. See section

Table 13.4: Summary of consultation responses

Organisation and date	Summary of response	Consideration within ES
		on consultation with the local planning authorities in this table below.
	Paragraph 3.77 states that in the event of any uncertainty in train timetabling, the noise modelling should consider a range of scenarios, including the potential worse case.	The proposed modelling scenarios and any uncertainty are explained fully in Section 13.3.
	Paragraph 3.78 requires the noise assessment during the construction phase to take account of traffic movements along access routes and provide information to inform the ecological assessment.	Construction traffic noise is dealt with in Section 13.6 and the impact of noise on ecology is addressed in Chapter 9 Ecology and Biodiversity (DCO Document Reference 6.12), Section 9.6.
	Paragraph 3.79 states that the potential noise and vibration from piling operations should be addressed.	Construction noise is addressed in Section 13.6.
	Paragraph 3.80 states that noise mitigation measures should be provided along with evidence to explain how and why they are effective. The assessment should also cover how noise and vibration impacts during construction and operation will be monitored and how the need for additional mitigation will be determined.	The need for noise mitigation and its effectiveness, monitoring of impacts and requirements of any further mitigation is described in Section 13.7.
Highways England	Consider adverse changes to noise.	Section 13.6 contains the assessment of noise effects.
Natural England	An assessment of noise is needed to assess the impacts on designated sites and wildlife.	The impact of noise on designations and wildlife is presented in Chapter 9 Ecology and Biodiversity (DCO Document Reference 6.12), Section 9.6.
Public Health England	The applicant should liaise with the local authorities on various matters, including noise.	The applicant has liaised with the local authorities, see entries directly below for North Somerset Council and Bristol City Council.

Table 13.4: Summary of consultation responses

Organisation and date	Summary of response	Consideration within ES
Informal consultation on DCO scheme boundary (22 June – 3 August 2015)		
Pill and Easton in Gordano Parish Council	Consideration to be given to barriers to the rear of Avon Road where there are already complaints about noise from freight traffic. Perhaps this can be done in conjunction with the Bristol Port Company and others responsible for freight.	The approach to determining whether mitigation is required is set out in Section 13.3. Section 13.6 presents the results of the noise impact assessment. The need for noise barriers in Portishead and at old Portbury Station and the residual effects are discussed in Section 13.7. The DCO Scheme does not consider the freight operations.
Formal Stage 1 Consultation (22 June to 3 August 2015)		
Transport Focus	Regarding Pill station: the station will be provided with “audible information” which is useful for passengers but often a source of annoyance for residents, many of whom will have moved there since the railway closed to passenger traffic.	The assumptions on the noise from public announcement systems incorporated into the noise modelling is explained in Appendix 13.3 (DCO Document Reference 6.25). The assessment of operation noise, including the public announcement systems at Pill Station is presented in Section 13.6.
Public	Reopening the Portishead branch line as Part of MetroWest Phase 1 will have a significant impact on privacy and cause increased noise pollution thereby affected myself and devaluing my property.	The effects of operational noise are addressed in Section 13.6 and the effects on privacy through loss of visual screening is discussed in Chapter 11 Landscape and Visual Impacts Assessment (DCO Document Reference 6.14).
Public	The increased number of trains will increase frequency of noise. As operating times for freight will also have restrictions due to the passenger trains it is likely that the freight trains will increase in frequency at night.	While the design of the DCO Scheme has taken into account the need for freight trains, it is a matter for Royal Portbury Dock to timetable freight train movements and potential changes to the future freight

Table 13.4: Summary of consultation responses

Organisation and date	Summary of response	Consideration within ES
	Concerns over noise from night-time maintenance on the wellbeing of near by residents. Concern over the lack of specific information on noise, with the consultation just saying "Pill village - noise barrier options to be investigated".	timetables does not form part of the EIA for the DCO Scheme. Commentary on maintenance is provided in Appendix 13.3 (DCO Document Reference 6.25). The operational noise assessment for Pill is presented in Section 13.6. Based on the approach to determining the need for mitigation described in Section 13.3, no noise barriers are proposed for Pill.
	Vibration – Concern for house built in 1880, and expectation of precautions such as tracks, train selection and speed limits to guarantee no structural damage to property.	The assessment of vibration during operation is presented in Section 13.6.
Public	Concern over the possible effects caused by vibrations to the local area including residential properties.	The assessment of vibration during operation is presented in Section 13.6.
Non-Statutory Stakeholder consultation		
Environment Officer, North Somerset Council	Meeting held on the 14th January 2016.	The outcome of the discussion has been used throughout the noise assessment. One key outcome was the suggestion of more baseline noise monitoring within Pill which was subsequently undertaken.
Environmental Health Officer, Bristol City Council	Meeting held on the 14th January 2016.	The outcome of the discussion has been used throughout the noise assessment.

Table 13.4: Summary of consultation responses

Organisation and date	Summary of response	Consideration within ES
Formal Stage 2 Consultation (23 October to 4 December 2017)		
North Somerset Council	NSDC is satisfied with the methodology used to predict the impact of noise and vibration from the project. They are satisfied with the chosen receptors and noise monitoring locations. They were pleased to note that the request for additional noise monitoring to be undertaken in the Pill area has been carried out. NSDC is satisfied with the proposed mitigation works, but would like to see more detail regarding the design of noise barriers and other measures to be used in the ES. The Preliminary Environmental Information Report ("PEI Report") reviewed did not include the supporting appendices, and this information is required to understand fully the noise impact and conclusions reached. Specific comments on the PEI Report: - Lacking details of the noise model and assumptions made. - Would like to see the predicted noise levels in a tabular format, with current and predicted noise levels provided side by side to assess the impact. - No data presented for the expected noise levels from the trains to be used or the existing freight train use. - No maximum noise data presented.	This chapter is supported by the following appendices (DCO Document Reference 6.25): Appendix 13.1: Introduction to Noise Appendix 13.2: Approach to Significance Appendix 13.3: Assumptions and Noise Model / Input Data Appendix 13.4: Time Period Conversions Appendix 13.5: Noise Survey Results Appendix 13.6: Vibration Survey Results Appendix 13.7: Construction Plant Lists Appendix 13.8: Noise Assessment Results Appendix 13.9: Rail Noise Management - Information on the noise model and assumptions is provided in Appendix 13.3 (DCO Document Reference 6.25). - Predicted noise levels are provided for the Do Minimum and Do Something in year of opening and a future Do Something in Appendix 13.8 (DCO Document Reference 6.25). - Existing freight train noise is captured in the baseline noise monitoring in Section 13.4 and Appendix 13.5 (DCO Document Reference 6.25). - Maximum (peak) noise levels for passing trains is considered in Section 13.6.

Table 13.4: Summary of consultation responses

Organisation and date	Summary of response	Consideration within ES
	- The report also needs to show the $L_{Aeq, 18hr}$ noise levels. - It is not clear whether freight train noise has been included in the report. NSDC acknowledge that there was still more to do on the design and develop the construction strategy. Given the close proximity of the Avon Road Bridge to residential property, a more detailed assessment of construction impacts is needed.	- Monitoring survey results are presented for $L_{Aeq, 16hr}$ and $L_{Aeq, 18hr}$ in Appendix 13.5 (DCO Document Reference 6.25). Operational noise levels are estimated in $L_{Aeq, 16hr}$ to reflect UAEL, SOAEL and LOAEL. - Freight train noise has been included in the baseline noise data. The construction noise at Avon Road Bridge has been considered in Section 13.6. See DCO Document Reference 6.25 for Technical Appendices.
Bristol City Council	The conclusions of the PEI Report are acceptable and set out that noise from the construction phase should be addressed through the adoption of a noise control plan.	Guidance on the control of noise during construction is presented in the ES Appendix 4.2 Master Construction Environmental Management Plan ("CEMP") (DCO Document Reference 8.14).
Public (Portishead Station)	Path to the north of the railway alongside Tansy Lane is unnecessary and may cause unwanted noise and littering. Concern that the peak noise as the train passes by has not been addressed and that discussion of average noise levels is misleading. Extension of barrier extended beyond the school to include all residential properties through Portishead. Concern that the vibration measurements in Oxford are not comparable with the soil types in Portishead. One property claims that soil is carried into the drain (rhyne) and the vibration of the train will accelerate this	There is no reason why the users of the footpath would create any more noise than those using other footpaths in the area. Having had regard to Tansy Lane in the context of the assessments undertaken it is not considered that there are any likely significant noise effects to be identified and assessed in this ES. This effect is not considered further in this Chapter. The predicted effects on receptors from noise generated by passing trains is addressed in Section 13.6. The noise barrier is proposed to reduce effects at locations where a significant effect has been predicted.

Table 13.4: Summary of consultation responses

Organisation and date	Summary of response	Consideration within ES
	process. The householder requested a retaining wall to their property to prevent soil erosion.	The vibration survey was undertaken in Oxford because at the time of undertaking that was the closest location where the Class 166 DMUs were in operation. With no trains passing the property at the moment, any vibration survey would have been meaningless. In 2017 the Class 166 DMUs started to operate in the Bristol region and a vibration survey has now been undertaken at the Portway Park and Ride in an area with a similar soil type to that in Portishead. The assessment of vibration from trains is considered in Section 13.6. The predicted level of vibration from the operation of the railway is shown in Section 13.6. The stability of the soil is addressed in Chapter 15 Soils, Agriculture, Land Use and Assets (DCO Document Reference 6.18).
Public (Monmouth Road, Pill)	Concerns over noise of trains. Sound barriers needed on Monmouth Road. Concerns over station tannoy announcements. Noise measurements are not accurate due to: • Location of recording muffled by embankment on Monmouth Road. It should be done further west level with the tracks. • Doesn't consider overnight maintenance works. • Only takes into account train and station noise, not foot traffic or vehicles to/from the car park – which could be 200 movements per day.	Noise barriers have been specified in Section 13.7 where likely significant noise effects have been predicted. There are no likely significant effects predicted for the dwellings along Monmouth Road so no noise barrier has been specified in this location. The noise from the Public Announcement Voice Alarm system ("PAVA") has been included within the noise model (see Appendix 13.3, DCO Document Reference 6.25, on assumptions in the model). The system used will conform to Network Rail standards and will consist of multiple speakers across the platform length. This will reduce the volume from each speaker, while providing sufficient coverage waiting passengers.

Table 13.4: Summary of consultation responses

Organisation and date	Summary of response	Consideration within ES
	• Noise data averaged out over 16 hours and is only measured as 'slight' – does not account for peak times or weekends. Needs re-measuring. • Does not account for cumulative noise levels caused by all noise contributors.	The noise survey location along Monmouth Road was chosen to be representative of the row of houses. During the survey there were no freight trains using the line and so no noise from the line would have been screened by the embankment. Had a location further to the west been selected it would not have been representative of the noise environment at the houses. Owing to the closer proximity of the M5 to any survey location further west, a higher baseline noise level would have been expected, leading to a lower increase in predicted noise levels from the DCO Scheme on receptors. The approach that has been used in this assessment provides a realistic worst case scenario. Maintenance work of the infrastructure permitted by the DCO will be the responsibility of the operator of the line. Any overnight maintenance required in the future would be undertaken in accordance with their policies, which comply with legal requirements and provide for measures to be taken to avoid unacceptable noise effects on residents. As such, maintenance work during the operational stage has not been identified as a source of likely significant noise or vibration effects for the purposes of this ES. Noise generated by pedestrians has not been identified as the source of likely significant effects and so has not been considered further in this Chapter. Noise from vehicles using Monmouth Road has been assessed in Section 13.6.

Table 13.4: Summary of consultation responses

Organisation and date	Summary of response	Consideration within ES
		The identification and assessment of the possible noise impact from individual passing trains is included in the assessment at Section 13.6.
Galliford Try	Concern about the impact of a new train service on a proposed residential development on land owned by the Homes England near Ashton Gate. Requested whether additional noise mitigation would need to be specified on the residential units and if the current noise survey has taken account of the future residential use on this parcel of land?	The land owned by Homes England was not identified during scoping or during the undertaking of the noise assessment for MetroWest Phase 1 as a potentially sensitive receptor. As no application for planning permission for residential development on the site, which is near Ashton Gate, has yet been submitted, it is the proposed housing development that will need to take in to account the potential impact of the DCO Scheme, which is the subject of a safeguarding provision in Policy BCS10. For assistance, the baseline noise levels would be similar to any representative residential properties identified in Section 13.4 and assessed in Section 13.6 for both construction and operation stages. In this area, the effects from the operation of the DCO Scheme are expected to be slight adverse but not significant in relation to the Infrastructure Planning (Environment Impact Assessment) Regulations 2017 ("EIA Regulations 2017"). No noise surveys have been undertaken on this land for the MetroWest Phase 1 scheme assessment.

Definition of the Study Area

13.3.4 There is no specific guidance on defining the study area for the assessment of noise for a rail project. The NIRR have an eligibility range of 300 m, but this is a cut-off point relevant only to a statutory instrument and not one based on impact assessment.

13.3.5 Paragraph 5.188 of the NPSNN lists factors that will determine the likely scope of the noise impact assessment. These are wide ranging and include locations that cannot be defined by a set distance range from the project. Paragraph 5.190 states "*The potential noise impact elsewhere that is directly associated with the development, such as changes in road and rail traffic movements elsewhere on the national networks, should be considered as appropriate*".

13.3.6 An examination of two recent large rail schemes, High Speed 2 ("HS2") (Department for Transport, 2013) and Crossrail (RPS, 2005), has found the following in relation to the study area. It should be noted that both these assessments use the term 'Spatial scope' as opposed to 'Study area'.

13.3.7 HS2 (Department for Transport, 2013) (para 14.3.15): *"Spatial scope for direct effects - for a mitigated Proposed Scheme and taking account of reasonably foreseeable worst case assumptions, the following screening distances will be used which are consistent with HS1 and in excess of guidance from sources such as US Federal Railroad Administration Guidance for high speed rail:*

- *Construction (from BS 5228-1) – 300 m from any construction activity or the area within which sound levels from the Proposed Scheme are forecast to give rise to potential impacts, whichever is the greater; and*
- *Operational Proposed Scheme – 500 m and 1 km from the centreline of the line of route in urban and rural areas respectively, or the area within which sound levels from the Proposed Scheme are forecast to give rise to potential impacts, whichever is the greater."*

13.3.8 Crossrail (RPS, 2005) (selected extracts): (para 5.7) "*The spatial scope of the noise and vibration assessment includes the following geographic coverage:*

- *Areas within approximately 100 m of construction worksites for the central route section and within approximately 250 m of the outer route sections, including grout shafts, excavated material and general materials handling facilities and utilities worksites, where significant activities may affect sensitive receptors. These distances were not strictly applied but used as a guide to limit the geographic distribution of receptors. The initial modelling included all receptors likely to be subject to a significant impact but receptor distribution was extended, if modelling indicated that further receptors could be subject to significant impacts;*
- *Rail routes which will experience direct or indirect changes in service patterns where sensitive receptors may be affected. The assessments have generally been carried out for receptors within 100 m of rail routes but this does vary slightly with ambient levels."*

13.3.9 Both these approaches recognise that the study area cannot be strictly defined, so allow flexibility to take account of possible impacts. In addition, the need to allow for a different study area between rural and urban areas is relevant to the DCO Scheme. This is because of the different baseline noise levels associated with each and the potential impact from the trains.

