Hampshire Water Transfer and Water Recycling Project

Environmental Statement – Chapter 15 Noise and vibration

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15.1 Introduction

15.1.1 This chapter provides the assessment of the likely significant effects from noise and vibration during the construction, operation and decommissioning of the Hampshire Water Transfer and Water Recycling Project (hereafter referred to as the 'Proposed Development') on human noise and vibration sensitive receptors (NVSRs).

15.1.2 This chapter details the legislation, policy and guidance that is relevant to noise and vibration, summarises the engagement and consultation undertaken to date, sets out the scope and methodology of assessment, and describes the baseline environment. Following this, the likely significant effects of the Proposed Development from noise and vibration are assessed taking account of embedded primary and tertiary mitigation within the design. The need for any secondary mitigation is then considered along with any proposals for monitoring and/or enhancement. The chapter concludes with a summary of residual effects.

15.1.3 Whilst this Environmental Statement (ES) presents an assessment of the effects that may occur from decommissioning activities of the Proposed Development, Southern Water Services ('the Applicant') is not seeking consent for decommissioning.

15.1.4 The noise and vibration topics considered within this chapter for the Proposed Development are:

1. Direct effects on health and quality of life of human NVSRs due to airborne and ground-borne noise and vibration emissions from the construction, operation and decommissioning of the Proposed Development.
2. Direct damage effects on structures due to ground-borne vibration emissions from the Proposed Development during construction and decommissioning.
3. Indirect effects on health and quality of life due to changes in airborne road traffic noise levels at NVSRs resulting from the construction and decommissioning of the Proposed Development. Changes in road traffic noise levels are classified as indirect effects as they are caused by a separate impact (additional road traffic) rather than noise emitted by the Proposed Development activities.

15.1.5 To align with the temporal scope as presented in section 5.3 of ES Chapter 5 EIA approach and methodology, Volume I (Document reference 6.1, DCO Volume 6) effects on health and quality of life during the construction and decommissioning phases are classified as temporary. Effects during the operational phase, or relating to building damage (present after construction has finished), are classified as permanent.

15.1.6 This chapter should be read in conjunction with ES Chapter 3 Description of the Proposed Development, Volume I (Document reference 6.1, DCO Volume 6) which describes the development parameters against which the effects considered in this chapter have been assessed.

15.1.7 In addition, this chapter should be read alongside relevant parts of other chapters in Volume I, namely:

1. ES Chapter 7 Archaeology and cultural heritage, Volume I (Document reference 6.1, DCO Volume 6) - considers effects from changes to the setting of heritage assets, which includes noise and vibration impacts, and vibration affecting the fabric of a heritage asset.
2. ES Chapter 8 Terrestrial and freshwater biodiversity and ES Chapter 9 Marine biodiversity, Volume I (Document reference 6.1, DCO Volume 6)- considers potential effects of noise and vibration on protected species, designations and habitats.
3. ES Chapter 12 Land use and agriculture, Volume I (Document reference 6.1, DCO Volume 6) - considers effects on amenity, taking into account potential noise impacts.
4. ES Chapter 13 Landscape and visual, Volume I (Document reference 6.1, DCO Volume 6) - considers effects from disruption to tranquility, which could include noise impacts.
5. ES Chapter 17 Socio-economics, tourism and health, Volume I (Document reference 6.1, DCO Volume 6) - considers noise impacts in the assessment of potential effects on health.
6. ES Chapter 18 Traffic and transport, Volume I (Document reference 6.1, DCO Volume 6) – provides an assessment of the traffic impacts resulting from the Proposed Development and should be considered in relation to the methodology of deriving traffic flows that are used in the noise and vibration assessment to evaluate the effects of the Proposed Development on NVSRs.
7. ES Chapter 20, Cumulative and in-combination effects, Volume I (Document reference 6.1, DCO Volume 6) – an assessment of the cumulative effects i.e. effects from the interrelationship between the Proposed Development and other developments, and an assessment of the in-combination effects i.e. effects from the interaction between the individual effects of the Proposed Development.

15.1.8 This chapter is supported and informed by the following appendices, all contained in the ES, Volume II (Document reference 6.2, DCO Volume 6):

1. ES Appendix 15.1 Construction noise and vibration assessment (Document reference 6.2, DCO Volume 6)
2. ES Appendix 15.2 Construction traffic noise assessment (Document reference 6.2, DCO Volume 6)
3. ES Appendix 15.3 Operational noise assessment (Document reference 6.2, DCO Volume 6)
4. ES Appendix 15.4 Acoustic terminology and baseline (Document reference 6.2, DCO Volume 6)

15.2 Legislation, policy and guidance

15.2.1 This section identifies the legislation, policy, guidance and other documentation that has informed the assessment of likely significant effects on noise and vibration.

Legislation

15.2.2 Table 15-1 lists the legislation relevant to the assessment of the likely significant effects on noise and vibration.

Table 15-1 List of relevant legislation

Legislation	Relevance to assessment
Control of Pollution Act 1974 [1] (CoPA)	Section 60 of the CoPA provides local planning authorities with powers to control noise from construction sites by issuing notices imposing requirements on how works are carried out. Section 61 of the CoPA provides a means for the person carrying out construction works to seek prior consent from the relevant local planning authority(/ies), by detailing the works and methods by which they would be undertaken, and the steps proposed to be taken to reduce noise resulting from the works. A Section 61 application must demonstrate that the works are going to carried out using Best Practicable Means (BPM), as defined in Section 72 of the CoPA. Compliance with the conditions of a Section 61 consent is a defence against any enforcement action under Section 60 of the CoPA. The CoPA also provides a basis for defining codes of practice (applies to British Standard (BS) 5228:2009 and A1:2014 Code of practice for noise and vibration control on construction and open sites, Part 1: Noise [2] and Part 2: Vibration [3]). The assessment of construction noise and vibration effects is presented in section 15.8. Whilst construction noise and vibration are factors which can be considered during the planning process, local planning authorities have alternative powers under Sections 60 and 61 of the CoPA to regulate these issues if complaints arise. The Outline Construction Environment Management Plan (CEMP) (Document reference 7.1, DCO Volume 7) secures good practice mitigation measures that represent BPM and requires that BPM is implemented during construction. This would reduce potential construction noise and vibration emissions such that the enforcement provisions of the CoPA would not be applicable.
Environmental Protection Act 1990 (Part III) [4]	Section 79 of the Environmental Protection Act 1990 (EPA) sets out what matters constitute 'statutory nuisances' and sets out duties for local planning authorities to investigate. Where a local planning authority is satisfied that a statutory nuisance exists, or is likely to occur or recur, then the local planning authority can take abatement action against noise nuisance as set out in Section 80. Section 82 provides for individuals to pursue abatement action against noise nuisance. The EPA provides for use of BPM to be a defence against abatement action. The Outline CEMP (Document reference 7.1, DCO Volume 7) secures good practice mitigation measures that represent BPM and requires that BPM is implemented during construction. This will reduce potential construction noise and vibration emissions such that the enforcement provisions of the EPA would not be applicable.
The Environmental Noise (England) Regulations 2006 [5]	These regulations transpose the provisions of the EU Environmental Noise Directive (END) 2002/49/EC relating to the assessment and management of environmental noise from transport and industry. The regulations set out the requirement to undertake strategic noise mapping and implement Noise Action Plans on a five yearly basis, for

Legislation	Relevance to assessment
	agglomerations[1] and major roads, railways and airports. The Action Plans identify Noise Important Areas (NIA) (areas exposed to the highest levels of noise) and suggests ways the relevant authorities can reduce these. The NIAs identified under these regulations with the potential to be impacted by noise from the Proposed Development are identified in section 15.7.

National policy

15.2.3 The primary policy for determining the application for the Development Consent Order (DCO) for the Proposed Development is the National Policy Statement for water resources infrastructure (NPSWRI) [6]. This sets out policies to guide how DCO applications for water resources infrastructure should be decided and how the effects of such infrastructure are considered.

15.2.4 Table 15-2 lists the paragraphs from the NPSWRI and other national policy that are relevant to the noise and vibration assessment. It also sets out where these policy requirements are addressed within the chapter.