13.3.10 The study area has therefore been defined as follows:

- Construction - An initial area of 100 m from any construction activities was examined to determine potential impacts. Where significant impacts were identified at 100 m then the study area was extended to a distance where these are not significant.
- Operation - An initial area of 500 m from the centreline of the route was examined to determine potential impacts. Had significant impacts been identified at 500 m then the area around these impacts would have been extended to ensure the study area included all receptors capable of receiving likely significant impacts beyond 500 m. It was not necessary to extend the study area for the purposes of this noise assessment.

13.3.11 In accordance with the NPSNN this approach was also applied to vibration, although the distance where impacts from vibration may be significant would be less than that for noise. Typically these would be reduced tenfold compared with those distances for noise.

Key Receptors

13.3.12 The key receptors along the route are residential properties and also ecological areas. Specifically, these are:

- Residential properties
  - Houses that either front or back onto the proposed railway line in Portishead.
  - Shipway Gate Farm.
  - Old Station House and Elm Tree Park at Portbury.
  - Houses that either front or back onto the proposed railway line in Pill, and in the vicinity of the Avon Road bridge.
  - Houses in the area of Ashton Gate that are close to the existing line.
- Other noise sensitive receptors
  - NHS Marina Healthcare Centre and Haven Lodge.
  - Trinity Anglican Methodist Primary school.
- Ecological sites
  - The Avon Gorge Woodlands Special Area of Conservation (“SAC”) and Avon Gorge Site of Special Scientific Interest (“SSSI”).
  - The Severn Estuary Special Protection Area (“SPA”), SAC, RAMSAR and SSSI.
  - The Portbury Wharf Nature Reserve.

Defining the Baseline

13.3.13 The baseline ambient noise climate was determined through a series of noise measurements. The locations of noise measurements are shown on Figure 13.1 in the ES Volume 3 Book of Figures (DCO Document Reference 6.24). These locations were representative of receptors likely to be affected by noise during the construction and operational phases of the DCO Scheme. The results from the surveys are summarised in Section 13.4 of this chapter and are reported in detail in Appendix 13.5 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25).

13.3.14 The noise measurements were conducted at locations along the DCO Scheme route between April 2014 and September 2016, with the majority of surveys being undertaken in September and October 2015.

13.3.15 These noise surveys were a combination of short term attended and long term unattended surveys. The short term measurements were used to gain an initial appreciation of an area, especially at locations where the noise climate was not thought to vary much throughout the day. Long term (generally 48 hours) noise measurements were used at locations where an appreciation was needed of the day and night time noise levels.

13.3.16 The noise surveys focussed on areas where the existing noise climate could not be predicted due to a lack of dominant noise source(s), for example in rural areas where the noise climate is not dominated by highway traffic.

13.3.17 In addition to the surveys along the line of the route, some noise measurements were also undertaken at the areas where the General Permitted Development works are to be undertaken as part of the MetroWest Phase 1 programme. These were undertaken in order to assist with the examination of potential cumulative impacts at these locations.

13.3.18 A series of vibration measurements were also undertaken at selected locations in March 2016. These were used to gain an understanding of the current levels of exposure from freight traffic using the operational railway in Pill. The locations selected were where the receptor was close to the existing railway used by freight traffic.

13.3.19 In addition to the surveys in Pill, measurements of vibration were also undertaken in September 2015 at Oxford Station to monitor vibration from freight trains and also a Class 166 DMU under similar conditions. This location was chosen because in 2015 no Class 166 units were being used in the Bristol area. Although the results from these measurements cannot be used to determine the baseline for the DCO Scheme, the measurements provide data to enable a comparison to be made between the vibration generated by the two types of train that are likely to be using the DCO Scheme through Pill.

Assessment of Construction Impacts

13.3.20 The assessment of construction noise was undertaken following BS 5228-1 (British Standards Institution, 2014a). Construction noise was estimated for the main construction activities and combined with monitored ambient noise levels taken at appropriate times of the day at nearby sensitive receptors. The combined noise levels were compared with the ambient noise levels to assess the predicted change in noise levels during construction.

13.3.21 An assessment of possible impacts from construction vibration has been undertaken in accordance with BS 5228-2 (British Standards Institution, 2014b).

Assessment of Operational Impacts

13.3.22 The operational impacts from the proposed new line have been determined by comparing the existing noise level with that expected with the DCO Scheme. The assessment of operational noise impacts includes the noise from the passenger services including when stationary at the railway stations, the new car parks, any additional traffic generated by the DCO Scheme, and the noise from railway station PAVA.

13.3.23 Two methods have been adapted to compare noise levels with and without the DCO Scheme, and the use of either method depends upon the existing noise sources in the area of assessment.

13.3.24 The first method was used where there is no dominant noise source in the area and the existing (or baseline) noise level cannot be predicted due to a lack of noise source(s). Areas such as this are where the proposed line passes close to houses in Portishead, Sheepway, and some parts of Pill. In these situations, noise measurements have been used to determine the existing noise climate. The survey locations have been determined to be representative of individual or groups of receptors where knowledge of the noise climate is required.

13.3.25 In order to predict the impact of the DCO Scheme, the noise level generated by the operation of the passenger trains is required. A computerised noise model using proprietary noise modelling software has been used to predict these expected noise levels. The input data for the noise model are based on the expected usage of the line and the other related noise sources. The Method 1 approach is summarised in Table 13.5.

Table 13.5: Method 1 approach to determining the operational noise impact

	Do-Minimum (A)	**Do-Something (B)**	**Impact[1]**
Approach	Measured	Measured + Predicted from Portishead Branch Line	B – A
Sources included	All existing noise sources during the measurement period.	As Do-Minimum, plus: • Noise from the movement of the proposed passenger services. • Noise from trains when stationary at stations. • Noise from station announcements. • Noise associated with the operation of the proposed car parks. • Noise from any additional traffic on the local road network.	

[1] Change in noise with the DCO Scheme.

13.3.26 The Method 1 approach does have to make the assumption that the measured level from 2015 / 2016 will still be a valid representation of the noise climate in 2021 when the DCO Scheme is assumed to open. Since the same measured level is used for determining the Do-Minimum and Do-Something scenarios this is considered to make no difference to the determination of the impact (i.e. the relative change in noise).

13.3.27 Method 2 was used where there was a sufficiently dominant noise source in the Do-Minimum scenario to enable the existing noise climate to be predicted. Examples of these situations were close to the M5 and near to the A370 / A3029 junction in the Ashton Gate area. For the Do-Something scenario the noise climate without the DCO Scheme was also calculated and then added to the predicted level from the DCO Scheme. This approach is summarised in Table 13.6.

Table 13.6: Method 2 approach to determining the operational noise impact

	Do-Minimum (A)	Do-Something (B)	Impact[1]
Approach	Predicted	Predicted + Predicted from Project	B – A
Sources included	Existing sources from main roads.	As Do-Minimum, plus: • Noise from the movement of the proposed passenger services. • Noise from trains when stationary at stations. • Noise from station announcements. • Noise associated with the operation of the proposed car parks.	

[1] Change in noise with the DCO Scheme.

13.3.28 The input data used for the noise model and assessment are described and presented in Appendix 13.3 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25). This includes the measured noise levels from stationary Class 166 DMUs and also vibration levels from Class 166 DMUs. Appendix 13.4 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25) contains the time period conversions used for noise levels from the noise model output data to those used for the assessment.

13.3.29 Traffic data for the road network have been supplied for inclusion within this assessment in two formats. For major roads (e.g. the M5 and the A4), these data have been supplied from a traffic noise model and outputs have been included as a noise source within the noise model, and any changes between the with and without scheme scenarios are included. The traffic using more local or minor roads (e.g. Quays Avenue in Portishead and Monmouth Road in Pill) has not been included within the noise model. The predicted change in traffic along local roads close to sensitive receptors have been calculated separately and then added to the overall predicted noise level with scheme noise level at receptors close to the local roads. This includes the change in noise at some locations due to the re-alignment of Quays Avenue in Portishead.

Assessment of Freight Traffic Impacts

13.3.30 The number of freight trains using the operational railway between Portbury Dock and the southwest main line between Bristol and Exeter varies year by year and also week by week. Table 13.7 shows the number of coal movements over the last eight years. This excludes the passage of freight trains transporting road vehicles.

Table 13.7: Coal freight train movements over the past eight years

Year	Number of movements[1]
2010	510
2011	712
2012	1,417
2013	1,784
2014	1,317
2015	463
2016	28
2017	137

[1] A movement is defined as a train entering the port, being loaded with coal, and departing. One movement is two passes of a train through Pill.

Source: Communication with The Bristol Port Company.

13.3.31 With the majority of the noise surveys being undertaken in 2015 it can be seen that these measurements were undertaken in conditions with less freight train movements than the previous five years. This would have resulted in a measured noise level in Pill that could have been lower than previous years. With this lower baseline noise level, this does mean that when using method 1 (described above) the impact from the DCO Scheme services would be worst case, since a higher baseline level would mean the passenger services would contribute less to the predicted noise climate.

13.3.32 In Pill there is currently a voluntary 10 mph speed limit for freight rail traffic. With the DCO Scheme this will be removed and, to ensure that this noise impact assessment is undertaken on a realistic worst case approach, it has been assumed that the freight trains will operate at a higher speed, and through Pill this could be up to 30 mph. Using the CRN, the predicted noise level from four freight trains (two on power, two rolling) with 28 wagons travelling at 10 mph is higher than one travelling at 30 mph. This higher noise level at a lower speed is because the power noise from a diesel locomotive reduces with speed, and at these low speeds the contribution from rolling noise, which increases with speed, is less than that from the power unit (CRN chart A1.1 and A1.2, Department of Transport, 1995). This lower noise level from freight trains in the with-Scheme scenario has not been taken into consideration, but it does mean that the assumed baseline level in the with-Scheme scenario is a realistic worst case.

13.3.33 In order to focus on the impact from the DCO Scheme, no noise contribution from freight traffic has been assumed in either the Do-Minimum or Do-Something scenarios when using method 2.

Assessment Years

13.3.34 The assessment for noise considers the impact on opening by comparing with a Do-Minimum scenario in that same year. For this assessment the opening year has been taken to be 2021.

13.3.35 A future year scenario is also considered and for this the predicted noise level in the 15th year after opening (i.e. 2036) is calculated. This is compared with the 2021 Do-Minimum condition to show the long term impact.

13.3.36 In relation to the operation of the DCO Scheme, the only difference between the Do-Something scenarios in the year of opening and 15 years after opening is the number of coaches of the unit. In 2021 it is assumed that the DMUs in use are 3-coach Class 166. For 2036 it is assumed that the units in use will be comprised of 5-coaches, a 3 coach Class 166 unit coupled to a 2 coach Class 165 unit.

13.3.37 The road traffic data used in 2036 also contains the predicted change in traffic as a result of the DCO Scheme.

13.3.38 Given the delays to the DCO Scheme, the actual year of opening is likely to be winter 2023/24 and not 2021. The differences that would occur to the predicted levels of road traffic between these years is considered to be negligible in noise terms and therefore is not considered to be a limitation of this assessment.

Assessment of Decommissioning Impacts

13.3.39 Chapter 4 Description of the Proposed Works (DCO Document Reference 6.7) explains that consideration has been given to likely significant effects arising during the decommissioning phase. However, owing to the nature and life span of the proposed development, the regulated process of any closure in the future, which would be overseen by the Office of Rail and Road, and there being no reasonably foreseeable decommissioning proposals such that likely impacts could be identified and assessed, these effects are not considered further in this chapter.

Assessment of Cumulative Effects

13.3.40 The assessment of cumulative effects has included committed developments identified along the Portishead Branch Line from searches of the planning portals for The Planning Inspectorate and the relevant local authorities, NSDC and Bristol City Council.

13.3.41 The cumulative operational effects from the use of the Bedminster Down Relief Line Bristol to Bath line have been considered alongside the existing services to determine if the additional services may give rise to a likely significant effect in terms of noise levels.

13.3.42 The cumulative effects associated with the construction of the Bedminster Down Relief Line and Bathampton Turnback have been scoped out of this assessment because the works at these locations are minor and would take place at distances that are beyond those where noise from construction works may contribute to one another. Severn Beach / Avonmouth Signalling works have not been included in the cumulative effects assessment for the construction phase as these works have already been completed but the revised timetable has not been implemented.

Use of Significance Criteria

13.3.43 The approach to significance is described in detail in Appendix 13.2 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25) for noise and vibration during construction and operation. The paragraphs below provide an overview of the approach adopted for operational noise for the DCO Scheme.

Value/Sensitivity of the Resource

13.3.44 No formal guidance is available on the value of noise sensitive resources. The Institute of Environmental Management and Assessment ("IEMA") Guidelines for Environmental Noise Impact Assessment (IEMA, 2014) identifies noise sensitive receptors and including dwellings, schools, hospitals and commercial premises. However, it should be noted that the degree of sensitivity may not be the same for all of them. For instance, since residential premises are intended to be used as permanent living and resting places, their value is considered to be 'High'.

13.3.45 Non-residential premises, such as schools, hospital, offices and commercial buildings, are not places of permanent residence. Given that their degree of noise sensitivity may vary depending on the use of the receptor, this (i.e. not being a place of permanent residence) has not been considered when classifying the magnitude of the noise impact during the construction and operation phase. The classification of magnitude has been determined based on the uses of the building.

13.3.46 Table 13.8 provides the outline in determining the value of a receptor for noise and is applicable to the value when assessing both construction and operation. This is followed in most cases for this assessment, but any deviations for special cases are noted in the assessment. The table covers all values and provides examples in order to provide context. This does not imply that the scheme contains all such receptor types as those listed in Table 13.8.

Table 13.8: Value of environmental receptors

Value (sensitivity)	Receptor type
Very High	International designated area, Special cases for noise sensitivity
High	Residential, Schools, Hospitals, Nationally designated areas
Medium	Places of worship, Community facilities
Low (or lower)	Commercial buildings (e.g. offices), Sports facilities
Negligible	Farmland, Industrial premises

13.3.47 In addition to a receptor being defined for its environmental value (Table 13.8), a receptor is also defined by the baseline level for comparison with the Government policy effect levels. These are shown Table 13.9 and an explanation of how these have been defined is provided in Appendix 13.2 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25).

Table 13.9: Operation noise effect levels for residential receptors

Effect level	Period	Noise level[1]
UAEL	Day	74 dB $L_{Aeq,16h}$
	Night	-
SOAEL	Day	66 dB $L_{Aeq,16h}$
	Night	55 dB $L_{Aeq,8h}$
LOAEL	Day	50 dB $L_{Aeq,16h}$
	Night	40 dB $L_{Aeq,8h}$

[1] All levels are free-field. A free-field level is one that does not contain the contribution from reflections from nearby buildings.

Magnitude of Impact

13.3.48 The magnitude of impact levels used for operational noise are defined in Table 13.10. The noise bands used for the impact (i.e. change in noise) have been taken from the noise chapter of the DMRB HD213/11 Revision 1 Noise and Vibration (Highways Agency and Welsh Office, 2011). These are applicable to both increases and decreases in noise, and applicable to both the construction and operation phases. HD213/11 provides a scale for both short term and long term changes in noise and these are shown in Table 13.10.

Table 13.10: Magnitude of Impact – change in noise, dB

Magnitude of change	Short term	Long term
No change	0	0
Negligible	0.1 – 0.9	0.1 – 2.9
Minor	1.0 – 2.9	3.0 – 4.9
Moderate	3.0 – 4.9	5.0 – 9.9
Major	5.0 +	10.0 +

Significance of Effect

13.3.49 The significance of effect is determined from the combination of the value / sensitivity of the resource and the magnitude of impact as shown in Table 13.11. It should be noted that the attribution of significant terms differs to some extent from the example provided in Table 5.3 of Chapter 5 Approach to the Environmental Statement (DCO Document Reference 6.8). This is to ensure that the assessment accurately reflects the nature of noise generation and effects, and avoids predictions of significant effects for minor changes in noise that would not otherwise warrant mitigation. The approach presented in Table 13.11 is consistent with that used for the M4 Junctions 3 to 12 Smart Motorway scheme (Highways Agency, 2015).

Table 13.11: Significance of effect for noise and vibration

Magnitude of Impact	Value / Sensitivity of Receptor				
	Very High	High	Medium	Low	Negligible
Major	Very Large	Large	Large	Moderate	Slight
Moderate	Large	Moderate	Moderate	Slight	Neutral
Minor	Moderate	Slight	Slight	Neutral	Neutral
Negligible	Slight	Slight	Neutral	Neutral	Neutral
No Change	Neutral	Neutral	Neutral	Neutral	Neutral

13.3.50 A significant effect, under the meaning of the EIA Regulations 2017, is taken to mean an adverse or beneficial effect of moderate, large, or very large significance of effect.

Approach to Mitigation

13.3.51 The approach to mitigation is determined by both policy impacts and environmental impacts.

13.3.52 A policy impact would be one that is against the aims of government policy on noise. This defines levels of effect on health and quality of life. These are:

- No observed effect;
- Adverse observed effect;
- Significant observed adverse effect; and
- Unacceptable adverse effect.

13.3.53 The thresholds that have been used to define these effects are shown in Appendix 13.2 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25). These relate to an absolute level of noise and not a change in noise. An impact that is against these aims would be considered as a policy impact. However, mitigation may not always be considered for each policy impact. In determining whether mitigation is to be provided, the change in noise and number of dwellings affected has been considered.

13.3.54 An environmental impact would be one that causes ‘likely significant effects’. An impact of this type would be where the change in noise is at or above the level defined to be significant as described in Appendix 13.2 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25).

13.3.55 Table 13.12 shows the effect levels and assigned noise levels, together with the approach adopted for policy and environmental impacts. This table is for operational noise only. For clarity, the absolute levels given in the table refer to that with the project.

Table 13.12: Approach to mitigation for operational noise

Government policy mitigation approach	Environmental assessment mitigation approach
Prevent	N/A – level would be prevented from occurring
Unacceptable Adverse Effect Level (UAEL). Day – 74 dB $L_{Aeq,16h}$	
Avoid - Reduce noise level through scheme design	Mitigate any increase in noise from the project that is above 1 dB[1]
Significant Observed Adverse Effect Level (SOAEL). 66 dB $L_{Aeq,16h}$ and 55 dB $L_{Aeq,8h}$	
No specific action unless environmentally significant	Mitigate where increases are environmentally significant (i.e. > 3 dB(A)) in the short term
Lower Observed Adverse Effect Level (LOAEL) 50 dB $L_{Aeq,16h}$ and 40 dB $L_{Aeq,8h}$	
No specific action unless environmentally significant	Mitigate where increases are environmentally significant (i.e. > 5 dB(A)) in the long term

[1] To reflect the adverse health effects of being above the SOAEL, a smaller increase in noise is considered sufficient to determine the need for mitigation to be considered. This is reflected in PPG-Noise by "In cases where existing noise sensitive locations already experience high noise levels, a development that is expected to cause even a small increase in the overall noise level may result in a significant adverse effect occurring even though little to no change in behaviour would be likely to occur".

13.3.56 It should be noted that this approach is not fixed, as there may be special cases where mitigation is considered where not indicated in Table 13.12. An example could be where a large number of dwellings are close to experiencing a significant change in noise and also close to the SOAEL. The engineering feasibility of such measures and the views of local stakeholders are also factors that would need to be taken into consideration.

13.3.57 For mitigation options, the NPSNN (para 5.198) states that: "*Mitigation measures for the project should be proportionate and reasonable and may include one or more of the following:*

- *engineering: containment of noise generated;*
- *materials: use of materials that reduce noise, (for example low noise road surfacing);*
- *lay-out: adequate distance between source and noise-sensitive receptors; incorporating good design to minimise noise transmission through screening by natural or purpose built barriers;*
- *administration: specifying acceptable noise limits or times of use (e.g., in the case of railway station PA* [public announcement] *systems)."*

13.3.58 Where mitigation is considered necessary at any location then the principal of source-path-receiver is used. This principle is widely used when considering mitigation and examines the option in the order stated, as these are considered to be the most effective in terms of noise reduction.

13.3.59 Mitigation at source considers issues such as track type and train type. Such measures are effective for the entire route. For mitigation in the path of the train, the use of barriers is the primary option. Barriers are location specific and the effect of a noise barrier reduces over distance from the barrier. For mitigation at a receiver, generally a specific receptor or a group of receptors, mitigation would involve noise insulation of the property and be effective for those inside the property.

13.3.60 In addition, when considering mitigation the NPSNN states "*Applicants should consider using best available techniques to reduce noise impacts*".

13.4 Baseline, Future Conditions and Value of Resource

Regional Overview

13.4.1 The wider Bristol area is served by the north-south main line railway between Birmingham and the south west of England, and the east-west line between London and Wales. These lines carry intercity trains, local services, and freight trains with some operating at night. Without any other dominant noise source in the area, the noise climate close to these routes is likely to be dominated by the trains.

13.4.2 Other less used lines, such as that from Bristol Temple Meads to Severn Beach, also serve the Bristol area.

13.4.3 The additional services provided by MetroWest Phase 1 will vary from introducing trains to a location where there are currently none, to a few additional trains on an existing route. The subsequent operational impacts will therefore vary along the route.

Portishead - Noise

13.4.4 The noise survey results for the Portishead area are summarised in Table 13.13 and are included in more detail within Appendix 13.5 of the ES Volume 4 Technical Appendices (DCO Document Reference 6.25). The noise survey locations are shown in Figure 13.1 in the ES Volume 3 Book of Figures (DCO Document Reference 6.24).

Table 13.13: Noise survey locations around Portishead

Sample Number – Location[1]	L_{Aeq} dB	
	Day (07:00 – 23:00)	Night (23:00 – 07:00)
LT6 - 28 Conference Avenue	46.0	41.2
LT7 - 15 Peartree Field	54.2	48.2
LT8 - 10 Tydeman Road	44.8	38.2
LT12 - 14 Peartree Field	48.9	43.7
LT15 - 16 Tydeman Road	49.1	43.3
ST1 - Tansy Lane	52.5	42.5
ST2 - Tydeman Road	51.0	46.1

[1] Locations that begin with 'LT' are where unattended measurements were undertaken over a period of at least 24-hours. Those that begin with 'ST' are short term attended measurements and the noise level presented is the average of the samples taken in the respective time period.

13.4.5 The measured daytime noise levels within Portishead range generally between 45 and 55 dB(A). In terms of effect levels this would place then either just above or just below the LOAEL (see Table 13.9). At all locations the noise climate was not comprised of a single source, and was made up of various noise sources such as the distant M5, local traffic, bird song, high aircraft, and, at certain times of the day, noise from activities at the Trinity Anglican Methodist Primary School.

13.4.6 Given its location close to Quays Avenue, it is unsurprising that LT7 has the highest overall daytime noise level due to the contribution of noise from local traffic. At the location with the lowest overall daytime level (LT8) the orientation of the surrounding houses meant that the noise logger was screened from the M5.

13.4.7 During the night the levels are typically 5 dB(A) less than the day. With the exception of LT8, all locations were between the LOAEL and the SOAEL for night time noise. At LT8 the night time noise level was below the LOAEL.

Sheepway - Noise

13.4.8 The noise survey results for the Sheepway area are summarised in Table 13.14 and are included in more detail within Appendix 13.5 of the ES Volume 4 Technical Appendices (DCO Document Reference 6.25).

Table 13.14: Noise survey locations around Sheepway

Sample Number – Location[1]	L_{Aeq} dB	
	Day (07:00 – 23:00)	Night (23:00 – 07:00)
LT2 - Shipway Gate Farm	52.8	48.1
LT3 – The New House	53.0	49.6
LT4 - Springfield Cottage	49.0	45.4
LT5 - The Bungalow	53.0	49.4
LT13 - Old Station House	55.2	51.8
ST3 – South west corner of Portbury Wharf Nature Reserve	50.6	45.3
ST11 - Bunting Lane	46.4	-
ST12 - Wharf Lane	50.4	-
ST13 – Northern end of Portbury Wharf Nature Reserve	46.8	-

[1] Locations that begin with 'LT' are where unattended measurements were undertaken over a period of at least 24-hours. Those that begin with 'ST' are short term attended measurements and the noise level presented is the average of the samples taken in the respective time period.

13.4.9 With the exception of LT4 the daytime levels at the long term monitoring location sites are just above the LOAEL of 50 dB(A). At LT4 the day time level is just below the LOAEL. The dominant noise source at these locations is the distant M5, traffic on the local roads, bird song, and occasional aircraft. The highest measured daytime level was at the Old Portbury Station House, where the noise climate has a high contribution of noise from the M5.

13.4.10 At the locations within the Portbury Wharf Nature Reserve where sample measurements were undertaken, the level varies between 46 and 50 dB(A). The locations with the lower levels are those more remote from noise sources such as local traffic.

13.4.11 During the night the levels are generally between 4 and 5 dB(A) lower than day time levels and are all between the LOAEL and SOAEL.

Pill - Noise

13.4.12 The noise survey results for the Pill area are summarised in Table 13.15 and are included in more detail within Appendix 13.5 of the ES Volume 4 Technical Appendices (DCO Document Reference 6.25).

Table 13.15: Noise survey locations around Pill

Sample Number – Location[1]	L_{Aeq} dB	
	Day (07:00 – 23:00)	Night (23:00 – 07:00)
LT1 - 38 Hardwick Road	51.0	48.3
LT17 - 1 Sunnyside	50.4	43.2
LT18 - 25 Avon Road	50.8	48.1
LT19 - 23 Avon Road	53.7	48.0
LT20 - 3 Star Lane	53.9	47.4
LT21 - 16 New Road	51.1	48.8
LT22 - 11 Mount Pleasant	47.0	44.6
ST4 - Monmouth Road	52.7	40.9
ST5 - Watchhouse Hill	52.7	41.7
ST17 - Chapel Pill Lane 1	39.5	-
ST18 - Chapel Pill Lane 2	46.5	-
ST19 - Chapel Pill Lane 3	48.4	-
ST20 - 5 Monmouth Road	57.0	-

[1] Locations that begin with 'LT' are where unattended measurements were undertaken over a period of at least 24-hours. Those that begin with 'ST' are short term attended measurements and the noise level presented is the average of the samples taken in the respective time period.

13.4.13 The long term measured levels within Pill are generally around the LOAEL of 50 dB(A), with the noise climate comprised of distant motorway noise, local traffic, and bird song. In addition, LT20 was influenced by a dog barking and the surveys along Avon Road were influenced by some vegetation clearance on the operating freight line. Any passing freight trains were audible at all locations.

13.4.14 At the short term measurement positions ST4 and ST5, the noise level was just above the LOAEL. At ST17, which was remote from many localised noise sources, the measured level was 39.5 dB(A).

13.4.15 The long term and short term levels measured at night within Pill were between the LOAEL and SOAEL. For the long term measurements the difference between the day and night levels generally ranged between 3 and 7 dB(A).

13.4.16 During discussions with the Environmental Health Officer at NSDC, it was stated that there is a history of complaints from residents concerning noise from freight trains. The nature of these complaints is understood to be related to freight trains that stop on the line while awaiting clearance to proceed into Portbury Dock. The DCO Scheme will not change the need for trains to stop on the line at this location.

13.4.17 In addition to the ambient noise that was measured during the surveys, there is also occasional noise from activities associated with the maintenance of the existing track.

Avon Gorge to Bristol - Noise

13.4.18 The noise survey results for the area through Avon Gorge to Ashton Gate are summarised in Table 13.16 and are included in more detail within Appendix 13.5 of the ES Volume 4 Technical Appendices (DCO Document Reference 6.25).

Table 13.16: Noise survey locations in the Avon Gorge and Ashton Gate

Sample Number – Location[1]	L_{Aeq} dB	
	Day (07:00 – 23:00)	Night (23:00 – 07:00)
Avon Gorge		
ST14 - Avon Gorge SAC	58.7	-
Ashton Gate		
LT9 - 61 Swiss Drive	50.7	44.6
LT10 - 56 Ashton Drive	49.8	44.5
LT11 - 55 Ashton Drive	48.9	46.4
Paxton Drive		
ST6 - Paxton Drive	54.0	62.6[2]

[1] Locations that begin with 'LT' are where unattended measurements were undertaken over a period of at least 24-hours. Those that begin with 'ST' are short term attended measurements and the noise level presented is the average of the samples taken in the respective time period.

[2] This survey was undertaken between 06:00 and 07:00. Although this is within the night period of between 23:00 and 07:00, it is not considered as representative of the noise climate over an 8-hour period as it is at the end of the period and when traffic is increasing leading up to the morning peak. However, it is reported here for completeness.

13.4.19 In the Avon Gorge the noise climate was dominated by traffic noise from the A4 on the eastern bank of the river.

13.4.20 In the Ashton Gate area the measured day time levels are very consistent and around the level of the LOAEL at 50 dB(A). At these locations the noise climate was comprised mainly of local traffic. Any passing freight trains were also clearly audible at the survey locations. At night the noise levels were also very consistent at around 45 dB(A), which is between the LOAEL and SOAEL.

13.4.21 At Paxton Drive the noise climate was also mainly from traffic noise on nearby main roads.

General Permitted Development Works - Noise

13.4.22 The noise survey results for the areas where the general permitted development works would be undertaken for MetroWest Phase 1 Project are summarised in Table 13.17 and are included in more detail within Appendix 13.5 of the ES Volume 4 Technical Appendices (DCO Document Reference 6.25). These are areas around Parson Street, Bedminster, Avonmouth to Severn Beach and Bathampton.

13.4.23 At Parson Street the day and night time measured noise levels are both between the respective LOAEL and SOAEL. However, the survey at LT16 was undertaken in weather conditions that were outside of the range where reliable and repeatable measurements should be undertaken due to the windy conditions. This has resulted in levels being measured that are higher than what would be expected under suitable conditions. The noise climate at both these locations consisted mainly of local road traffic and trains using the Great Western Main Line.