Table 15-2 List of relevant national policy

Relevant paragraph reference	Summary of policy requirement	Where addressed in chapter
National Policy Statement for water resources infrastructure 2025 [6]		
4.11.1	Clarifies that references to 'noise' in the NPSWRI also apply to 'vibration'.	This chapter provides the assessment of the likely significant effects from both noise and vibration of the Proposed Development. Measures to be employed in mitigating the effects of vibration are described in section 15.4 and section 15.9. The assessment of vibration-related effects is described in section 15.8.
4.11.3	Sets out the required information relating to noise and vibration that should be included in an ES, as follows: • Description of the noise-generating aspects of the proposal. • Identification of noise sensitive receptors and noise sensitive areas. • Characteristics of the existing noise environment.	A description of the noise and vibration sources associated with the Proposed Development included in the assessment of changes in noise environment are described in section 15.5. The characteristics of the existing noise environment are described in section 15.7. Measures to be employed in mitigating the effects of noise are described in section 15.4 and section 15.9. The assessment of effects has considered changes in the short and long-term and at particular times, as described in section 15.8. ES Chapter 17

[1] An agglomeration is an urban area with a population in excess of 100,000 persons and a population density equal to or greater than 500 people per km^2.

Relevant paragraph reference	Summary of policy requirement	Where addressed in chapter
	• Predictions and assessment of changes in noise environment arising from the proposal in the short and long-term and at particular times as required, including impacts on health and well-being where appropriate. • Assessment of underwater or subterranean noise effects, if likely to cause disturbance. • Proposed mitigation measures.	Socio-economics, tourism and health, Volume I (Document reference 6.1, DCO Volume 6) has considered noise impacts in the assessment of potential effects on health and wellbeing. Underwater noise and vibration effects on biodiversity have been considered in ES Chapter 8 Terrestrial and freshwater biodiversity, Volume I (Document reference 6.1, DCO Volume 6) and ES Chapter 9 Marine biodiversity, Volume I (Document reference 6.1, DCO Volume 6).
4.11.5	Requires a consideration of potential noise impacts from "*ancillary activities associated with the development*", such as transportation, where appropriate.	Section 15.5 confirms that road traffic noise impacts from the construction and decommissioning phases of the Proposed Development are included in the assessment scope and this assessment is provided in section 15.8.
4.11.6	Requires assessments of operational and construction phase noise impacts to be undertaken in accordance with relevant British Standards and other guidance.	The relevant British Standards and other guidance to the assessments are identified in this section (15.2). The assessment methodology, described in section 15.5, has been developed in line with the requirements of guidance and British Standards identified in Table 15-4.
4.11.7	Describes requirements for assessments of noise impacts on protected species or other wildlife, including requirements to consult with relevant stakeholders including Natural England (NE), the Marine Management Organisation (MMO) and the Environment Agency (EA).	These topics are considered in ES Chapter 8 Terrestrial and freshwater biodiversity, Volume I (Document reference 6.1, DCO Volume 6), and ES Chapter 9 Marine biodiversity, Volume I, (Document reference 6.1, DCO Volume 6), which also describe the engagement undertaken to date with relevant stakeholders.
4.11.8, 4.11.9, 4.11.10, 4.11.12 4.11.14 and 4.11.15	Describes design and mitigation measures that may be implemented in relation to construction and operational noise impacts and how these may be secured to ensure noise impacts are no worse than those on which the assessment is based.	Measures to be employed in mitigating the effects of noise and vibration and the securing mechanisms are described in section 15.4 and section 15.9. ES Appendix 5.5 Commitments Register, Volume II (Document reference 6.2, DCO Volume 6) sets out all the commitments made in the ES and the relevant securing mechanisms.
4.11.11	Requires that due regard is given to the relevant sections of the Noise Policy Statement for England (NPSE), 2010 [7], National Planning	Due regard has been given to the noise elements of these policy documents in the development of the assessment methodology described in section 15.5.

Relevant paragraph reference	Summary of policy requirement	Where addressed in chapter
	Policy Framework (NPPF), 2024 [8] and Planning Practice Guidance on Noise (PPG-N), 2019 [9].	
4.11.13	Provides the following aims which noise from the new development must meet if consent is to be granted: • *"avoid significant adverse impacts on health and quality of life…* • *mitigate and minimise other adverse impacts on health and quality of life…* • *where possible, contribute to improvements to health and quality of life"*	The noise and vibration assessment in section 15.8 identifies the potential for significant adverse impacts on health and quality of life to occur. Sections 15.4 and 15.9 identify the mitigation that will be implemented to reduce adverse impacts. Section 15.10 summarises residual effects and shows that, with the identified mitigation, significant adverse impacts on health and quality of life are not anticipated. Due to the nature of the Proposed Development, it has not been possible to identify noise-related opportunities to improve health and quality of life.
National Planning Policy Framework 2025 [8]		
Section 15-187 and 198	Paragraph 187 states planning policies and decisions should contribute to and enhance the natural and local environment by: "*e)……preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution…".* Paragraph 198 states planning policies and decisions should ensure that new development is appropriate for its location, "*taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area…In doing so they should*: *a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;* *b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason…".*	The Proposed Development design includes primary and tertiary mitigation described in section 15.4 and secondary mitigation measures have also been adopted in section 15.9. These measures will reduce potential adverse noise impacts associated with the Proposed Development and, as far as is practicable, avoid significant adverse impacts on health and the quality of life as per the residual effects identified in section 15.10. Assessment of likely significant effects and resultant mitigation has accounted for the sensitivity of receptors. The approach for identifying the impact of noise (amongst other factors) on tranquillity for landscape receptors is presented in ES Chapter 13 Landscape and visual, Volume I (Document reference 6.1, DCO Volume 6). The methodology for identifying the impact of noise (amongst other factors) on setting and tranquillity of heritage receptors is presented in the ES Chapter 7 Archaeology and cultural heritage, Volume I (Document reference 6.1, DCO Volume 6).

Relevant paragraph reference	Summary of policy requirement	Where addressed in chapter
		ES Chapter 17 Socio-economics, tourism and health, Volume I (Document reference 6.1, DCO Volume 6), has considered noise impacts in the assessment of potential effects on health and wellbeing. ES Chapter 20 Cumulative and in-combination effects, Volume I (Document reference 6.1, DCO Volume 6) has considered noise impacts in the assessment of potential cumulative effects.
Noise Policy Statement for England 2010 [7]		
1.7	Identifies noise policy aims, which duplicate those stated in the NPSWRI (para. 4.11.13).	The noise and vibration assessment in section 15.8, secondary mitigation measures in section 15.9 and description of residual effects in section 15.10 demonstrate how the Proposed Development will mitigate and reduce to a minimum potential adverse impacts resulting from noise and avoid noise giving rise to significant adverse impacts on health and the quality of life.
2.20, 2.21 and 2.22	Paragraph 2.20 identifies the Lowest Observed Adverse Effect Level (LOAEL) as "*the level above which adverse effects on health and quality of life can be detected"* and paragraph 2.21 identifies the Significant Observed Adverse Effect Level (SOAEL) as "*the level above which significant adverse effects on health and quality of life occur*". Paragraph 2.22 states "*it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times.*".	To enable assessment against this policy, the LOAEL and the SOAEL are defined separately for each identified impact in the assessment methodology in section 15.5.
2.23, 2.24 and 2.25	Provide further explanation of the noise policy aims identified in section 1.7, including that: • *Significant adverse effects on health and quality of life should be avoided while also taking into*	Section 15.9 identifies the mitigation implemented to avoid significant adverse effects on health and quality of life. It also identifies the measures taken to mitigate and minimise adverse effects on health and quality of life.

Relevant paragraph reference	Summary of policy requirement	Where addressed in chapter
	account the guiding principles of sustainable development. • *The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur.*	
Planning Practice Guidance on Noise (PPG-Noise), 2019 [9]		
001 and 002	Advises that noise needs to be considered in the planning process "*when development may create additional noise, or would be sensitive to the prevailing acoustic environment*". It advises that "*good acoustic design needs to be considered early in the planning process*". It explains that, where justified, noise can override other planning concerns, when considered "*in the context of the wider characteristics of a development proposal, its likely users and its surroundings*".	The noise and vibration assessment in section 15.8, details of mitigation, monitoring and enhancement in section 15.9 and summary of residual effects in section 15.10 provides the information required to appropriately consider noise from the Proposed Development through the planning process. The Proposed Development surroundings are described in section 15.7 which identifies the baseline for the assessment. Good acoustic design has been embedded into the scheme development design through the avoidance of receptors in the site/route selection process, as mentioned in section 15.4.
003	The guidance advises that "*Plan-making and decision making need to take account of the acoustic environment and in doing so consider:* • *Whether or not a significant adverse effect is occurring or likely to occur.* • *Whether or not an adverse effect is occurring or likely to occur.* • *Whether or not a good standard of amenity can be achieved".*	The noise and vibration assessment in section 15.8 identifies the potential for adverse and significant adverse effects to occur. Section 15.10 summarises residual adverse and likely significant effects. The methodology for the assessment of noise effects has been informed by guidance on suitable noise levels in external residential amenity areas, as described in section 15.5. Potential impacts of the Proposed Development on visual amenity have been assessed in ES Chapter 13 Landscape and visual, Volume I (Document Reference 6.1, DCO Volume 6).