13.4.24 The area around Parson Street Station has been defined as an IA under the Environmental Noise (England) Regulations 2006 (see Section 13.2). Action to investigate this is the responsibility of Network Rail as the noise making authority.

13.4.25 At Bedminster the noise climate comprised similar noise sources to the Parson Street measurements.

13.4.26 At Avonmouth there was a high contribution of noise from traffic using Portview Road and also trains using the Severn Beach spur line. The surveys at Severn Beach contained mainly local and distant traffic noise sources.

Table 13.17: Noise survey locations in the areas of the General Permitted Development Works for MetroWest Phase 1 Project

Sample Number – Location[1]	L_{Aeq} dB	
	Day (07:00 – 23:00)	Night (23:00 – 07:00)
Parson Street		
LT14 - 29 Nelson Street	50.5	45.1
LT16 – 6 Willada Close	56.6	53.8
Bedminster		
ST9 - Cotswold Road North	52.5	-
Severn Beach		
ST15 - Albert Road	48.9	-
ST16 - Riverside Park	53.0	-
Avonmouth		
ST10 - Napier Road	56.3	-

Table 13.17: Noise survey locations in the areas of the General Permitted Development Works for MetroWest Phase 1 Project

Sample Number – Location[1]	L_{Aeq} dB	
	Day (07:00 – 23:00)	Night (23:00 – 07:00)
Bathampton Turnback		
ST7 - Meadow Lane	54.0	-
ST8 - Grosvenor Bridge	50.8	-

[1] Locations that begin with 'LT' are where unattended measurements were undertaken over a period of at least 24-hours. Those that begin with 'ST' are short term attended measurements and the noise level presented is the average of the samples taken in the respective time period.

13.4.27 The noise climate at the survey locations near the Bathampton Turnback was comprised mainly of distant road traffic noise, bird song, and also trains using the Great Western Main Line.

Vibration Measurements

13.4.28 The existing level of vibration was measured at three locations within Pill. From records of freight trains using the line an attempt has been made to align the passage of a freight train with the measured level of vibration. Table 13.18 shows the maximum measured level from the passage of a freight train at each location. The full results from the vibration survey in Pill are presented in Appendix 13.6 of the ES Volume 4 Technical Appendices (DCO Document Reference 6.25).

Table 13.18: Maximum vibration levels associated with the passage of a freight train

Location	Maximum level, peak particle velocity (PPV[1])	Distance to closest rail head
LT17	0.32	13 m
LT20	0.32	18 m
LT21	0.34	15 m

[1] PPV is defined as the maximum instantaneous positive or negative peak of the vibration signal. It is specified in millimetres per second (mm/sec). It is important to note that the PPV refers to the movement within the ground of molecular particles and not surface movement.

13.4.29 These measured levels are all just above the level that may be considered as 'just perceptible in residential environments' in accordance with the scale of magnitude presented in Table 2.7 of Appendix 13.2 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25). These would be considered as being just above the LOAEL. In relation to potential for building damage the levels are below the level of negligible risk of building damage (Table 2.6 in Appendix 13.2 in the ES Volume 4 Technical Appendices, DCO Document Reference 6.25).

Future Conditions

13.4.30 The baseline without the scheme is predicted to experience an increase in traffic which will in turn result in an increase in noise. Due to the decline in the use of coal, the number of freight train movements from the Portbury docks is considered likely to remain at current levels.

13.5 Measures Adopted as Part of the Project

13.5.1 A number of measures have been included as part of the project design in order to minimise certain environmental effects. These include:

- careful designing of the project to minimise effects on key receptors where possible;
- construction adopting best practices techniques, which are introduced in the Code of Construction Practice ("CoCP") (DCO Document Reference 8.15) and presented in more detail in the Master CEMP (DCO Document Reference 8.14), where these techniques are known to be effective and have not been identified in order to mitigate likely significant environmental effects; and
- compliance with regulatory and legislative regimes as required by law.

13.5.2 Appendix 13.9 (DCO Document Reference 6.25) provides a summary of options for rail noise management and states how the DCO Scheme is addressing each.

13.5.3 An indicative Construction Strategy has been developed for the DCO Scheme, which is presented in DCO Document Reference 5.4. The construction strategy will be developed in detail once the contractor has been appointed. Consequently, only a high level indicative assessment of impacts has been undertaken. Given this the adoption of any specific measures to mitigate the noise or vibration from construction activities would be premature and potentially misleading, and therefore no measures have been considered during the assessment.

13.6 Assessment of Effects

13.6.1 This section of the chapter presents the results from the assessment. Unless otherwise stated, the receptors described here are all of high value as described in Table 13.8. Noise predictions at ecological receptors have been undertaken and an assessment of possible impacts at these receptors is described in the ES Chapter 9 Ecology and Biodiversity (DCO Document Reference 6.12).

Construction Phase - Noise

13.6.2 The potential impact from construction activities at locations along the route are described below, together with a summary table for each location showing the expected noise levels at the closest sensitive receptors. The construction impact assessment considers the impacts from construction of the stations, the car parks, the road realignment, and the works along the line. The estimates given for duration are based on professional judgement and can only be indicative until a contractor is appointed.

13.6.3 The expected works along the route have been first broken down by location, and then into specific work areas each comprising a number of activities. The full list of assumed construction plant for each activity is included within Appendix 13.7 (DCO Document Reference 6.25). The proposed working hours during the construction phase for the works along the disused railway line and highway modifications will adhere to normal daytime working hours (typically 06:~~03~~30 to 18:00 Monday to Saturday), with no working on Sundays, Bank or Public Holidays except as reasonably necessary and notified to the relevant and affected residents by an agreed notification procedure. For the construction works along the operational railway line between Portbury Junction and Ashton Junction, it will be necessary to arrange possessions to block freight train movements between Royal Portbury Dock and the Bristol to Exeter main line. The programme for the possessions has not been finalised at this stage, but may include weekday night working and 24 hr to 100 hr possessions during the week or over weekends, and longer possessions of four to six weeks to complete specific works. As a result, there is likely to be night-time working and 24-hour working in shifts during week days and at weekends.

Portishead

13.6.4 The Portishead area would be exposed to noise from the following construction activities:

- Construction compound at the site of the proposed car park and a lay down area alongside the railway line by Tansy Lane
- Realignment of Quays Avenue
- Car park construction
- Station construction – piled foundations, building and platform
- Railway line construction works
- Construction of the Trinity Primary School Bridge.

13.6.5 The construction of the compound will initially involve earthworks and the construction of access tracks. Following this, any temporary building will be lifted into place, and materials imported. The construction of the haul road along the railway corridor and associated earth works are likely to generate the highest levels of noise and would be below the LOAEL. The works would be generally of only a few days for each activity associated with the construction of the compounds.

13.6.6 During the operation of the Portishead construction compound, the expected highest noise levels are around 72 dB(A) which is below the SOAEL. This highest noise level would be from the movement of vehicles and the unloading of materials.

13.6.7 At the Haven Lodge Care Home and Marina Healthcare Centre on Harbour Road, the activity likely to generate the highest noise level will be pavement works associated with the road realignment. For short periods (approximately 90 minutes in any one day) during the works, the existing noise climate could be elevated by up to 25 dB(A). These works are likely to last for one month. Other activities associated with these works are likely to raise the noise level by only 5 dB(A).

13.6.8 Prior to the works at the station, for the car park and for the road re-alignment, there may be the need for utility diversions. At the closest sensitive receptors, the highest noise level from this activity is likely to be around 73 dB(A). The works would be moving along the line and not expected to be in any one location for more than a few days in a single area.

13.6.9 The car park construction is expected to last for about 20 weeks. During this time the highest noise levels will be from excavation works for the installation of the facilities (e.g. lighting columns, bollards). At 30 m from the works, the noise level is expected to be around 20 dB(A) above the background level, although such instances would be limited to perhaps two hours per day and not for the full 20 weeks.

13.6.10 For the construction of the station platform and the foundations for the building, the works are expected to last for about nine months. Initially there would be high noise levels from vegetation clearance, although this activity would only take place for around one week. During the construction of the station the highest expected noise levels would be from brick work for the platform construction. This individual activity is likely to last for about 10 weeks and at 25 m from the works the noise level is expected be about 78 dB(A). There may be some percussive piling during the station construction and at the closest sensitive receptor at 25 m the predicted noise level would be 73 dB(A). Properties along Peartree Field and Tansy Lane are likely to be the most exposed to these works. Other works associated with the station construction will be the construction of the building, where the maximum noise levels are predicted to be from the plant used to lift the components of the station building into place, as described in Chapter 4 Description of the Proposed Works (DCO Document Reference 6.7) under Work Number 5.

13.6.11 The construction of the line at the station and through Portishead will involve the removal of the existing line and sleepers, followed by trackbed preparation and the laying of the new line. In addition, all remaining fencing along the line will be replaced. During the removal of the existing track the noise level at the closest sensitive receptors would be around 72 dB(A) for short periods of time. These works would generally be expected to be at one location for no longer than a day. During the construction of the new line, the highest noise levels are likely from the excavators used for the trackbed preparation and tamping (i.e. levelling) and alignment of the new line. The highest noise levels from these activities is likely to be between 80 and 85 dB(A), although the works would be moving along the line and not expected to be in any one location for more than a few days. There will also be signalling and telecommunications work involved in the railway line works. However, activities associated with these works will be short and transient and have therefore not been considered within the construction calculations.

13.6.12 The construction of Trinity Primary School Bridge is expected to take approximately a year allowing for settlement, perhaps six months for the actual construction works. During this time the highest noise levels would be from the percussive piling. The closest receptors to this activity are at 25 m from the works and noise levels could be up to 77 dB(A) for short periods of time. The duration of the piling work is likely to be no longer than two weeks.

13.6.13 The expected highest noise level from these activities is presented in Table 13.19, together with the assigned effect level (see Table 2.4 of Appendix 13.2 in the ES Volume 4 Technical Appendices, DCO Document Reference 6.25). Where the predicted noise level is above the SOAEL, although temporary, this would still represent a **significant adverse environmental effect.**

Table 13.19: Predicted noise levels from construction activities in Portishead

Location of works / work areas	Highest expected noise level at the closest receptor, L_{Aeq} dB	Activity associated with highest noise level[1]	Distance to closest receptor, m	Effect level[2]
Compound construction	72	Haul road construction	20	LOAEL
Compound operation, including laydown area at Tansy Lane	62	Vehicle movements	20	LOAEL
Utility diversions	73	Cutting road surface	30	LOAEL
Road realignment	83	Pavement works	15	SOAEL
Car park construction	68	Earthworks	30	LOAEL
Station construction – building and platform	78	Vegetation clearance and platform construction	25	SOAEL
Station construction – piling	73	Percussive piling	25	LOAEL
Railway line works	83	Tamping and lining	15	SOAEL
Trinity Primary School Bridge	77	Percussive piling	25	SOAEL

[1] Some work areas have more than one activity. These are shown in detail in Appendix 13.7 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25).

[2] These are in terms of daytime predicted noise level.

13.6.14 Table 13.19 shows that the SOAEL is predicted to be exceeded for some of the works. This would be a temporary **significant adverse** effect. The pavement works would be transient in nature and of generally short duration in any one location. The vegetation clearance and track bed preparation would also be transient and of short duration. Predicted levels are just above the SOAEL of 75 dB(A). Notwithstanding, the noise levels are considered to be significant in relation to the EIA Regulations 2017. Section 13.7 considers the mitigation measures proposed to be used.

13.6.15 Some of the construction works in Portishead and the railway line works may need to be undertaken at night. If works are undertaken at night then the expected noise levels would be similar to those presented in Table 13.19. At night, all the predicted noise levels are above the night-time UAEL of 65 dB $L_{Aeq,1h}$ and would cause a temporary **significant adverse** environmental effect. Levels of this magnitude should be avoided and mitigation considered.

Portishead to Portbury Junction, Pill

13.6.16 Sensitive receptors along the disused line between Portishead and Portbury Junction, Pill would be exposed to noise from the following construction activities listed below. These receptors would be those directly alongside the proposed railway line and some along the route between Portishead and Pill.

- Compounds (Sheepway, Portbury Hundred, and Lodway Farm)
- Railway Line construction works, including off-line haul route between the Portbury Hundred and the outskirts of Portishead.

13.6.17 The construction of the line from Portishead to Portbury Junction first involves the removal of the derelict line and sleepers, followed by trackbed preparation and the laying of the new line. In addition, all remaining fencing along the line will be replaced. During the removal of the existing track the noise level at the closest sensitive receptors would be around 76 dB(A) for short periods of time. These works would generally be expected to be at one location for no longer than a day. During the construction of the new line, the highest noise levels are likely from the excavators used for the trackbed preparation and tamping (i.e. levelling) and alignment of the new line. The highest noise levels from these activities is likely to be between 80 and 85 dB(A), although the works would be moving along the line and not expected to be in any one area for more than a day or two.

13.6.18 Along the line of works, the closest sensitive receptors are around 15 m from the works. However, the Old Station House in Portbury will be within 10 m of the works. At this location the highest predicted noise level will be 87 dB(A), which is just above the UAEL of 85 dB(A). However, the works for tamping and lining being transient in nature this noise level is only expected for a day or two.

13.6.19 During the construction of the compounds, the works would initially involve the stripping of the top soil and the laying and rolling of material to support the haul route and temporary buildings. The Lodway compound would be the closest to dwellings at approximately 20 m, and the expected noise levels would be up to 72 dB(A) during the construction of the compound. At the Sheepway and Portbury Hundred compounds, the closest dwellings are further away and the predicted noise levels are lower.

13.6.20 For the operation of the compounds, there will be noise from the distribution (including delivery and removal) of materials, and also from generators required for power. One of the three options being considered for the removal of old track formation (comprising waste ballast and old track) envisages the use of the Portbury Hundred and Lodway construction compounds for temporary storage prior to disposal (see Chapter 4 (DCO Document Reference 6.7) paragraph 4.4.32). If this option is selected then there is the potential for some night time working if the materials are loaded

at night on to engineering trains parked on the existing operational railway line.

13.6.21 The expected highest noise level from these activities is presented in Table 13.20, together with the assigned effect level (see Table 2.4 of Appendix 13.2 in the ES Volume 4 Technical Appendices, DCO Document Reference 6.25). Although temporary in nature, those activities above the SOAEL would still represent a **significant adverse environmental effect.**

13.6.22 Table 13.20 shows that the UAEL is predicted to be exceeded for the railway line works at the closest receptor of the Old Station House in Portbury. At the next closest receptors the SOAEL is expected to be exceeded. Although the works involving tamping and lining will be transient and of short duration, these would be considered as temporary **significant adverse environmental effects**. Section 13.7 considers the mitigation measures proposed to be used.

13.6.23 During the construction of the DCO Scheme there is the potential for the compounds to be used at night. If used at night, the expected noise levels would be similar to those presented in Table 13.20. Some of these predicted noise levels are above the night-time UAEL of 65 dB $L_{Aeq,1h}$ and would cause a temporary **significant adverse effect** and would be significant in relation to the EIA Regulations 2017. Levels of this magnitude should be avoided, and an assessment to determine eligibility for noise insulation would need to be undertaken prior to any night working.