Relevant paragraph reference	Summary of policy requirement	Where addressed in chapter
004 and 005	Identifies the concepts of SOAEL and LOAEL as described in the Noise Policy Statement for England 2010 [7] and introduces the No Observed Effect Level (NOEL), which is "*the level of noise exposure below which no effect at all on health or quality of life can be detected.*" Provides a description of noise exposure from imperceptible i.e. below the NOEL, increasing to cross the NOEL, LOAEL and SOAEL boundaries, and the expected effects which are summarised in a noise exposure hierarchy table.	The LOAEL and the SOAEL are defined separately for each identified impact in the assessment methodology in section 15.5.
006	Identifies additional factors beyond the noise level which need to be considered when determining the relationship between noise exposure and effects.	The description of the assessment methodology in section 15.5 identifies the relevant factors in addition to noise level which have been used to determine effect significance.
007	Explains that plans can include noise standards; however, these should not be applied as rigid thresholds, as "*specific circumstances may justify some variation being allowed.*"	Local plans and policies have been used to inform the assessment methodology described in section 15.5.
008	Explains the factors which would justify protection of an area for its tranquillity.	The impact of the Proposed Development on tranquillity has been considered in the ES Chapter 13 Landscape and visual, Volume I (Document reference 6.1, DCO Volume 6).
009	Discusses how to address the risk of conflict between new development and existing businesses or facilities, in particular placing responsibility for identifying and mitigating these conflicts on the Applicant or 'agent of change'.	This relates to potential conflicts between proposed new noise sensitive development and existing businesses; hence, this is not relevant to the Proposed Development and is not addressed in this chapter.
010	Describes the types of mitigation measures available to control noise.	This advice has informed the selection of Proposed Development mitigation measures described in sections 15.4 and 15.9.
011	States that noise impacts on residential development may be partially offset if residents have access to a relatively quiet façade and/or a relatively quiet external amenity area.	Whilst this guidance could be used to consider whether effects are significant, it is considered more relevant to impacts on proposed residential development. To ensure that likely worst case impacts are assessed, this guidance has not been used in the assessment.

Relevant paragraph reference	Summary of policy requirement	Where addressed in chapter
012, 013 and 014	Describes how impacts of aviation noise and airport expansion can be addressed and mitigated and how local communities should be engaged and consulted.	Not relevant, as the Proposed Development would not change aircraft noise levels.
015	Identifies other noise-related guidance and policy that could be used.	The guidance used in the assessment methodology has incorporated the relevant documents identified in this policy.
016	Explains that the principles of this guidance are applicable to developments that fall under the Permitted Development Regime.	Not relevant, as the Proposed Development does not fall under the Permitted Development Regime.
017	Discusses how local planning authorities should assess whether noise constitutes a statutory nuisance.	Measures to avoid the Proposed Development noise from being considered a statutory nuisance (i.e. implementation of BPM, as discussed in Table 15-1 in relation to the EPA) have been included as tertiary mitigation as described in section 15.4.

Local policy

15.2.5 The local policies listed in Table 15-3 are considered relevant to the noise and vibration assessment of the Proposed Development. While the Secretary of State (SoS) is required to determine an application for development consent in accordance with the NPSWRI, it may be that the SoS considers aspects of local policy to be matters that are important and relevant to the determination. In the event that there is any conflict between the local policy and the NPSWRI, the NPSWRI would prevail for the purposes of decision making given the national significance of the infrastructure.

15.2.6 Adopted and emerging development plan policies have been considered. Adopted and emerging planning policy that is relevant is included in Table 15-3.

Table 15-3 List of relevant local policy

Local planning authority	Relevant local policy	Relevance to assessment
East Hampshire District Council (EHDC)	East Hampshire District Local Plan: Joint Core Strategy. Adopted June 2014) [10]: • Policy CP27 Pollution • Policy CP20 Landscape East Hampshire District Local Plan: 'Regulation 18' Consultation	Policy CP27 of the extant local plan indicates that developments that "*result in pollution* [including noise] *which prejudices the health and safety of communities and their environments*" will not be permitted. Policy DM11 of the draft local plan is similar in that it states that development "*will only be permitted where it… does not have a significant adverse impact on the amenity of nearby buildings or spaces*".

Local planning authority	Relevant local policy	Relevance to assessment
	Document Draft for consultation January 2024 [11]: • Policy NBE13 Protection of Natural Resources • Policy DM11 Amenity • Policy NB10 Landscape	Policy NBE13 of the draft local plan indicates that development proposals should demonstrate that they do not give rise to noise which "*could cause harm to sensitive receptors (including impact on dark night skies)*". The Proposed Development has been designed and mitigation has been incorporated to avoid the potential health-related effects of noise, which are considered in the assessment methodology identified in section 15.5, and any assessment requirements are included in section 15.8. Policy CP20 of the extant plan requires protection of tranquillity in areas with exceptionally low levels of ambient noise, especially those in the South Downs National Park (SDNP). Policy NB10 of the draft plan indicates that "*development proposals will be supported where there will be no significant impact to:…The setting of the South Downs National Park, with regard to its… tranquillity.*" The impact of the Proposed Development on tranquillity is considered in the ES Chapter 13 Landscape and visual, Volume I (Document reference 6.1, DCO Volume 6).
Eastleigh Borough Council (EBC)	Eastleigh Borough Local Plan (2016-2036). Adopted April 2022 [12]: • Policy S5 New development in the countryside • Policy DM1 General criteria for new development • Policy DM8 Pollution	Policy S5, criteria 2.a) indicates that, in permitting new development in the countryside, the local planning authority will seek to avoid adverse impacts on: landscape character, the significance of heritage assets and biodiversity. These impacts are addressed in ES Chapter 13 Landscape and visual, Volume I (Document reference 6.1, DCO Volume 6), ES Chapter 7 Archaeology and cultural heritage, Volume I (Document reference 6.1, DCO Volume 6) and ES Chapter 8 Terrestrial and freshwater biodiversity, Volume I (Document reference 6.1, DCO Volume 6) respectively, and where appropriate, potential noise and vibration impacts have been accounted for in those assessments. Policies DM1, criteria a) and c) and DM8 criterion 1(c) indicate that new development will not be permitted where unacceptable impacts on residential amenity or public health are anticipated. Noise and vibration impacts have the potential to result in effects on amenity and health; the process by which this is addressed in the assessment methodology is identified in section 15.5, and any assessment requirements