Table 13.20: Predicted noise levels from construction activities between Portishead and Portbury Junction, Pill

Location of works / work areas	Highest expected noise level at the closest receptor, L_{Aeq} dB	Activity associated with highest noise level[1]	Distance to closest receptor, m	Effect level[2]
Compounds:				
Sheepway compound construction	68	Haul route construction	50	LOAEL
Sheepway compound operation	63	Vehicle movements	50	LOAEL
Permanent Sheepway compound construction	68	Haul route construction	50	LOAEL
Permanent Sheepway compound operation	63	Vehicle movements	50	LOAEL

Table 13.20: Predicted noise levels from construction activities between Portishead and Portbury Junction, Pill

Location of works / work areas	Highest expected noise level at the closest receptor, L_{Aeq} dB	Activity associated with highest noise level[1]	Distance to closest receptor, m	Effect level[2]
Lodway Farm compound construction	72	Haul route construction	20	LOAEL
Lodway Farm compound operation	69	Loading and removal of ballast	20	LOAEL
Portbury Hundred compound construction	58	Haul route construction	100	LOAEL
Portbury Hundred compound operation	48	Vehicle movements	100	LOAEL
Other works:				
Railway line works[3]	87	Tamping and lining	10	UAEL

[1] Some work areas have more than one activity. These are shown in detail in Appendix 13.7 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25).

[2] These are in terms of daytime predicted noise level.

[3] The Old Station House in Portbury is within 10 m of the railway line. This is a single receptor and not typical of the rest of the receptors along the route, where the closest are 15 m. At these receptors the predicted noise level is 83 dB(A) which is above the SOAEL.

Pill

13.6.24 This area would be exposed to noise from the following construction activities:

- Avon Road bridge and earthworks at Avon Road embankment
- Car park construction
- Station construction – building, Hardwick Cutting (embankment) stabilisation, and platform (including the demolition of the Station House)
- Railway line construction works
- Pill Viaduct works
- Mount Pleasant embankment stabilisation

- Pill Junction.

13.6.25 The bridge at Avon Road, where a footpath passes under the railway, is due to be reconstructed and the embankments steepened to accommodate the new line. The works required for this will involve piling, excavation of the existing earthworks, installation of a new pre-cast concrete box culvert to replace the bridge, together with reinstatement works including track replacement and track tamping, all of which are close to sensitive receptors. The highest predicted noise level of 83 dB(A) is from vegetation clearance, which could be 15 m from the closest sensitive receptors. For the anticipated vibratory piling, at approximately 20 m from the closest sensitive receptors, the noise level is expected to be just under 80 dB(A), although such instances would be limited to perhaps one or two weeks and not for the full three to six months of the planned works at this location. Although both these activities are temporary in nature, this would still represent a **significant adverse environmental effect.** At this location there is the potential for night working due to possessions of the railway line, although this night working would not involve piling activities.

13.6.26 The embankment stabilisation at Avon Road may require a small percussive piling rig and will be undertaken approximately 15 m from sensitive receptors. In this location the noise level at the closest sensitive receptor is predicted to be 69 dB(A).

13.6.27 Prior to the works at the station and those for the car park, there may be the need for utility diversions. At the closest sensitive receptors the highest noise level from this activity is likely to be just above 76 dB(A). The works would be moving along the line and not expected to be in any one location for more than a few days in a single area. Although temporary in nature, this would still represent a **significant adverse environmental effect.**

13.6.28 The car park construction is expected to last for about 20 weeks, and during this time the highest noise levels will be from excavation works for the installation of the facilities (e.g. lighting columns and bollards). At 15 m from the works, which is the approximate location of the closest sensitive receptors, the noise level is expected to be around 20 dB(A) above the background level, although such instances would be limited to perhaps two hours per day and not for the full 20 weeks.

13.6.29 For the construction of the platform and the foundations for the building, the works are expected to last for nine months. Initially there would be high noise levels from vegetation clearance, although this activity would only take place for less than one week. Following this work would start on the Hardwick Cutting. Piling will be required in order to provide sufficient space for the second railway line. These works take the form of kingpost piling, where H-section piles are inserted using a percussive hammer attachment on a large excavator to create uprights into which are slotted concrete or steel planks to ensure earthworks retention. As a result the impact is not continual, as the line of piles is not continuous.

13.6.30 During the construction of the station the highest expected noise levels would be from the initial vegetation clearance and the brickwork for the platform construction. Vegetation clearance is likely to last less than two weeks but may produce the highest noise levels of up to 84 dB(A) albeit

very briefly. Although temporary in nature, this would still represent a **significant adverse environmental effect**.

13.6.31 The platform construction is likely to last for about 15 weeks and at 15 m from the works the noise level is expected be about 20 dB(A) above the background. Properties along Sambourne Lane and possibly Monmouth Road are likely to be the most exposed to these works. Other works associated with the station construction would be building construction, where the maximum noise levels are expected from the lifting of elements of the station building and facilities.

13.6.32 The kingpost piling at the Hardwick Cutting may require a percussive piling method, and with the closest sensitive receptors being 20 m away, the predicted noise level will be just below 75 dB(A).

13.6.33 The works to install the new line will initially involve trackbed preparation and then the laying of the new railway. During the construction of the new line, the highest noise levels are likely from the excavators used for the trackbed preparation and tamping (i.e. levelling) and alignment of the new railway. The highest noise levels from these activities are likely to be just above 80 dB(A), although the works would be moving along the line and not expected to be in any one location for more than a day or two in a single area. Although temporary in nature, this would still represent a **significant adverse environmental effect.**

13.6.34 The works at the Pill Viaduct are likely to last between three to six months, and the closest sensitive receptors to the works would be around 5 m from the structure. During this period the highest noise level from the works is expected to be just above 70 dB(A) which would be around 15 to 20 dB(A) above the baseline level. This is likely to be from activities associated with concreting, from both mixing and transporting.

13.6.35 For the stabilisation of the embankment at Mount Pleasant, the highest predicted noise level is from the piling works. This could involve percussive piling where the predicted noise level would be up to 77 dB(A) at the closest sensitive receptors at 15 m. The majority of the works will be from the railway when under a possession, and these will be limited to daytime working, expected for a period of six to eight months. Although temporary in nature, these works would still represent a **significant adverse environmental effect.**

13.6.36 Section 13.7 considers mitigation measures for those locations above the SOAEL where significant adverse environmental effects have been identified.

13.6.37 The expected highest noise level from these activities is presented in Table 13.21, together with the assigned effect level (see Table 2.4 of Appendix 13.2 in the ES Volume 4 Technical Appendices, DCO Document Reference 6.25).

Table 13.21: Predicted noise levels from construction activities in Pill

Location of works / work areas	Highest expected noise level at the closest receptor, L_{Aeq} dB	Activity associated with highest noise level[1]	Distance to closest receptor, m	Effect level[2]
Avon Road bridge	83	Vegetation clearance and vibratory piling	15	SOAEL
Avon Road embankment	69	Percussive piling	15	LOAEL
Utility diversions	76	Cutting road surface	20	SOAEL
Car park construction	74	Earthworks	15	LOAEL
Station construction	84	Vegetation clearance	15	SOAEL
Hardwick Cutting embankment	74	Percussive kingpost piling	20	LOAEL
Railway line construction works (including Pill junction)	81	Tamping and lining	15	SOAEL
Pill viaduct works	71	Concreting	5	LOAEL
Mount Pleasant embankment stabilisation	77	Percussive kingpost piling	15	SOAEL

[1] Some work areas have more than one activity. These are shown in detail in Appendix 13.7 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25).

[2] These are in terms of daytime predicted noise level.

13.6.38 Table 13.21 shows that the SOAEL is predicted to be exceeded for some of the works. This would be a temporary significant **adverse** effect. Notwithstanding, the noise levels are considered to be significant in relation to the EIA Regulations 2017. Section 13.7 considers the mitigation measures proposed to be used.

13.6.39 If any of the construction works are to be undertaken at night then the expected noise levels would be similar to those presented in Table 13.21. The predicted noise levels are all above the night-time UAEL of 65 $dBL_{Aeq,1h}$ and would cause a temporary **significant adverse environmental effect** which would be significant in relation to the EIA Regulations 2017. An assessment to determine eligibility for noise insulation would need to be undertaken prior to any night working.

Pill to Ashton Junction

13.6.40 Between Pill and Ashton Junction, including through the Avon Gorge, the main activity involves works to the existing railway line and fencing. In addition there will be a temporary construction compound and maintenance access point at the Pill Tunnel eastern portal, repair work to some structures (bridges and retaining walls) along the route and Quarry Bridge No. 2 will be strengthened.

13.6.41 The cliff faces will be inspected to assess the need to remove vegetation and provide measures to stabilise the rocks, ranging from rock pinning to the controlled removal of unstable blocks down the slope. These works will be undertaken using hand tools. The main construction compound will be at Clanage Road, with micro-compounds approximately every kilometre through the Avon Gorge.

13.6.42 Highway works will be required in Ham Green so that vehicles can access the new construction and maintenance compound at the Pill Tunnel eastern portal.

13.6.43 At either end of this section there are some sensitive receptors close to the railway. These are located in the Ham Green area of Pill, Bower Ashton, and Ashton Gate. For the majority of the route there are no sensitive receptors within 200 m of the railway line. In the Ham Green where there are receptors within 15 m of the railway the highest noise levels will be from vegetation removal, although this activity is likely to be short in duration and would not generally be in any one place for more than two days as a maximum. After the vegetation removal, the highest noise levels are likely to come from works associated with upgrading the existing line, but these too will be mobile and unlikely to be in one place for any length of time. Around Ashton Gate, where the closest sensitive receptors are about 50 m from the railway, the impact from the construction works will be minimal due to the distance from the railway and also because the baseline noise level is high in this area.

13.6.44 The works to the various structures along the route would generally last for up to two months although some could be longer. Some of these works may involve the use of hand held pneumatic tools, which are likely to generate the highest noise levels. These works are unlikely to generate noise levels above 60 dB(A) at the closest sensitive receptors due to the separation distances between the works and the closest receptors.

13.6.45 The ‘Babcock ramp’ is being constructed to provide pedestrian and cycle access from the level crossing in Ashton Gate to Ashton Road. The construction of this ramp is likely to last for a year and will involve noise generating activities such as vegetation clearance, earthworks and auger piling. At the closest sensitive receptor, just under 100 m away in Bower Ashton Terrace, the predicted noise level is 62 dB(A) for the highest noise generating activity.

13.6.46 Highway works undertaken along Winterstoke Road are planned in order to widen the carriageway on the northbound approach to the level crossing. Given these works are relatively minor and around 250 m from sensitive receptors, no noise calculations have been undertaken to determine the impact.

13.6.47 The expected highest noise level from these activities is presented in Table 13.22, together with the assigned effect level (see Table 2.4 of Appendix 13.2 in the ES Volume 4 Technical Appendices, DCO Document Reference 6.25).

Table 13.22: Predicted noise levels from construction activities between Pill and Ashton Junction

Location of works / work areas	Highest expected noise level at the closest receptor	Activity associated with highest noise level[1]	Distance to closest receptor, m	Effect level[2]
Construction of micro compounds	42	Distribution of materials	300	LOAEL
Operation of micro compounds	43	Lifting of materials	300	LOAEL
Railway line works	84	Vegetation clearance and track upgrading	15	SOAEL
Structure works	57	Pneumatic tools	50	LOAEL
Babcock ramp	62	Vegetation clearance	95	LOAEL

[1] Some work areas have more than one activity. These are shown in detail in Appendix 13.7 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25).

[2] These are in terms of daytime predicted noise level.

13.6.48 Table 13.22 shows that the SOAEL is predicted to be exceeded for the works on the railway line. Although these activities (i.e. vegetation clearance, trackbed preparation, tamping) would be transient in nature, the predicted noise levels would still represent a temporary **significant adverse environmental effect**. Section 13.7 considers the mitigation measures proposed to be used. It is likely that some of the works along the operational railway line will be undertaken at night. The predicted noise level from the railway line works is predicted to be above the night-time UAEL of 65 dB $L_{Aeq,1h}$ and would cause a temporary **significant adverse effect** and would be significant in relation to the EIA Regulations 2017. Levels of this magnitude should be avoided, and an assessment to determine eligibility for noise insulation would need to be undertaken prior to any night working near sensitive receptors.

Construction Phase - Vibration

13.6.49 Potential impacts from vibration are considered in those locations where there is the potential for activities which could generate high levels of vibration. Given that no contractor has been appointed and the construction methodology not finalised, such activities have been examined at seven locations and the worst case possible piling method has been assumed.

These locations are where there is likely to be piling or compaction works, as these are considered to be the only activities likely to generate noticeable levels of vibration during the construction of the railway line.

13.6.50 The first of these is at Portishead station, where percussive (or hammer) piling may be required for the new platform foundations. At the Trinity Primary School Bridge, percussive (or hammer) piling is required to create secure foundations for the structure in order to take the vertical load of the structure itself. The third and fourth of the locations where vibration generating activities could take place is the construction of the walls at Hardwick Cutting for the Pill station works and the embankment stabilisation works at Mount Pleasant. These works take the form of kingpost piling, where H-section piles are inserted using a percussive hammer attachment on a large excavator to create uprights into which are slotted concrete or steel planks to ensure earthworks retention. The fifth location of possible piling is at the Avon Road bridge, where a vibratory piling method may be required for bridge foundation works. Along the Avon Road embankment, the sixth location of possible percussive piling, small piles may be required for the bank stabilisation works. Finally, along the line from Portishead to Pill, vibratory compaction could be used where works are required in the vicinity of existing structures or on the main earthworks themselves in order to ensure a finished trackbed that will not settle further and be subject to subsequent maintenance works.

13.6.51 The soil nailing being undertaken at Pill Station would not generate noticeable levels of vibration due to the work not involving impact work.

13.6.52 Calculations of possible levels of vibration have been undertaken using the equations provided within BS 5228-2:2009 + A1:2014 (British Standards Institution, 2014b). These equations require input parameters based on variables such as the power of the piling rig. The input parameters for these equations has been estimated using professional judgement, taking into account any restrictions the location may impose on the equipment that could be used. The calculated levels of vibration are shown in Table 13.23, with Table 7.66 in Appendix 13.7 in the Volume 4 Technical Appendices (DCO Document Reference 6.25) providing the input data used for these calculations.

Table 13.23: Predicted levels of vibration from selected activities

Location	Distance to closest receptor, m	PPV[1], mm/s	Effect level[2]
Portishead station (percussive piling)	25	0.4	LOAEL
Trinity Primary School Bridge (percussive piling)	25	0.4	LOAEL
Hardwick Cutting (percussive piling)	20	0.5	LOAEL
Mount Pleasant (percussive piling)	15	0.8	LOAEL
Avon Road bridge (vibratory piling)	20	1.2	SOAEL
Avon Road embankment (percussive piling)	20	0.4	LOAEL
Railway line works (vibratory compaction)	15	1.7	SOAEL

[1] PPV is defined as the maximum instantaneous positive or negative peak of the vibration signal. It is specified in millimetres per second (mm/s). It is important to note that the PPV refers to the movement within the ground of molecular particles and not surface movement.

[2] Only applicable to the assessment against impacts on human receptors. See Table 2.7 of Appendix 2 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25).