Local planning authority	Relevant local policy	Relevance to assessment
		are included in section 15.8. ES Chapter 12 Land use and agriculture, Volume I (Document reference 6.1, DCO Volume 6) considers effects on amenity while ES Chapter 17 Socio-economics, tourism and health, Volume I (Document reference 6.1, DCO Volume 6) considers noise impacts in the assessments of potential health effects. Policy DM8 provides construction noise level criteria related to impacts on habitats on the Solent and Southampton Water SPA and Ramsar sites. Impacts on these receptors are considered in ES Chapter 8 Terrestrial and freshwater biodiversity, Volume I (Document reference 6.1, DCO Volume 6).
Fareham Borough Council (FBC)	Fareham Local Plan 2037. Adopted April 2023 [13]: • Policy D2 Ensuring Good Environmental Conditions	Policy D2 indicates that developments will be permitted where they do not result in unacceptable environmental impacts, including on noise and vibration. The Proposed Development has been designed (refer to section 15.4), and secondary mitigation has been incorporated (refer to section 15.9), so as to avoid unacceptable noise and vibration impacts.
Havant Borough Council (HBC)	Havant Borough Core Strategy. Adopted March 2011 [14]: • Policy CS16 High Quality Design • Policy DM10 Pollution	Policy CS16 indicates that planning permission will not be granted if the development will cause *"unacceptable harm to the amenity of neighbours through … noise*". Policy DM10 requires that noise from new development must not put the health of nearby residents at risk. Guidance on suitable noise levels in external amenity areas and potential noise effects on health have been used to inform the assessment methodology identified in section 15.5, and any assessment requirements are included in section 15.8. Additionally, ES Chapter 12 Land use and agriculture, Volume I (Document reference 6.1, DCO Volume 6) considers effects on amenity and ES Chapter 17 Socio-economics, tourism and health, Volume I (Document reference 6.1, DCO Volume 6), considers noise impacts in the assessments of potential health effects.
Portsmouth City Council (PCC)	Portsmouth Plan (The Portsmouth Core Strategy. Adopted January 2012 [15]:	The Pre-submission Portsmouth Local Plan 'Regulation 19' Consultation Document July 2024 Policy PLP1, requires that development proposals demonstrate that they will avoid, minimise, or where necessary mitigate, adverse

Local planning authority	Relevant local policy	Relevance to assessment
	• No specific relevant policies. Pre-Submission Portsmouth Local Plan (2038) 'Regulation 19' Consultation Document July 2024 [16]: • Policy PLP1: Design • Policy PLP35 Air Quality and Pollution	direct or cumulative impacts in relation to noise. The potential for significant noise effects to occur is considered within the assessment methodology identified in section 15.5, while assessments are detailed in section 15.8. Any necessary mitigation is detailed in section 15.9. ES Chapter 20 Cumulative and in-combination effects (Document reference 6.1, DCO Volume 6) considers noise impacts in the assessment of potential cumulative effects. The Pre-submission Portsmouth Local Plan 'Regulation 19' Consultation Document July 2024 Policy PLP35, requires that development proposals demonstrate how potential health impacts have informed the application and that they will not contribute to unacceptable levels of pollution (including noise and vibration) that cannot be mitigated. The potential health effects of noise due to the Proposed Development are considered in the assessment methodology identified in section 15.5, and any assessment requirements are included in section 15.8. ES Chapter 12 Land use and agriculture, Volume I (Document reference 6.1, DCO Volume 6) considers effects on amenity and ES Chapter 17 Socio-economics, tourism and health, Volume I (Document reference 6.1, DCO Volume 6), considers noise impacts in the assessments of potential health effects.
South Downs National Park Authority (SDNPA)	South Downs Local Plan, adopted July 2019 [17]: • Strategic Policy SD7: Relative Tranquillity • Development Management Policy SD44 Telecommunications and Utilities Infrastructure • Development Management Policy SD54 Pollution and Air Quality South Downs Local Plan Review, First Public Consultation (Regulation 18) January 2025 [18]:	Policy SD7 requires that development proposals conserve or enhance relative tranquillity in the SDNP, considering potential changes on the visual and aural environments. The impact of the Proposed Development on tranquillity is considered in ES Chapter 13 Landscape and visual, Volume I (Document reference 6.1, DCO Volume 6). Policy SD44 requires that development proposals for new water infrastructure do "*not have an adverse impact on the special qualities*" and "*minimise other relevant environmental impacts*". These requirements are addressed in ES Chapter 13 Landscape and visual, Volume I (Document reference 6.1, DCO Volume 6) and within the assessment methodology identified in section 15.5. Policy SD54 indicates that development proposals *"will be permitted provided that levels*

Local planning authority	Relevant local policy	Relevance to assessment
	• Strategic Policy SD7: Relative Tranquillity • Development Management Policy SD44 Telecommunications Infrastructure • Development Management Policy SD54 Pollution and Air Quality	*of air, noise... or other pollutants do not have a significant negative affect on people and the natural environment*". The potential for significant noise effects to occur is considered within the assessment methodology identified in section 15.5, and any assessment requirements are included in section 15.8. The Local Plan Review (Regulation 18) January 2025 makes no amendments to SD7 and SD54. Policy SD44 is reduced in scope to Telecommunications infrastructure only, removing its relevance here.
Winchester City Council (WCC)	'Your Place Your Plan Winchester District Local Plan' 2020 – 2040 [19]: • SP3 Development in the Countryside • D7 Development standards Winchester City Council (2022), Technical Guidance for Noise [20]	Policy SP3 requires that development in the countryside should not create "*unacceptable noise"*; however, the term unacceptable noise is not defined. Policy D7 states that development will only be permitted where the associated noise pollution "*does not have an unacceptable impact on human health or quality of life*". It requires that assessments of noise impacts have regard to the advice in the NPSE. It goes on to state that "*Development will not be permitted where levels above the Significant Observed Adverse Effect Level (SOAEL) exist and mitigation measures have not been proposed that will reduce impacts to, or as near to the Lowest Observed Effect Level (LOAEL) as is reasonably possible.*" The potential for significant noise effects to occur is considered within the assessment methodology identified in section 15.5, and any assessment requirements are included in section 15.8. The potential health effects of noise due to the Proposed Development are considered in the assessment methodology, along with applicable LOAEL and SOAEL values, as described in section 15.5. Mitigation measures to ensure that the SOAEL is not exceeded, and impacts are reduced as far as possible to the LOAEL are identified in sections 15.4 and 15.9. The impact of the Proposed Development on tranquillity is considered in the ES Chapter 13 Landscape and visual, Volume I (Document reference 6.1, DCO Volume 6).

Local planning authority	Relevant local policy	Relevance to assessment
		ES Chapter 17 Socio-economics, tourism and health, Volume I (Document reference 6.1, DCO Volume 6) - considers noise impacts in the assessment of potential effects from the Proposed Development on health. The assessment of operational noise for the Intermediate Pumping Station (IPS) in the WCC area (from paragraph 15.8.99 to paragraph 15.8.107) is reliant on the target rating level provided by the WCC Technical Guidance for Noise. The Guidance for noise states: "*the design objective should be that the development should be designed so as to achieve a rating level of 10dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location. Where this criterion cannot be achieved, the various noise control measures considered as part of the assessment should be fully explained (i.e. relocation of noise sources, use of quieter equipment, enclosures, screening, restriction of the hours of operation etc.) and the achievable noise level should be identified*."

Guidance, standards and advice

15.2.7 In addition, the noise and vibration assessment has been undertaken in accordance with relevant guidance and has been compiled in accordance with professional standards. The guidance and standards which relate to this assessment are detailed in Table 15-4.

Table 15-4 List of relevant guidance and standards

Guidance	Description	Relevance to assessment
British Standard (BS) 4142:2014+A1:2019 Method for Rating and Assessing Industrial and Commercial Sound [19]	Describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.	Used to define the methodology for the assessment of operational noise impact from Above Ground Plant (AGP) on residential receptors as described in section 15.5.
BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites - Part 1: Noise [2]	Provides recommendations for basic methods of noise and vibration control relating to construction and open sites where work activities/operations generate significant noise and/or vibration levels. The legislative background to noise and vibration control is described and recommendations	Used to define the methodology for the assessment of construction noise impacts as described in section 15.5, identify the likely noise emissions from construction equipment as described in section 15.6 and to inform the tertiary mitigation

Guidance	Description	Relevance to assessment
	are given regarding procedures for the establishment of effective liaison between developers, site operators and local planning authorities. This British Standard provides guidance on methods of predicting and measuring noise and assessing its impact on those exposed to it.	measures for construction noise described in section 15.4.
BS 5228-2:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites - Part 2: Vibration [3]	Gives recommendations for basic methods of vibration control relating to construction and open sites where work activities/operations generate significant vibration levels. The Standard includes tables of vibration levels measured during piling operations throughout the UK. It provides guidance concerning methods of mitigating vibration from construction, particularly with regard to percussive piling.	Used to define the methodology for assessing construction vibration impacts on human receptors and to identify the likely vibration emissions from construction equipment, as described in section 15.5. Also used to inform the tertiary mitigation measures for construction vibration described in section 15.4.
BS 7385-2:1993 Evaluation and measurement for vibration in buildings - Guide to damage levels from ground borne vibration [21]	Provides guidance regarding the potential for vibration to result in building damage, including basic principles for carrying out vibration measurements and processing the data. It includes guide values for transient and continuous vibration, above which there is a likelihood of cosmetic damage.	Used to define the methodology for assessing potential structural damage impacts of construction vibration described in section 15.5.
International Standards Organisation (ISO) 4866: 2010 Mechanical vibration and shock — Vibration of fixed structures — Guidelines for the measurement of vibrations and evaluation of their effects on structures [22]	Defines three different categories of building damage: • Cosmetic– formation of hairline cracks in plaster or drywall surfaces and in mortar joints of brick/concrete block constructions. • Minor– formation of large cracks or loosening and falling of plaster or drywall surfaces or cracks through brick/block. • Major–damage to structural elements, cracks in support columns, loosening of joints, splaying of masonry cracks.	Used in-combination with BS 7385 to define the effects of vibration on fixed structures described in section 15.5.
BS 7445-1:2003 Description and	Provides details of the instrumentation and measurement	Provides fundamental requirements for undertaking

Guidance	Description	Relevance to assessment
measurement of environmental noise. Guide to quantities and procedures [23] BS 7445-2:1991 Description and measurement of environmental noise. Guide to the acquisition of data pertinent to land use [24]	techniques to be used when assessing environmental noise and defines the basic noise quantity as the continuous A-weighted sound pressure level (L_{Aeq}). Part 2 of BS 7445 replicates International Standards Organisation (ISO) 1996-2.	environmental noise surveys, used here to provide background and ambient noise levels for assessments as described in section 15.7.
BS 6472-1:2008 Guide to Evaluation of Human Exposure to Vibration in Buildings [25]	Provides general guidance on human exposure to building vibration in the range of 1 Hertz (Hz) to 80Hz and includes curves of equal annoyance for humans. It also outlines the measurement methodology to be employed. It introduces the concept of Vibration Dose Value (VDV) and estimated Vibration Dose Value (eVDV) for the basis of assessment of the severity of impulsive and intermittent vibration levels.	Used to inform the methodology for the assessment of vibration impacts from tunnelling on human receptors as described in section 15.5.
Calculation of Road Traffic Noise (CRTN), 1988 [26]	Provides a method for assessing noise from road traffic in the UK and a method of calculating noise levels from the Annual Average Weekday Traffic (AAWT) flows and from measured noise levels. Since being published in 1988 this document has been the nationally accepted standard in predicting noise levels from road traffic. The calculation methods provided include correction factors to take account of variables affecting the creation and propagation of road traffic noise, accounting for the percentage of heavy goods vehicles, different road surfacing, inclination, screening by barriers and relative height of source and receiver.	Used to quantify likely changes in road traffic noise levels to inform the assessment of construction road traffic noise impacts, as per the methodology described in section 15.5.
Design Manual for Roads and Bridges (DMRB) LA111 Noise and Vibration, Revision 2 2020 [27]	Provides detailed methodologies for the assessment of construction and operational noise and vibration impacts from major road schemes. It provides guideline significance criteria in terms of both absolute noise and vibration levels (LOAELs	Whilst DMRB LA111 is specifically related to the impact of proposed highway schemes, it provides guidance on the assessment of construction noise and vibration impacts, as well as

Guidance	Description	Relevance to assessment
	and SOAELs for use in relation to the NPSE) and the change in noise levels due to a scheme.	the impact of construction traffic noise, which is considered relevant to the Proposed Development. Hence, used to inform the methodologies for the assessments of these impacts as described in section 15.5.
World Health Organization (WHO) (1999) Guidelines for Community Noise [28]	Presents health-based noise limits intended to protect the population from exposure to excess noise. They present guideline limit values at which the likelihood of particular effects, such as sleep disturbance or annoyance, may increase. The guideline values are 50 or 55dB L_{Aeq} during the day, related to annoyance, and 45dB L_{Aeq} or 60dB L_{Amax} at night, related to sleep disturbance. *"The effects of noise in dwellings, typically, are sleep disturbance, annoyance and speech interference. For bedrooms the critical effect is sleep disturbance. Indoor guideline values for bedrooms are 30dB L_{Aeq} for continuous noise and 45dB L_{Amax} for single sound events. Lower noise levels may be disturbing depending on the nature of the source."* *"Night-time, outside sound levels about 1 metre from facades of living spaces should not exceed 45dB L_{Aeq}, so that people may sleep with bedroom windows open. This value was obtained by assuming that the noise reduction from outside to inside with the window open is 15dB. To enable casual conversation indoors during daytime, the sound level of interfering noise should not exceed 35dB L_{Aeq}. To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55dB L_{Aeq} on balconies, terraces and in outdoor living areas. To protect the majority of*	Used to determine assessment criteria for operational noise effects on non-residential receptors such as care homes, offices, children's nurseries and external amenity spaces, as described in section 15.5.

Guidance	Description	Relevance to assessment
	people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50dB L_{Aeq}. Where it is practical and feasible, the lower outdoor sound level should be considered the maximum desirable sound level for new development."	
World Health Organization (2009) Night Noise Guidelines for Europe [29]	Described as an extension to the WHO Guidelines for Community Noise (1999). It concludes that: *"Considering the scientific evidence on the thresholds of night noise exposure indicated by L_{night} outside as defined in the Environmental Noise Directive (2002148/EC), an L_{night} outside of 40dB should be the target of the night noise guideline (NNG) to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly. L_{night} outside value of 55dB is recommended as an interim target for those countries where the NNG cannot be achieved in the short-term for various reasons, and where policy-makers choose to adopt a stepwise approach."*	Provides additional information, which supports the decision making of a LOAEL for operational noise effect on residential receptors where background sound levels are low, as described in section 15.5.
Institute of Sustainability and Environmental Professionals (ISEP) (formerly the Institute of Environmental Management and Assessment) (2014), Guidelines for Environmental Noise Impact Assessment [30]	Provides guidance on how to undertake a noise impact assessment, with particular focus on the context of an Environmental Impact Assessment (EIA). They describe the process of scoping, defining a baseline, prediction of noise level changes and determination of the significance of the effect. They aim to apply to all types of proposed development.	Used when classifying the sensitivity of receptors to health and quality of life-related effects as described in section 15.5.
Department for Education (2015), Building Bulletin 93 (BB93) Acoustic design of schools: performance standards [31]	Provides performance standards, acoustic criteria, acoustic principles and good acoustic design practice for school buildings. BB93 states, *"The overall objective of the performance standards is to ensure that the design and construction of school buildings provide acoustic conditions that enable effective teaching and learning."*	Used to define appropriate indoor noise levels in educational facilities as described in section 15.5.

Guidance	Description	Relevance to assessment
	The acoustic criteria set out in BB93 relate to noise intrusion from external sources, sound insulation requirements between rooms, and noise control of reverberation times within rooms.	
Department of Health (2013), Health Technical Memorandum 08-01: Acoustics [32]	Covers the acoustic design criteria that are important for healthcare premises. It recommends acoustic criteria for internal and external noise levels, sound insulation between rooms and other applicable metrics.	Used to define appropriate indoor noise levels in healthcare facilities as described in section 15.5.
Association of Noise Consultants (2021), Construction Noise - A good practice guide to the preparation, submission and management of Section 61 consents [33]	Provides guidance on the process for applying for prior consent for construction works. Recommends LOAEL and SOAEL values for construction noise assessment.	Used to inform the methodology for the assessment of construction noise impacts as described in section 15.5.

15.3 Consultation, scoping and engagement

Consultation

15.3.1 Feedback received from stakeholders for each consultation relevant to noise and vibration is summarised within the Consultation Report (Document reference 5.1, DCO Volume 5), including how the Proposed Development has had regard to the feedback. These cover the consultation responses received for the following consultations:

1. Summer 2022 Consultation
2. Summer 2024 Consultation
3. Spring 2025 Consultation
4. Autumn 2025 Consultation
5. Spring 2026 Consultation

Environment Impact Assessment scoping

15.3.2 An EIA Scoping Opinion was adopted by the Planning Inspectorate on behalf of the SoS on 31 August 2023. A full list of the EIA Scoping Opinion comments made by the Planning Inspectorate and a response to those comments are provided in ES Appendix 5.3 Response to EIA Scoping Opinion, Volume II (Document reference 6.2, DCO Volume 6).

15.3.3 Comments received in relation to noise and vibration are set out in Table 15-5, describing how and where these are addressed in the ES.