13.6.53 In the vicinity of the proposed Portishead station, the closest sensitive receptors are 25m away in Tansy Lane. Using the scale presented in Table 2.6 of Appendix 13.2 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25), this predicted level of 0.4 mm/s PPV is below the level where building damage may occur and would be classed as a negligible impact. Examining the impact on humans using Table 2.7 of Appendix 13.2 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25), the predicted level of vibration would be just above the level where "*vibration might be just perceptible in residential environments*" and would be classed as a minor impact and a **slight adverse** significance of effect, which is not significant in relation to the EIA Regulations 2017.

13.6.54 The closest receptors to the Trinity Primary School Bridge are the dwellings in Holmlea and Tansy Lane. Using the scale presented in Table 2.6 of Appendix 13.2 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25), this predicted level of 0.4 mm/s PPV is below the level where building damage may occur and would be classed as a negligible impact. Examining the impact on humans using Table 2.7 of Appendix 13.2 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25), the predicted level of vibration would be just above the level where "*vibration might be just perceptible in residential environments*" and would

be classed as a minor impact and a **slight adverse** significance of effect, which is not significant in relation to the EIA Regulations 2017.

13.6.55 The closest receptors to the vibratory piling works in the area of Hardwick Cutting are the residential dwellings in Hardwick Road and Sambourne Lane. These are around 20 m from the works and the predicted level of vibration is 0.5 mm/s PPV. For the embankment stabilisation works at Mount Pleasant, the closest sensitive receptors are around 15 m away and the predicted level of vibration is 0.8 mm/s PPV. Using the scale presented in Table 2.6 of Appendix 13.2 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25), these predicted levels of vibration are below the level where building damage may occur and would be classed as a negligible impact. Examining the impact on humans using Table 2.7 of Appendix 13.2 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25), the predicted levels of vibration would be above the level where "*vibration might be just perceptible in residential environments*" and would be classed as a minor impact and a **slight adverse** significance of effect which is not significant in relation to the EIA Regulations 2017.

13.6.56 For the Avon Road bridge works, it is anticipated that vibratory piling may be required, and at the closest sensitive receptors which are 20 m away the predicted level of vibration is 1.2 mm/s PPV. Using the scale presented in Table 2.6 of Appendix 13.2 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25), this predicted level of vibration is below the level where building damage may occur and would be classed as a negligible impact. Examining the impact on humans using Table 2.7 of Appendix 13.2 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25), the predicted level of vibration would be above the level where "*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*" and would be classed as a moderate impact and a **moderate adverse** significance of effect, which is significant in relation to the EIA Regulations 2017.

13.6.57 The closest receptors to the embankment stabilisation works at the Avon Road embankment are the dwellings in Avon Road. Using the scale presented in Table 2.6 of Appendix 13.2 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25), this predicted level of 0.4 mm/s PPV is below the level where building damage may occur and would be classed as a negligible impact. Examining the impact on humans using Table 2.7 of Appendix 13.2 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25), the predicted level of vibration would be just above the level where "*vibration might be just perceptible in residential environments*" and would be classed as a minor impact and a **slight adverse** significance of effect, which is not significant in relation to the EIA Regulations 2017.

13.6.58 The closest receptors to the railway line works are the dwellings alongside the line in Portishead and also the Old Station House in Portbury. Using the scale presented in Table 2.6 of Appendix 13.2 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25), this predicted level of vibration is below the level where building damage may occur and would be classed as a negligible impact. Examining the impact on humans using Table 2.7 of Appendix 13.2 in the ES Volume 4 Technical Appendices (DCO

Document Reference 6.25), the predicted level of vibration would be above the level where "*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*" and would be classed as a moderate impact and a **moderate adverse** significance of effect, which is significant in relation to the EIA Regulations 2017.

13.6.59 Section 13.7 considers mitigation measures for those locations above the SOAEL where significant adverse environmental effects have been identified.

Operation Phase - Noise

13.6.60 The impact of the Portishead Branch Line is presented below. For each area identified below, the expected change in the noise climate is described for the short term (i.e. on opening) and the long term (i.e. 15 years after opening). Unless an area is represented only by an individual receptor, the assessment discusses the expected change in an area and not a specific location. The list of predicted noise levels for all scenarios is provided in Appendix 13.8 (DCO Document Reference 6.25).

13.6.61 The measurement locations are shown in Figure 13.1 in the ES Volume 3 Book of Figures, with the assessment locations shown in Figure 13.2 in the ES Volume 3 Book of Figures (DCO Document Reference 6.24). Each assessment location is intended to be representative of either a number of properties or an individual property.

13.6.62 All residential receptors are considered to be high value. Effects which are evaluated as moderate or higher are considered to be significant in relation to the EIA Regulations 2017 and require further consideration for mitigation.

Portishead - Residential

13.6.63 Method 1 (see Table 13.5) was used to determine the impacts where there is currently no dominant noise source in the area that could be modelled for the baseline.

13.6.64 The area to the south of the proposed station in Peartree Field was forecast to experience an increase in ambient noise levels of more than 5 dB(A), with the absolute level between the LOAEL and SOAEL. This is a major adverse magnitude of impact, mainly caused by the noise from the trains when idle at Portishead Station. This level of increase in noise would be a **large adverse** significance of effect on a high value receptor, which is significant in relation to the EIA Regulations 2017. Mitigation for this location is described in Section 13.7.

13.6.65 Further back from Portishead Station and railway line, due to distance and the screening provided by other houses, the magnitude of impacts would be below 1 dB(A), which is a negligible magnitude of impact resulting in a **slight adverse** significance of effect.

13.6.66 To the immediate north of the proposed station, along Tansy Lane, the increase in noise is predicted to be around 1 dB(A) in the short term which is a minor magnitude of impact. This is less than the predicted on the south side of the rail line due to the screening provided by the platform and station buildings. This increase in noise would be a **slight adverse** significance of effect. Further back from the front line of houses, due to distance and the

screening provided by other houses, the impacts would be below 1 dB(A), which is a negligible magnitude of impact, resulting in a **slight adverse** significance of effect. In the long term the increase in noise would at worse be around 3 dB(A) which would be a minor magnitude of impact resulting in a **slight adverse** significance of effect.

13.6.67 Further to the east and to the south of the rail line, around Holmlea and the western end of Tydeman Road, the maximum increase in noise is predicted to be 1 dB(A) which would be a minor magnitude of impact and a **slight adverse** significance of effect. In the long term the maximum increase in noise would around 1.5 dB(A) which would be a negligible magnitude of impact and a **slight adverse** significance of effect.

13.6.68 For the properties to the far east of Tydeman Road that are built parallel to the rail line, the background noise level at the rear of the properties is low due to screening from the M5. At the most exposed of these the increase in noise is predicted to be 2.3 dB(A), which is a minor magnitude of impact. The impact here is considered to be a **slight adverse** significance of effect. In the long term the increase in noise at these locations is predicted to be at highest 3.3 dB(A) which would be a minor magnitude of change and a **slight adverse** significance of effect.

13.6.69 To the north of the rail line in the area of Fennel Road and Tarragon Place the highest increase in noise is predicted to be just under 2 dB(A), which would be a minor magnitude of impact and a **slight adverse** significance of effect. This increase is higher than that predicted in the area of Holmlea and the western end of Tydeman Road because of the higher speed of the trains they move further from the station. In the long term the highest increase in noise is predicted to be just under 3 dB(A) which would be a minor magnitude of change and a **slight adverse** significance of effect.

13.6.70 Table 3.5 of Appendix 13.3 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25) shows the measured maximum noise level from 10 passages of a three carriage Class 166 DMU's. These measurements were undertaken at Portway Park and Ride in January 2018 at a distance of around 10 m. From the ten measurements undertaken, the highest measured level was 81 dB(A). Relating these to the expected maximum noise level (i.e. L_{Amax}) from the passage of a three carriage Class 166 DMU at Portishead, at a location 15 m from the railway line, the expected noise level would be around 80 dB(A), which is approximately that of the passage of a HGV at 10 m. For the passage of a train along the railway line either into or out of Portishead, this maximum noise level would be maintained for about five seconds. Overall, the pass by of the train would elevate the baseline noise level for approximately 30 to 40 seconds. Behind the front line of houses, both the maximum noise level and the time the train is audible would decrease with distance.

13.6.71 Appendix 13.2 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25) describes how the L_{Amax} noise index can be used as a stress indicator to indicate effects on health and mental wellbeing, which could be linked to quality of life. The maximum noise level of 85 dB(A) can be used as an indicator for a significant impact (RPS, 2005), although this is only applied to night time noise levels. However, applying this level to daytime maximum noise levels could be seen as a worst case scenario.

13.6.72 Comparing the measured maximum noise levels of the measurements undertaken at Portway Park and Ride it can be seen that none are above 85 dB L_{Amax}. This would indicate the passage of the train would not be a significant impact and no significant environmental effect. Furthermore, by using this as an indicator of an effect on quality of life, the maximum noise level from the passing trains can be related to the effects from PPG-Noise which have been reproduced in Table 13.2. The perception of "*Noticeable by not intrusive*" can be related to the outcome of "*Noise can be heard, but does not cause any change in behaviour or attitude. Noise can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life"*. In the hierarchy of effect levels given in Table 13.2, this would be given an effect level of "*No Observed Adverse Effect*" and an action of "*No specific measures required*".

13.6.73 Overall, the effect of operational noise on residential property in Portishead is largely assessed to be slight adverse, which is not significant in relation to the EIA Regulations 2017. The exception is properties to the south of the railway station in Peartree Field where the operational noise level is assessed to be large adverse and significant in relation to the EIA Regulations 2017 and mitigation is proposed in Section 13.7.

Portishead - School

13.6.74 At the Trinity Anglican Methodist Primary School, the increase in noise at the closest point of the building is predicted to be just under 1 dB(A), a negligible magnitude of impact, which would increase the ambient noise level to just under 50 dB $L_{Aeq,16h}$. In the long term the increase in noise is predicted to be around 1.5 dB(A), a negligible magnitude of impact for this high value receptor, resulting in a **slight adverse** significance of effect, which is not considered to be significant in relation to the EIA Regulations 2017.

13.6.75 For outdoor play areas, it is recommended (Institute of Acoustics and the Association of Noise Consultants, 2015) that the noise levels in unoccupied playgrounds, playing fields and other outdoor areas should not exceed 55 dB $L_{Aeq,30min}$ and there should be at least one area suitable for outdoor teaching activities where noise levels are below 50 dB $L_{Aeq,30min}$. At the closest point of the railway line to the school playing field, approximately 15 m, the overall ambient noise level is predicted to be around 52 dB $L_{Aeq,16h}$ dB in the short term and 53 dB $L_{Aeq,16h}$ dB in the long term. This will be an increase just under 3 dB(A) in the short term and 4 dB(A) in the long term. These increases are at a level that would be considered as a significant environmental effect if the school buildings were at this distance from the railway line. However, since this is an open space and not buildings, a comparison is only made with the absolute level against the guideline level. Towards the middle of the playing field at 45 m from the railway line and closer to the school, the absolute level is predicted to be about 3 dB(A) lower, with the increase less than 2 dB(A) in both the short and long term. Around the perimeter of the school building there are areas where the overall level would remain below 50 dB $L_{Aeq,30min}$. The overall noise level is therefore predicted to remain within the guideline levels.

Portishead – NHS Marina Healthcare Centre and Haven Lodge

13.6.76 At the Marina Healthcare Centre and Haven Lodge in Portishead the noise level is expected to increase by less than 1 dB(A) in the short term. Being newly constructed buildings it is assumed they will have been constructed in a way to mitigate the noise levels from the existing situation. The predicted noise from the operation of the Portishead Station should not alter this existing noise climate.

Portishead – Harbour Crescent

13.6.77 A noise assessment was undertaken for the planned development at Harbour Crescent (Kimber Acoustics Ltd, 2015) that considered the suitability of the area for residential development. In considering the expected noise climate at the development location, the assessment took into consideration the expected noise from the MetroWest Phase 1 Project. Therefore, since the assessment for the expected development at Harbour Crescent has taken into consideration the potential noise from the MetroWest Phase 1 Project and has designed mitigation accordingly, it is not included as a sensitive receptor for this assessment.

Portishead – Portbury Wharf Nature Reserve

13.6.78 The pools/lagoons suitable for SPA/Ramsar species within the Portbury Wharf Nature Reserve are located approximately 650 m from the Portishead to Pill line. Operational noise at this location from the passage of trains are expected to be below 30 dB $L_{Aeq,16h}$. Based on the existing noise climate of 46.4 dB $L_{Aeq,16h}$ measured at monitoring position ST11, which is considered to be representative of this receptor, no increase in noise is predicted at the pools/lagoons suitable for SPA/Ramsar species.

Sheepway - Residential

13.6.79 At the locations on the western side of Sheepway (e.g. Shipway Gate Farm) the increase in noise is predicted at worst to be 0.5 dB(A), which is a negligible magnitude of impact. With an overall noise level below the SOAEL this would be a **slight adverse** effect. In the long term the increase is predicted to be less than 1 dB(A) which would also be a **slight adverse** effect, which is not considered to be significant in relation to the EIA Regulations 2017. The proposed holiday/tourist accommodation at Shipway Gate Farm are approximately 25 m from the proposed railway line and would experience an increase of 0.7 dB(A) in the short term and 1.1 dB(A) in the long term. With an overall noise level below the SOAEL this would be a **slight adverse** effect for both the short and long term, which is not considered to be significant in relation to the EIA Regulations 2017.

13.6.80 Further away from the rail line in Sheepway, including properties on Wharf Lane, the increase in noise is predicted to be below 1 dB(A) in both the short and long term. This would be a **slight adverse** significance of effect, which is not considered to be significant in relation to the EIA Regulations 2017.

13.6.81 At the location closest to the rail line on the eastern side of Sheepway, a **moderate adverse** significance of effect is predicted at the Old Station House at Portbury. This is due to an increase of just over 3 dB(A) in the short term. This level of increase in noise would be a moderate adverse significance of effect, which is considered to be significant in relation to the

EIA Regulations 2017. Mitigation for this location is described in Section 13.7.

13.6.82 For the buildings on the southern edge of Elm Tree Park the increase in noise is predicted to be around 1.5 dB(A) in the short term. The absolute level of 56.7 dB $L_{Aeq,16h}$ is below the SOAEL and therefore this increase would be a **slight adverse** effect and mitigation would not be considered. In the long term the highest increase is predicted to be below 3 dB(A) which would be a **slight adverse** effect, which is not considered to be significant in relation to the EIA Regulations 2017.

13.6.83 In summary, the increases in noise levels for most residential property (high value receptor) in Sheepway is assessed to be slight adverse, which is not considered to be significant in relation to the EIA Regulations 2017. The exception is Old Station House at Portbury, which has been converted into a private dwelling. Given the location of this property alongside the railway, the predicted increases in operational noise are assessed to have a **moderate adverse** effect, which would be significant in relation to the EIA Regulations 2017.

Sheepway – Permanent maintenance compound

13.6.84 The operational noise level at the Sheepway permanent maintenance compound at Portbury Wharf Nature Reserve is predicted to change from the existing level of 51 dB(A), measured at monitoring location ST3, to 54 dB(A).

Portbury and the Western Edge of Pill - Residential

13.6.85 For the dwellings within Portbury and on the western edge of Pill (e.g. Church Road and The Breeches) there is predicted to be no change in noise with the DCO Scheme, thus the impact would be a **neutral** effect. This is because the noise climate at these locations is dominated by noise from the M5, which lies between the DCO Scheme and these properties, and the DCO Scheme will not increase the ambient noise level at these properties. For Marsh Farm there is also predicted to be no change in the short term which is a **neutral** effect. These effects are not considered to be significant in relation to the EIA Regulations 2017.

13.6.86 In the long term at all the locations considered there is predicted to be an increase of up to 0.5 dB(A). However, this change is due to the forecast increase in traffic on the M5 and not due to the DCO Scheme.

Pill - Residential

13.6.87 In the area to the north of the railway in Pill (Avon Road and Severn Road) there is predicted to be at worst an increase in noise of just under 2 dB(A) in the short term, which is a minor adverse magnitude of impact. The absolute level is around 52.5 dB $L_{Aeq,16h}$ which is between the LOAEL and SOAEL and which would be considered as a **slight adverse** significance of effect. In the long term this increase would be below 3 dB(A) which would also be a **slight adverse** effect, which is not considered to be significant in relation to the EIA Regulations 2017. Further from the railway line the increase in noise is below 1 dB(A) due to the distance from the line and screening provided by other houses.

13.6.88 To the south of the rail line on the western side of Pill, in the area around Lodway Close and the western end of Hardwick Road, there are predicted to be increases just below 2 dB(A) in the short term and around 2.5 dB(A) in the long term, which are both considered to represent a minor adverse magnitude of impact. This increase in noise is due to operation of the DCO Scheme services. The absolute level is around 53 dB $L_{Aeq,16h}$ which is between the LOAEL and SOAEL and therefore the impact would be considered as a **slight adverse** significance of effect, which is not considered to be significant in relation to the EIA Regulations 2017.

13.6.89 Towards the area of Pill where the station is proposed to be, on the southern side in the area of Sambourne Lane, the increase in noise is predicted to be at worst 1.5 dB(A) in the short term (minor adverse magnitude) and just below 2 dB(A) in the long term (negligible adverse magnitude). The potential impacts here are reduced by the natural topography of the area and also the platform providing screening from the noise from a stationary train. These impacts would be a **slight adverse** significance of effect. Further back from the front line of properties, the short term increase is predicted to be less than 1 dB(A), which represents a negligible adverse magnitude of impact and a **slight adverse** significance of effect, which is not considered to be significant in relation to the EIA Regulations 2017.

13.6.90 To the north of the proposed station, in Monmouth Road, the day time increase is predicted to be just above 1 dB(A) in the short term and 1.5 dB(A) in the long term, which both represent a minor adverse magnitude of impact. This increase is mostly from the noise of the trains when stationary at the station, but there is also a noise contribution from the trains when moving, the PAVA system at the railway station, and cars travelling to and from the new car park. With the absolute noise level around 58 dB(A), this location is between the LOAEL and the SOAEL.

13.6.91 Further back from the front line of properties in Monmouth Road to the north, the short term increase is predicted to be less than 1 dB(A), which is a negligible magnitude of impact and a **slight adverse** significance of effect, which is not considered to be significant in relation to the EIA Regulations 2017.

13.6.92 To the immediate south east of the proposed station, between Station Road and Pill Viaduct (i.e. properties in the area of Chapel Row, New Road and Star Lane), the day time short term increase in noise is predicted to be less than 1 dB(A). This increase is not higher due to the natural topography of the area and also the existing walls alongside the railway line providing screening. In the long term the increase is predicted to be just above 1 dB(A). Both these would be a **slight adverse** significance of effect, which is not considered to be significant in relation to the EIA Regulations 2017.

13.6.93 On the eastern side of Pill, for the properties from Pill Viaduct to the western portal of the Pill Tunnel, there are predicted to be increases in noise of around 2.5 dB(A) in the short term and just under 3 dB(A) in the long term. These increases are due to the noise from the operation of the trains along the elevated railway line. A background noise level below the LOAEL at some locations is also a contributing factor to the relatively high increase in noise. This increase would be a **slight adverse** significance of effect, which is not considered to be significant in relation to the EIA Regulations 2017.

13.6.94 To the eastern side of the Pill Tunnel, an increase of less than 1 dB(A) is predicted for the short and long term (minor adverse magnitude of impact) at properties along Chapel Pill Lane. The measured baseline level is below the daytime LOAEL and the impact is a **slight adverse** significance of effect, which is not considered to be significant in relation to the EIA Regulations 2017.

13.6.95 The passage of the passenger trains would be audible and noticeable above the baseline noise level. However, the maximum noise level from the passages would not be above the level of a passing freight train, to which the receptors in Pill are already exposed. Therefore, it is considered that the passage of trains would not be intrusive as they would not sufficiently alter the character of the area and would not affect quality of life.

13.6.96 In summary, the increase in operational noise levels through Pill is assessed to result in slight adverse effects, which are not considered to be significant in relation to the EIA Regulations 2017.

Eastern side of the River Avon - Residential

13.6.97 Noise predictions have been undertaken at some locations on the eastern side of the River Avon to determine any possible impact from the DCO Scheme. The receptors considered are those closest to the River Avon in Shirehampton, Stoke Bishop, and Clifton. In addition, predictions have also been undertaken on the western edge of Leigh Wood, to the west of the River Avon. Impacts at these locations would be low due to the distance from the railway line and the level of background noise due to roads, such as the A4 Portway.

13.6.98 The highest increase predicted in the short term is 0.5 dB(A) at the dwellings closest to the River Avon in Shirehampton. This increase is 1 dB(A) in the long term, and for both short and long term would be a negligible magnitude and a **slight adverse** significance of effect, which is not significant in relation to the EIA Regulations 2017.

Bower Ashton and Brunel Way - Residential

13.6.99 At the closest sensitive receptors to the railway line in the area around the Brunel Way, the highest day time increase in noise is predicted to be 0.5 dB(A) in the short term and just under 1 dB(A) in the long term. The absolute level is around 54 dB $L_{Aeq,16h}$ which is between the LOAEL and SOAEL and these increases in noise would be considered as a **slight adverse** significance of effect, which is not considered to be significant in relation to the EIA Regulations 2017.

13.6.100 Just to the west of the existing railway line on Bower Ashton is Teddies Nursery. In accordance with the methodology from Table 13.8, this would be considered as a location of high value. The increase in noise is predicted to be less than 1 dB(A) in the short term and just over 1 dB(A) in the long term. The absolute level is around 59 dB $L_{Aeq,16h}$ which is between the LOAEL and SOAEL and these increases in noise would be considered as a **slight adverse** significance of effect, which is not considered to be significant in relation to the EIA Regulations 2017. The passage of the passenger trains would be audible and noticeable above the baseline noise level. However, the maximum noise level from the passage of trains would not be above the level of a passing freight train, to which this receptor is already exposed.

13.6.101 In summary, the increase in operational noise levels around Bower Ashton and Brunel Way is assessed to result in slight adverse significance of effects, which is not considered to be significant in relation to the EIA Regulations 2017.

Operational Phase - Vibration

13.6.102 The assessment of possible operation impacts from vibration in Pill has been undertaken by showing that the proposed passenger trains will not result in any more vibration than a freight train. Measurements of vibration were undertaken on the approach to Oxford station where there were passing freight trains and also passenger trains similar to those proposed for the DCO Scheme, that is the Class 166. At Oxford there were freight trains passing through the station at a slow speed (assumed to be around 10 mph) and also Class 165/166 DMUs slowing to stop at the station. These slowing DMUs were assumed to be at the approximate same speed as the freight trains.

13.6.103 A summary of the measured levels of vibration is provided in Table 13.24.

Table 13.24: Maximum vibration levels from slow moving trains at Oxford station

Source	Maximum vibration level, PPV[1]	Distance[2]	Number of observations
Freight	0.52	6.5 m	3
Class 165 / 166	0.44	4 m	10

[1] This was the maximum level measured from the observations of each train type.

[2] The distance from the vibration monitor to the closest rail.

13.6.104 At this location the freight traffic was using a different line to the passenger trains and so measurements were not possible of the different trains on the same track. However, from the levels presented in Table 13.24 it can be seen that the freight traffic produced a higher level of vibration despite being further from the vibration monitor. This would indicate that a freight train generates a higher level of vibration than a passenger train, which is unsurprising given the weight difference between the two train types.

13.6.105 As has been discussed in the baseline section of this assessment when examining the actual measured levels of vibration from freight trains measured in Pill (see Table 13.18), the absolute level is of 0.34 mm/s of a freight train pass-by is below the 7.5 mm/s where the risk of building damage is considered to be negligible (see Table 2.6 of Appendix 13.2 in the ES Volume 4 Technical Appendices, DCO Document Reference 6.25). Compared against the level for an indication of human annoyance, the measured levels from Table 13.18 are just above being ‘just perceptible in residential environments’ in accordance with the scale of magnitude presented in Table 2.7 of Appendix 13.2 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25). Given that these levels are such that they would not be considered as significant, the impact from passenger trains in Pill is also considered to be not significant.

13.6.106 With no trains currently passing the dwellings in Portishead, it is clearly not possible to use measured levels at that location to predict the impact. The

level of vibration from the passenger trains at Oxford can be used to give an indication of the likely impact at dwellings in Portishead. At a distance of 13.5 m the measured level ranges from 0.16 to 0.24 mm/s. This distance is around the same as the closest dwelling to the proposed line within Portishead. These measured levels are all below the level that may be considered as 'just perceptible in residential environments' in accordance with the scale of magnitude presented in Table 2.7 of Appendix 13.2 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25). These would be below the LOAEL with a minor adverse magnitude of impact and a **slight adverse** significance of effect. In relation to the potential for building damage, a level of below 5 mm/s would present no risk to building damage and would be a no change magnitude of impact (Table 2.6 in Appendix 13.2 in the ES Volume 4 Technical Appendices, DCO Document Reference 6.25) and would be a neutral effect.

13.6.107 To further determine the possible impact from vibration within Portishead, measurements of vibration were undertaken of Class 166 DMUs using the Severn Beach line in January 2018. The results from this survey are presented in Table 6.5 of Appendix 13.6 in the ES Volume 4 Technical Appendices (DCO Document Reference 6.25). These show a measured level of between 0.16 and 0.34 mm/s at a distance of approximately 10 m, which is similar to the levels measured at Oxford.

Noise Insulation (Railway) Regulations

13.6.108 The predicted overall noise levels at locations where the noise level change is predicted to change by more than 1 dB(A) are not above the trigger level of 68 dB $L_{Aaq,18h}$. Therefore, Part 2 of the NIRR is not triggered.

13.7 Mitigation and Residual Effects

13.7.1 Potential significant adverse temporary effects have been identified during construction, for both noise and vibration. The appointed contractor would develop appropriate mitigation where necessary and practicable as required by the CoCP (DCO Document Reference 8.15) and the Master CEMP (DOC Document Reference 8.14). In addition, the appointed contractor would seek to obtain prior consent from the relevant Local Authority under Section 61 of the Control of Pollution Act 1974 for the proposed construction works. The consent application would set out the final Best Practical Means ("BPM") measures to minimise construction noise and vibration, including control of working hours, and also provide a further assessment of construction noise and vibration including confirmation of noise insulation / temporary re-housing provision. The Section 61 application will also describe the procedures for the monitoring of noise and vibration during construction. In addition, a vibration plan would be completed to include the undertaking of structural surveys at a selection of dwellings before and after construction. This should include the undertaking of structural surveys once the Portishead Branch Line has been operational for at least six months.

13.7.2 The application of BPM would be expected to reduce the construction noise and vibration levels and eliminate all of the predicted temporary significant effects. As plant and equipment is likely to be fixed due to the constraints of working within a railway-related environment, other forms of mitigation are

likely to be required in order to result in acceptable noise levels at the receptor locations.

13.7.3 Noise mitigation measures that are known to be effective in reducing the impact should be considered and include:

- Providing effective liaison with local residents wherever working outside of core hours is to be undertaken;
- Programming and phasing the works over a number of stages to restrict impacts within any one area to the minimum time;
- Keeping local residents and property owners fully informed about the nature and timing of the works, including compound locations and traffic controls, via such means as newsletters and public meetings;
- Local hoarding, screens or barriers should be erected as necessary to shield particularly noisy activities, or around the site boundary if residential properties are located close to construction works. In addition, excess spoil or ballast could be used to form temporary bunds to reduce noise. If these are an option, other factors (e.g. impact in ecology) would need to be considered;
- All plant and equipment will be properly maintained and operated in accordance with manufacturers' recommendations and in such a manner as to avoid causing excessive noise;
- Shutting down of equipment when not in use, i.e. maintain a 'no idling policy';
- Positioning of equipment behind physical barriers, i.e. existing features, hoarding or purpose built acoustic barriers;
- Static machines shall be sited as far away as practicable from inhabited buildings or other noise sensitive locations;
- Toolbox talks will be carried out to make sure that all those undertaking the works are aware of their environmental responsibilities and of the sensitivities of the vicinity. These will also ensure that BPM of control are delivered on the site;
- Directing noise emissions from plant, including exhausts or engines, away from sensitive positions;
- Handling of all materials in a manner which minimises noise, including minimising drop heights into hoppers and lorries;
- Minimise the height from which material drops when loading lorries or tipping into crushers;
- Avoiding double handling and therefore the overall number of tipping actions;
- Avoid body and tailgate slap from empty lorries;
- Moving parts of working platforms and other equipment shall be lubricated to control noise when being operated;
- Reminding all site employees of their obligation to minimise noise on site by the use of signs and site inductions; and,

- Engaging in community liaison to explore ways of minimising noise impacts and increasing local tolerance to noise.

13.7.4 Some of the suggested mitigation measures above would also be relevant to vibration (e.g. informing residents of the works). In addition, for vibratory piling, the use of soft start piling rigs can reduce the levels of vibration. For vibratory compaction, undertaking start up operations away from receptors and using an elongated pass near sensitive receptors can help reduce the levels of vibration. These would reduce predicted impacts from the works to **minor adverse** significance of effect, which would not be a significant effect in relation to the EIA Regulations 2017.

13.7.5 During operation, significant adverse effects from noise have been identified at the dwellings to the south of Portishead station along Peartree Field and also at the Old Station House, Portbury.

13.7.6 Alongside Peartree Field, a noise barrier has been included within the design in order to mitigate likely significant adverse operational environmental effects at this location. This barrier extends from the western end of the platform at Portishead Station and finishes at the Trinity Primary School Bridge along the southern side of the railway (see the General Arrangement Plans Sheet 1 in DCO Document Reference 2.4 and the Environmental Masterplan in DCO Document Reference 2.53). The barrier will be 2 m high and absorptive to avoid reflections to the opposite side where there are sensitive receptors in Tansy Lane. With this barrier, and taking into account the change in alignment of Quays Avenue, the impact for the dwellings closest to Quays Avenue would be a reduction in noise of just over 1 dB(A) in the short term. With the overall noise level below the SOAEL this would result in a **slight beneficial** significance of effect. In the future assessment year, the decrease in noise is predicted to be just under 1 dB(A), which using the long term impact scale would also be a **slight beneficial** significance of effect. However, for the majority of dwellings directly to the south of the proposed station at Portishead, there would be an impact of just under 1 dB(A). With the overall noise level below the SOAEL this would result in a **slight adverse** significance of effect, which is not a significant effect in relation to the EIA Regulations 2017. In the future assessment year, the increase in noise is predicted to be at worst 1.3 dB(A), which using the long term impact scale would be **slight adverse** significance of effect and not a significant effect in relation to the EIA Regulations 2017.