Table 15-5 Environmental Impact Assessment Scoping Opinion – Planning Inspectorate Comments

EIA Scoping Opinion ID	Summary of EIA Scoping Opinion comment	How the ES addresses the EIA Scoping Opinion comment	Where addressed in the ES
ID 3.9.1	The EIA Scoping Opinion agreed that indirect temporary or permanent effects due to construction and operational phase road traffic vibration impacts can be scoped out. However, it requested that the ES should provide further details of the likely measures envisaged to mitigate effects and how these would be secured.	Information on the measures to manage construction traffic are identified in the Framework Construction Traffic Management Plan (CTMP) submitted as part of the DCO application (Document reference 7.2, DCO Volume 7), as discussed in section 15.4.	Section 15.4
ID 3.9.2	The EIA Scoping Opinion agreed that noise and vibration from pipelines during operation can be scoped out. However, requested that the ES should confirm the industry good practice measures incorporated into the design of the pipeline.	The industry good practice measures incorporated into the design of the pipeline are identified in section 15.4.	Section 15.4
ID 3.9.3	The EIA Scoping Opinion agreed that noise and vibration impacts from operation of the Havant Thicket Reservoir can be scoped out.	This is scoped out of the assessment.	No additional information provided in the ES.
ID 3.9.4	The EIA Scoping Opinion stated that there was not sufficient information about the possibility of any temporary noise and vibration that may occur during operation, for example through maintenance and	Maintenance activities are described in ES Chapter 3 Description of the Proposed Development, Volume I (Document reference 6.1, DCO Volume 6). These are anticipated to include: end of design life inspections; checks of washout, isolation and air valves every six months; visits by a site operative to the AGP	ES Chapter 3 Description of the Proposed Development, Volume I (Document reference 6.1, DCO Volume 6) and paragraph 15.3.8.

EIA Scoping Opinion ID	Summary of EIA Scoping Opinion comment	How the ES addresses the EIA Scoping Opinion comment	Where addressed in the ES
	renewal works to scope out direct temporary noise and vibration during operation. It was requested that the ES should include an assessment or demonstrate that likely significant effects are not likely to occur with evidence of agreement from relevant consultation bodies.	approximately once per month for planned maintenance (including generator testing) and approximately once per week for monitoring; and regular routine maintenance of the Water Recycling Plant (WRP) site. Most of these activities do not have the potential to cause significant noise effects, as they would not result in higher noise impacts than the permanent operation of the plant being maintained. The only operational activity with the potential to cause direct temporary noise impacts is generator testing, which is included in the assessment scope. Maintenance activities do not have the potential to cause direct temporary vibration impacts; hence, these have been excluded from the assessment scope, as referenced in paragraph 15.3.8.	
ID 3.9.5	The EIA Scoping Opinion agreed that indirect temporary road traffic noise during operation can be scoped out.	This is scoped out of the assessment.	No additional information provided in the ES.
ID 3.9.6	The EIA Scoping Opinion agreed that direct permanent noise impacts during construction can be scoped out.	This is scoped out of the assessment.	No additional information provided in the ES.
ID 3.9.7	The EIA Scoping Opinion agreed that direct permanent vibration impacts during construction and operation (from AGP) can be scoped out but requested that the ES should describe the sources of vibration and the predicted vibration	The potential sources of permanent vibration impacts associated with the Proposed Development operational phase are pumps at the WRP site, and IPS. Pump rotation can result in vibration due to a variety of factors, including: • Imbalance of rotating components, such as impellers or shafts	Relevant primary and tertiary mitigation measures are outlined in section 15.4.

EIA Scoping Opinion ID	Summary of EIA Scoping Opinion comment	How the ES addresses the EIA Scoping Opinion comment	Where addressed in the ES
	level with standard design measures implemented (such as pump balancing and anti-vibration mounts).	• Misalignment of components due to uneven interaction • Cavitation, which is when the pressure within the pump drops to the point where vapor bubbles form and collapse • Mechanical issues e.g. wear and tear, loose parts, or damaged bearings Excessive pump vibration can lead to equipment damage, reduced pump efficiency and increased maintenance costs. The primary and tertiary mitigation measures identified in section 15.4 will ensure these negative effects are avoided and, as a result, vibration transmitted into the ground from the pumps would be negligible. Accounting for the further attenuation due to propagation with distance, vibration levels would be orders of magnitude less than what would be expected to give rise to likely significant effects at sensitive receptors. The information supplied demonstrates that likely significant effects would not occur; hence, quantitative predictions are not considered necessary. This has been agreed through consultation with local planning authorities, as mentioned in paragraph 15.3.8.	
ID 3.9.8	The EIA Scoping Opinion agreed that indirect permanent road traffic noise during construction and operation can be scoped out.	This is scoped out of the assessment.	No additional information provided in the ES.
ID 3.9.9	The EIA Scoping Opinion agreed that noise and vibration impacts from the Eastney Transfer Tunnel (TT) can be scoped out.	The Proposed Development does not include physical construction works at the Havant Thicket Reservoir. An assessment of potential cumulative effects with the separately consented Havant	ES Chapter 20 Cumulative and in-combination effects, Volume I (Document

EIA Scoping Opinion ID	Summary of EIA Scoping Opinion comment	How the ES addresses the EIA Scoping Opinion comment	Where addressed in the ES
	The EIA Scoping Opinion requested that potential construction impacts from Havant Thicket Reservoir are included in the assessment and that consideration be given to the potential for cumulative effects between the Proposed Development and Havant Thicket Reservoir. It was requested that the ES should include an assessment of this matter or evidence of agreement with relevant consultees that this matter can be scoped out and an absence of likely significant effects.	Thicket Reservoir scheme is undertaken in ES Chapter 20 Cumulative and in-combination effects, Volume I (Document reference 6.1, DCO Volume 6).	reference 6.1, DCO Volume 6).
ID 3.9.10	The EIA Scoping Opinion requested that the ES confirms the final study area used in the assessment and explain how it has been selected by reference to relevant guidance.	The operational noise study area is defined in paragraph 15.5.8, this section also explains the guidance used in selection of the study areas.	Paragraph 15.5.8
ID 3.9.11	The EIA Scoping Opinion agreed that the approach to baseline noise surveys was acceptable, subject to confirmation in the ES as to: a. how the assessment has allowed for any potential for construction works to overrun b. how construction noise at public open space would be assessed c. where likely significant effects	The potential for construction works to overrun is addressed by incorporating worst case assumptions regarding the works durations into the assessment, as described in section 15.6. If construction works overrun, the mitigation measures required to avoid associated likely significant effects will be secured in the detailed CEMP(s), as described in the Outline CEMP (Document reference 7.1, DCO Volume 7) and described in section 15.4. Section 15.5 addresses how construction noise at public open space will be assessed.	Sections 15.4, 15.5 and 15.7 and paragraph 15.3.9.

EIA Scoping Opinion ID	Summary of EIA Scoping Opinion comment	How the ES addresses the EIA Scoping Opinion comment	Where addressed in the ES
	from construction traffic noise are identified, baseline surveys should be completed or a justification as to why this is not required It was also requested that efforts should be made to agree the survey approach with relevant consultation bodies.	Sections 15.5 and 15.7 address requirements for baseline conditions where likely significant effects from construction traffic noise are identified. Paragraph 15.3.9 explains that the proposed survey methodology was agreed with the local planning authority officer where the survey was located.	
ID 3.9.12	The EIA Scoping Opinion states that ES should contain a statement with the rationale behind any assumptions made.	Section 15.6 identifies and justifies the assumptions made in the assessment.	Section 15.6
ID 3.9.13	The EIA Scoping Opinion states that the ES should include figures showing the location of receptors considered in the assessment.	NVSRs included in the assessment are shown in ES Figure 15.1 Noise and vibration direct effects study areas, sensitive receptors and monitoring locations, Volume III (Document reference 6.3, DCO Volume 6).	ES Figure 15.1 Noise and vibration direct effects study areas, sensitive receptors and monitoring locations, Volume III (Document reference 6.3, DCO Volume 6).
ID 3.9.14	The EIA Scoping Opinion stated that the ES should explain the vibration baseline that has been used in the assessment, or otherwise confirm why a baseline is not required.	Paragraph 15.5.50 explains that the criteria adopted to assess construction vibration impacts are independent of baseline; therefore, baseline vibration levels are not required to inform assessment. This approach was agreed in the Emission and Transport EIA Working Group (see paragraph 15.3.6).	Paragraphs 15.3.8 and 15.5.50

Engagement

15.3.4 This section provides details of the ongoing technical engagement that has been undertaken with stakeholders in relation to noise and vibration.

Environmental Impact Assessment Working Groups

15.3.5 Five EIA Working Groups have been established as forums for ongoing engagement with statutory bodies regarding the Proposed Development. These Working Groups when combined cover all of the assessment topics considered by the EIA. A full description of each of the EIA Working Groups, the key stakeholders, and an overview of the topics presented can be found in ES Chapter 5 EIA approach and methodology, Volume I (Document reference 6.1, DCO Volume 6). This section presents a summary of the topics covered in the EIA Working Groups which are of relevance for the noise and vibration assessment.

15.3.6 The Emission and Transport EIA Working Group, which includes noise and vibration, waste management, traffic and transport, air quality and odour and climate change, has been the main forum for engagement for noise and vibration. There have been 12 Emission and Transport EIA Working Group meetings, that included discussion of noise and vibration, between Summer 2022 and DCO application. Technical officers from EHDC, EBC, EA, FBC, Hampshire County Council (HCC), HBC, National Highways (NH), NE, PCC, SDNPA, and WCC attended the EIA Working Group meetings. The local planning authority noise specialists involved in this Working Group were also invited to attend the Biodiversity and Water Environment EIA Working Group meeting in October 2025, at which the agenda was amended to include noise and vibration.

15.3.7 The following overarching themes were covered across the EIA Working Group meetings:

1. Introduction and background to the Proposed Development.
2. Overview of the baseline environment.
3. EIA scoping which included setting out the proposed approach to EIA scoping, providing an overview of the EIA Scoping Report and seeking feedback on the EIA Scoping Opinion.
4. An overview of the Preliminary Environmental Information (PEI) Report, including setting out the baseline and approach to mitigation, as well as providing an overview of the PEI Report findings.
5. Updates on the approach to development of the design of the Proposed Development.
6. Briefings on the materials to be consulted on, including design and environmental assessment related matters, ahead of the Summer 2022, Summer 2024 and Spring 2025 Consultations.
7. Approach to mitigation, Commitments Register (ES Appendix 5.5 Commitments Register, Volume II (Document reference 6.2, DCO Volume 6)) and associated management plans to be provided with the DCO application.
8. Consultation feedback and updates on scheme development, and design principles following the Summer 2024 Consultation and PEI Report.
9. Updates on EIA progress and development of mitigation, including management plans and the Commitments Register.
10. An overview of the ES, including setting out the baseline and any updates from the PEI Report, as well as providing an overview of the findings of the EIA.

15.3.8 Comments received as part of the EIA Working Groups and matters resolved in relation to noise and vibration included:

1. The approach to gathering baseline data was agreed, including the baseline noise survey methodology and locations and that baseline vibration data are not required.
2. The relevant planning policy to the assessment was agreed.
3. The scope and methodology for the noise and vibration assessment was agreed, including that temporary and permanent operational vibration impacts would be scoped out and that predictions of operational vibration are not necessary. Agreement to scope out these topics addressed the requirements of EIA Scoping Opinion ID 3.9.4 and 3.9.7, details of these requirements and the basis for agreement with stakeholders is provided in Table 15-5.

Fareham Borough Council, Eastleigh Borough Council, Havant Borough Council, Portsmouth City Council and Winchester City Council one-to one engagement

15.3.9 One-to-one technical engagement on the Proposed Development and matters related to baseline noise surveys has been undertaken with the Environmental Health/Protection or Pollution Prevention teams of the relevant local planning authorities. This consultation involved exchange of e-mails to discuss the proposed survey locations and procedures. In all cases, the proposed survey methodology was agreed with the local planning authority officer applicable to the survey location.

Eastleigh Borough Council, Havant Borough Council and Winchester City Council one-to-one engagement

15.3.10 Additional technical engagement was undertaken with the Environmental Health/Protection and Pollution Prevention teams of EBC, HBC and WCC regarding the proposed construction and removal of temporary accesses for the temporary construction compounds and haul road, as these may need to be undertaken at night to reduce the impacts of Traffic Management on driver delay. The Traffic Management Strategy (Document reference 7.3, DCO Volume 7) sets out that all night-time working in the public highway would be limited to a maximum of ten days within a 15-day period. Each local planning authority agreed that this restriction on the duration of night-time working was sufficient to demonstrate that noise effects are not significant (in accordance with the assessment methodology described in ES Appendix 15.1 Construction noise and vibration assessment (Document reference 6.2, DCO Volume 6)) and that these works can therefore be excluded from the assessment scope.

15.4 Primary and tertiary mitigation

Primary measures

15.4.1 As described in ES Chapter 3 Description of the Proposed Development, Volume I (Document reference 6.1, DCO Volume 6) a range of measures have been embedded into the Proposed Development design to avoid or reduce environmental effects. These primary mitigation measures specific to noise and

vibration, which form part of the design that has been assessed and are secured in the Design Principles Document (Document reference 5.11, DCO Volume 5) are:

1. Avoidance of sensitive receptors through the site/route selection process.
2. The Contractor will ensure that operational noise levels at noise sensitive receptors do not exceed the LOAEL. Mitigation measures will be adopted according to the following mitigation hierarchy:
   a. Avoidance of noise and vibration by, for example, selection of quiet/low vibration plant.
   b. Control noise and vibration at source by, for example, maximising the distance from sources of potentially high noise and vibration levels to NVSRs where possible, utilising screening from existing landforms or structures, introducing additional silencers or enclosures, and upgrades to the fabric of buildings with high indoor noise levels.
   c. Implement good practice environmental noise management measures.
   d. Introduce additional screening to obstruct line of sight between the source and receptor, for example boundary screening.

Tertiary measures

15.4.2 Good construction practices are secured in the Outline CEMP (Document reference 7.1, DCO Volume 7) and will manage the effects of construction. The measures of particular relevance to noise and vibration are:

1. Scheduling works, where practicable, to reduce noise and vibration emissions at highly sensitive times.
2. Selection of plant and working methods to reduce noise and vibration emissions whilst carrying out the work in an efficient and cost-effective manner.
3. Reducing intensity of works during noise sensitive periods, where required.
4. Locating noisy equipment to reduce noise levels at NVSRs.
5. Scheduling works, where practicable, to avoid multiple activities near to NVSRs.
6. Provision of acoustic screening and enclosures where required.
7. Provision of plant movement alarms that vary the loudness level according to ambient noise levels.
8. Provision of contact details for complaints via site environmental notice boards and adoption of a procedure for monitoring and investigating complaints.

15.4.3 The Outline CEMP (Document reference 7.1, DCO Volume 7) commits that a Noise and Vibration Management Plan (NVMP) will be prepared which will include the management and monitoring processes to ensure the following as a minimum:

1. Preparation and submission of Section 61 consent applications (under the Control of Pollution Act (1974))
2. Identification of likely noisy activities, or activities with high vibration emissions, in the construction programme, the proposed Best Practicable Means and additional noise and vibration mitigation measures, and a strategy for actively communicating this information to local communities.

3. Development of a noise and vibration monitoring protocol including a schedule of noise and vibration monitoring locations and stages during construction of the scheme when monitoring will be undertaken. To include physical and observational checks/audits at locations to be determined in consultation with relevant local planning authorities. Locations selected shall be determined by the works being undertaken (and level of anticipated noise) and the sensitivity of receptor and will be informed by additional calculations post-consent.
4. Management processes to ensure ongoing compliance, improvement, and rapid corrective actions to avoid any potential non-compliance.

15.4.4 The potential attenuation of noise from construction activities through the localised use of temporary site hoardings or noise barriers has not been included in the assessment of construction noise in order to represent a worst case scenario. Hence, these measures form part of the secondary mitigation described in section 15.9, with any residual effects reported accordingly.

15.4.5 The Outline CEMP (Document reference 7.1, DCO Volume 7) also commits that a scheme of construction noise and vibration monitoring will be developed and implemented by the Contractor. Monitoring will aim to demonstrate that noise levels are being sufficiently controlled to protect NVSRs from significant adverse construction noise and vibration effects, based on the criteria identified in section 15.5. Details of the monitoring will be defined in the NVMP prepared by the Contractor, and submitted post-consent for agreement with the local planning authorities prior to commencement. The final NVMP will also identify mitigation measures to be implemented in the event that exceedances of the criteria are observed in the monitoring data.