13.7.7 The performance of the noise barrier alongside Peartree Field shall be $DL_{\alpha,NRD}$ ≥8 in accordance with BS EN 1793-1:2017 Road traffic noise reducing devices - Test method for determining the acoustic performance: Part 1 Intrinsic characteristics of sound absorption under diffuse sound field conditions (British Standards Institution, 2017).

13.7.8 The significant effect predicted at the Old Station House in Portbury is to be mitigated by the provision of a 2.4 m high noise barrier (i.e. 2.4 m in relation to the track bed level) of approximately ~~3~~55 m in length. With this barrier the impact would be reduced to under 1 dB(A). With the overall noise level below the SOAEL this would result in a **slight adverse** significance of effect, which is not a likely significant effect in relation to the EIA Regulations 2017. In the future assessment year the increase in noise is

predicted to still be below 1 dB(A), which using the long term impact scale would also be a **slight adverse** significance of effect, which is not a likely significant effect in relation to the EIA Regulations 2017. The performance of the noise barrier shall be DL_R ≥25 in accordance with BS EN 1793-2:2018 Road traffic noise reducing devices - Test method for determining the acoustic performance: Part 2 Intrinsic characteristics of airborne sound insulation under diffuse sound field conditions (British Standards Institution, 2018).

13.7.9 The identified mitigation measures will reduce all predicted significant adverse effects to not significant. No other mitigation measures have been identified at this stage of project design and the residual effects for other residential property remain as described in Section 13.6. The residual effects for noise impacts are not significant in terms of the EIA Regulations 2017.

13.7.10 It is considered that the DCO Scheme complies with the aims of the NPSE. The justification for this is provided in Table 13.25 in relation to each aim of the NPSE.

Table 13.25: How the DCO Scheme meets the aims of the NPSE

Aim	Justification
To avoid significant adverse impacts on health and quality of life.	During construction the identified significant adverse effects for noise and vibration will be avoided by following the measures set out in the CEMP. The identified significant adverse effects for operational noise at Portishead station and the Old Station House in Portbury have been avoided by the provision of a noise barrier in these two locations. There are no predicted significant operational effects from vibration.
To mitigate and minimise adverse impacts on health and quality of life.	Through the use of BPM the slight adverse effects are minimised through measures incorporated into the scheme design and operation. These measures are described in more detail in Appendix 13.9 of the ES Volume 4 Technical Appendices (DCO Document Reference 6.25).
Where possible, contribute to the improvement of health and quality of life.	With the introduction of a railway there is little opportunity to improve the quality of life in the surrounding area.

13.8 Cumulative Effects

13.8.1 The methodology for assessing cumulative effects with other projects is set out in Chapter 18 In-combination and Cumulative Effects Assessment (DCO Document Reference 6.21). For the purposes of this chapter, the value, magnitude and sensitivities are as described in Section 13.3.

Other Projects along the Portishead Branch Line

13.8.2 There are no identified other projects in the area that are likely to cause cumulative effect for either operation or construction in relation to ambient noise levels. Summary commentary is provided in Chapter 18 In-

combination and Cumulative Effects Assessment (DCO Document Reference 6.21).

Other Works for MetroWest Phase 1

Construction Phase

13.8.3 Other elements of MetroWest Phase 1, namely the Parson Street Junction (including Liberty Lane Sidings), Parson Street Station, Bedminster Down Relief Line, Avonmouth / Severn Beach Signalling and Bathampton Turnback comprise small scale works, confined within the existing railway land. The works to improve the service on the Avonmouth / Severn Beach line have been undertaken by Network Rail under their permitted development rights as part of the Filton Four Track project. The remaining works will similarly be undertaken by Network Rail under their permitted development right and none forms part of the DCO Application.

13.8.4 The management and control process used by Network Rail for delivering projects that enhance or renew the operational railway is called Governance for Railway Investment Projects ("GRIP"). The GRIP process provides assurance that a project can successfully progress to the next stage and requires the preparation of reports for each GRIP stage. Environmental studies are undertaken as part of the GRIP process to identify potential issues and capture the need for mitigation during design and construction. The environmental reports are carried forward from options and feasibility design (GRIP 3 and 4), into the detailed design phase (GRIP 5) and construction (GRIP 6). In this way, environmental issues and mitigation measures are identified at an early stage and addressed through the design and construction phases. Consequently, while permitted development works do not require statutory environmental impact assessment, the GRIP process provides an internal, non-statutory environmental impact assessment process.

13.8.5 Given the small scale nature of these works and the distances between these projects and the Portishead Branch Line, it is considered that there are unlikely to be any significant cumulative effects during the construction of these projects on the ambient noise and vibration. Consequently, these works have been scoped out of further cumulative impact assessment for the DCO Scheme.

Operation Phase

Ashton Gate – Ashton Drive Area

13.8.6 In the area where Ashton Drive passes under the railway line and there are houses close by, the predicted increase during the day for the Portishead Branch Line in the short term is just above 2 dB(A) and in the long term it is just above 3 dB(A). These increases would mean a minor adverse magnitude of impact and a **slight adverse** significance of effect, which would not be a significant effect for the purposes of the EIA Regulations 2017.

13.8.7 Away from those properties that directly front the railway line, the increases in noise are predicted to reduce to levels where the significance of effect would be **slight adverse,** which would not be a significant effect for the purposes of the EIA Regulations 2017.

13.8.8 For the properties that back onto the railway line along Swiss Drive there are predicted to be increases in noise of below 1 dB(A) in the short and long term. These changes are a negligible magnitude of impact and the significance of the effect would be **slight adverse,** which would not be a significant effect for the purposes of the EIA Regulations 2017.

Parson Street Junction

13.8.9 In the vicinity of the Parson Street Junction the highest increases in noise following the opening of the Portishead Branch Line are expected to be at those properties close to the junction along Nelson Street and Trafalgar Terrace. Increases in noise in the day time short term are predicted to be up to 1 dB(A) (minor adverse magnitude) and in the day time long term are predicted to be around 1.5 dB(A) (negligible magnitude of effect). These increases would result in a **slight adverse** significance of effect, which would not be a significant effect for the purposes of the EIA Regulations 2017.

Other Works for MetroWest Phase 1

13.8.10 During the operation of the DCO Scheme the small number of additional services along already busy main lines between Bristol and Exeter and Bristol and Bath Spa lines are considered unlikely to result in significant effects.

13.9 Limitations Encountered in Compiling the ES

13.9.1 The main limitations associated with the DCO Scheme are the assumptions that were made with regard to the operation of the new passenger service. This is because no Train Operating Company has been appointed. Consequently, assumptions have been made based on professional knowledge from the acoustics project team and agreed with NSDC and Network Rail. These are assumptions are related to:

- the class of passenger train that will be used,
- the frequency and noise level associated with station platform announcements,
- the operating characteristics (e.g. speed) of the trains along the route, and
- the operating characteristics of the first and last services of the day.

13.9.2 Limitations have also been encountered for the construction assessment as the contractor has yet to be appointed. Assumptions have been made regarding the majority of equipment to be used and the techniques used to construct a new railway line, stations and car parks. The assumptions made have been based on professional knowledge of the acoustics project team.

13.10 Summary

13.10.1 A summary of the impacts of the construction and operation of the DCO Scheme is presented in Table 13.26.

Table 13.26: Summary of the assessment of the DCO Scheme on noise and vibration receptors

Aspect and control measures embedded in the DCO Scheme	Receptors	Impact	Environmental Mitigation	Residual Effects
Construction activities				
Construction of the stations in Portishead and Pill, new road infrastructure, and the new line between Portishead and Pill.	Nearby sensitive receptors, which would include dwellings and schools. **Value: High**	Temporary increase in noise and vibration. Noise **Magnitude: Adverse** Vibration **Magnitude: Moderate adverse**	Prepare and implement a Noise and Vibration Control Plan for the CEMP. Use of BPM in the selection and operation of equipment. Use of Section 61 notice to agree maximum noise levels with the Local Authorities.	Noise **Magnitude: Adverse** **Significance of Effect: Slight adverse** **Significant for EIA legislation: Not significant** Vibration **Magnitude: Minor adverse** **Significance of Effect: Slight adverse** **Significant for EIA legislation: Not significant**

Table 13.26: Summary of the assessment of the DCO Scheme on noise and vibration receptors

Aspect and control measures embedded in the DCO Scheme	Receptors	Impact	Environmental Mitigation	Residual Effects
Operation activities				
Operation of the new stations, the rail services, and the changes in road traffic distribution.	Nearby sensitive receptors, which would include dwellings and schools. **Value: High**	Increased noise level as trains pass. **Magnitude: Minor to Major adverse**	A 2 m high, 200 m long absorptive noise barrier to the south of Portishead Station from the western end of the station platform to the Trinity Primary School Bridge. A ~~1.8~~2.4 m high, ~~35~~5 m long reflective noise barrier alongside the Old Station House, Portbury.	**Magnitude: Minor adverse** **Significance of Effect: Slight adverse** **Significance for EIA legislation: Not significant**
Cumulative Effects				
Additional services on the Portbury Freight Line outside the DCO Scheme	Receptors near Ashton Drive underpass. **Value: High**	Increase in noise along the Portbury Freight Line. **Magnitude: Minor adverse**	N/A	**Magnitude: Minor adverse** **Significance of Effect: Slight adverse** **Significance for EIA legislation: Not significant**

13.11 References

Bristol City Council (2011). Bristol Development Framework Core Strategy.

Bristol City Council (2014). Site Allocations and Development Management Policies Local Plan.

British Standards Institution (1992). BS 5228-4:1992, Noise control on construction and open sites - Code of practice for noise and vibration control applicable to piling operations.

British Standards Institution (1993). BS 7385-2:1993, Evaluation and measurement for vibration in buildings -Guide to damage levels from ground borne vibration.

British Standards Institution (1999). BS 8233:1999, Sound insulation and noise reduction for buildings - Code of Practice.

British Standards Institution (2008). BS 6472-1:2008, Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting.

British Standards Institution (2017). BS EN 1793-1:2017, Road traffic noise reducing devices - Test method for determining the acoustic performance: Part 1 Intrinsic characteristics of sound absorption under diffuse sound field conditions.

British Standards Institution (2018). BS EN 1793-2:2018, Road traffic noise reducing devices - Test method for determining the acoustic performance: Part 2 Intrinsic characteristics of airborne sound insulation under diffuse sound field conditions.

British Standards Institution (2014a). BS 5228-1:2009+A1:2014, Code of practice for noise and vibration control on construction and open sites - Noise.

British Standards Institution (2014b). BS 5228-2:2009+A1:2014, Code of practice for noise and vibration control on construction and open sites - Vibration.

British Standards Institution (2014c). BS 8233:2014, Guidance on sound insulation and noise reduction for buildings.

Department for Communities and Local Government (2014). Planning Practice Guidance – Noise.

Department of the Environment (1976). Advisory Leaflet (AL) 72 (1976), Noise control on Building Sites, HMSO, first published 1968, Third edition 1976.

Department of Environment (1994). Planning Policy Guidance: Planning and Noise 24.

Department for Environment Food and Rural Affairs (2010a). Noise Action Plan Major Roads (outside first round agglomerations).

Department for Environment Food and Rural Affairs (2010b). Noise Action Plan Major Railways (outside first round agglomerations).

Department for Environment Food and Rural Affairs (2010c). Noise Policy Statement for England.

Department for Environment Food and Rural Affairs (2014a). Noise Action Plan: Railways (Including Major Railways).

Department for Environment Food and Rural Affairs (2014b). Possible options for the identification of SOAEL and LOAEL in support of the NPSE.

Department of Transport and Welsh Office (1988). Calculation of Road Traffic Noise.

Department of Transport (1995). Calculation of Railway Noise.

Department for Transport (2013). High Speed Two: London- West Midlands Environmental Statement. Volume 5 | Technical Appendices. Methodology, assumptions and assessment (route-wide) (SV-001-000).

Environment Agency (2004). Horizontal Guidance for Noise Part 2 – Noise Assessment and Control.

European Environment Agency (2010). Good practice guide on noise exposure and potential health effects, EEA Technical Report No. 11/2010.

Highways Agency and Welsh Office (2011). Design Manual for Roads and Bridges Volume 11, Section 3, Part 7, HD213/11 Revision 1, Noise and Vibration.

Highways Agency (2015). M4 Junctions 3 to 12 Smart Motorway Scheme. Environmental Statement Chapter 12, Noise and Vibration.

Institute of Acoustics and the Association of Noise Consultants (2015). Acoustics of Schools: A design guide.

Institute of Environmental Management & Assessment (2014). Guidelines for Environmental Noise Impact Assessment.

Kimber Acoustics Ltd (2015). Noise Assessment Report, Harbour Crescent. Report reference (KA15009-05082015-2).

North Somerset Council (2017). Core Strategy Adopted January 2017.

RPS (2005). Crossrail: Technical Report Assessment of Noise and Vibration Impacts. Volume 1 of 8, Introduction, Scope and Methodology. Report (1E315-G0E00-00001).

World Health Organisation (1999). Guidelines for Community Noise.

World Health Organisation (2009). Night Noise Guidelines for Europe.

World Health Organisation (2018). Environmental Noise Guidelines for the European Region.

13.12 Abbreviations

BPM	Best Practicable Means
CEMP	Construction Environmental Management Plan
CoCP	Code of Construction Practice
CRN	Calculation of Railway Noise
DB	Decibel
DCO	Development Consent Order
DMRB	Design Manual for Roads and Bridges
DMU	Diesel Multiple Unit
EIA	Environmental Impact Assessment
ES	Environmental Statement
EU	European Union
GRIP	Governance for Railway Investment Projects
HS2	High Speed 2
IA	Important Area
IEMA	Institute of Environmental Management and Assessment
LOAEL	Lowest Observed Adverse Effect Level
LT	Long Term (with reference to a measurement location)
NSDC	North Somerset District Council
NIRR	Noise Insulation (Railways and Other guided Transport Systems) Regulations 1996
NPPF	National Planning Policy Framework
NPSNN	National Policy Statement for National Networks
NOEL	No Observed Effect Level
NPSE	Noise Policy Statement for England
NSIP	Nationally Significant Infrastructure Project
PAVA	Public Announcement Voice Alarm
PEI Report	Preliminary Environmental Information Report
PPV	Peak Particle Velocity
PPG	Planning Practice Guidance
SAC	Special Area of Conservation
SOAEL	Significant Observed Adverse Effect Level
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
ST	Short Term (with reference to a measurement location)
UAEL	Unacceptable Adverse Effect Level

WHO World Health Organisation