15.4.6 The Framework CTMP (Document reference 7.2, DCO Volume 7) secures the requirement for detailed CTMPs to be developed by the Contractor, and submitted for approval in accordance with the corresponding requirement in Schedule 2 to the draft DCO (Document reference 3.1, DCO Volume 3). The Framework CTMP (Document reference 7.2, DCO Volume 7) details construction traffic management measures, including a proposition for highway condition surveys to be undertaken before and after the construction period, to identify whether construction activities have negatively impacted highway conditions. The scope of these surveys will be discussed and agreed with the relevant highway authorities (HCC and PCC) and set out in the detailed CTMPs. Repair of any damage caused by construction traffic would reduce the potential for traffic-induced vibration effects.

15.4.7 As discussed in relation to ES Appendix 5.2 EIA Scoping Opinion (Document reference 6.2, DCO Volume 6), with these measures in place, indirect vibration effects associated with Proposed Development construction traffic have been scoped out of the assessment.

15.4.8 A further tertiary measure is that the pipeline and pumping systems will be designed and maintained in accordance with recognised industry good practice and relevant water industry standards. This includes undertaking hydraulic assessment to confirm appropriate pipeline performance, balancing pump rotors and incorporating heavy inertia bases and flexible connectors on pumps where required. This standard design process will ensure that the pipeline operates as intended and that noise from water flow within the underground pipeline is not expected to be audible. It will also ensure that vibration from the pumping systems will not be perceptible at NVSRs.

15.4.9 Decommissioning would be subject to the appropriate permits, consents and regulatory environment at the relevant time. Decommissioning activities are expected to follow good industry practice in place at the time, anticipated to be similar in nature to measures contained in the Outline CEMP (Document reference 7.1, DCO Volume 7).

15.5 Assessment methodology

Scope of assessment

15.5.1 Likely significant effects requiring assessment may be temporary or permanent, direct, indirect, secondary, cumulative, in-combination, beneficial or adverse and may occur during construction, operation or decommissioning. Potential likely significant effects on noise and vibration receptors within the scope of the assessment are summarised in Table 15-6. The scope of the assessment has responded to feedback received as detailed in section 15.3.

15.5.2 Effects from decommissioning of the Proposed Development are considered to be no greater than those identified during the construction phase and are therefore assessed to be of the same significance as those assessed for construction effects. Please refer to ES Chapter 3 Description of the Proposed Development, Volume I (Document reference 6.1, DCO Volume 6) section 3.7 for additional information on decommissioning.

15.5.3 Cumulative effects are those resulting from the interrelationship between the Proposed Development and other developments (inter-project). These are reported within ES Chapter 20 Cumulative and in-combination effects, Volume I (Document reference 6.1, DCO Volume 6).

15.5.4 In-combination effects are those that result from the interaction of individual effects combined together on a single receptor or resource at a single point in time. Where a receptor is affected by multiple topics and there is the potential for significant in-combination effects to occur, these aggregated effects are reported within ES Chapter 20 Cumulative and in-combination effects, Volume I (Document reference 6.1, DCO Volume 6).

15.5.5 Table 15-6 sets out the summary of the scope for the assessment in this chapter. All scoped out elements as agreed in the EIA Scoping Opinion are confirmed in ES Appendix 5.3 Response to EIA Scoping Opinion, Volume II (Document reference 6.2, DCO Volume 6). Where the EIA Scoping Opinion required that agreement was reached with stakeholders that impacts could be scoped out, this is discussed in section 15.3. As outlined in paragraph 15.1.5, effects on health and quality of life during the construction and decommissioning phases are classified as temporary. Effects during the operational phase, or relating to building damage (present after construction has finished), are classified as permanent.

Table 15-6 Summary of the scope for the noise and vibration assessment

Sub-topic	Construction	Operation	Decommissioning
Direct temporary airborne noise effects on NVSRs	Scoped in	Scoped in	Scoped in
Direct temporary ground-borne noise effects on NVSRs	Scoped in	Scoped out	Scoped in

Sub-topic	Construction	Operation	Decommissioning
Direct temporary vibration effects on NVSRs	Scoped in	Scoped out	Scoped in
Indirect (i.e. due to traffic flow changes) temporary noise effects on NVSRs	Scoped in	Scoped out	Scoped in
Direct permanent airborne noise effects on NVSRs	Scoped out	Scoped in	Scoped out
Direct permanent (i.e. building damage) vibration effects on NVSRs	Scoped in	Scoped out	Scoped in

Study area

15.5.6 This section describes the spatial scope (the area which may be impacted) for the assessment as it applies to noise and vibration.

15.5.7 Separate study areas have been established for direct effects due to construction noise, construction vibration and operational noise, and indirect effects due to construction traffic noise. The decommissioning study areas are the same as those for construction effects.

Direct effects study area

15.5.8 The direct noise and vibration effects study area extends from the Proposed Development Order Limits to the closest (i.e. most likely to be worst-affected) NVSRs, except for the Eastney Transfer Tunnel, which, as discussed in section 15.3, is excluded from the assessment scope. The maximum distances to NVSRs at which effects have been considered depend on the Proposed Development phase as follows:

1. Construction – in accordance with the guidance in DMRB LA111 Noise and Vibration Rev 2 (2020) [27], airborne noise impacts have been assessed at NVSRs which are no further than 300m from the Order Limits for construction noise, and 100m for vibration. The 100m distance is also considered relevant to construction ground-borne noise impacts.
2. Operation – no guidance is available to identify an operational noise study area; hence, predictions of the noise emissions from potential sources of operational noise (the WRP site, and AGP) were undertaken. Based on these predictions, it was determined that in no cases was the LOAEL (identified in Table 15-18) exceeded at a distance of 500m, and this has been used to define the operational noise study area.
3. Decommissioning – effects from decommissioning of the Proposed Development are considered to be no greater than those identified during the construction phase, and therefore the study areas are as per those assessed for construction effects.

15.5.9 These study areas are shown in ES Figure 15.1 Noise and vibration direct effects study areas, sensitive receptors and monitoring locations, Volume III (Document reference 6.3, DCO Volume 6).

Indirect effects study area

15.5.10 The indirect noise effects study area relates to potential impacts due to changes in road traffic noise levels during construction. In accordance with DMRB, it incorporates the roads on which construction traffic associated with the Proposed Development is anticipated to result in emitted noise level changes of at least 1dB(A). The indirect noise effects study area therefore incorporates the identified links and the closest NVSRs which are no more than 50m away, also in accordance with DMRB. Where there are no NVSRs within 50m, this link has been excluded from the study area.

Assessment scenarios

15.5.11 ES Chapter 5 EIA approach and methodology, Volume I (Document reference 6.1, DCO Volume 6) provides an overview of the Proposed Development's approach to the temporal scope (the time scales over which impacts may occur) of the EIA. This section describes the temporal scope for the assessment as it applies to noise and vibration.

15.5.12 The noise and vibration assessment considers the following scenarios through the construction and operational phases of the Proposed Development (decommissioning is assumed to be the same as construction) and the activities which have the most potential to give rise to likely significant effects:

1. Construction noise and vibration – assessment of the peak of construction activities across the construction programme at each receptor location against the current baseline.
2. Construction traffic noise – the assessment of construction traffic noise impacts compares the peak of construction traffic flows at each link against forecast future baseline traffic flows for that year. The peak year of construction is assumed to be 2031, which is the earliest that the peak construction traffic is currently anticipated. Later years would have higher baseline traffic flows so the calculated change in flows due to the Proposed Development is maximised by assuming the earliest possible construction year.
3. Operational noise – once all fixed AGP is operational, i.e. first year of operation (currently anticipated to be 2034). In general, the impact of the operational noise depends on the predicted change from the baseline sound levels. Future baseline sound levels are considered in section 15.7 and no robust evidence has been identified that these are likely to reduce. Hence, operational noise impacts are assessed against the current baseline.

Baseline methodology

Desk study

15.5.13 Baseline data collection has been undertaken to obtain information across the study area. This section provides the approach to collecting baseline data.

15.5.14 The following data sources have been accessed to inform the baseline with respect to noise and vibration (refer to Table 15-7). In addition to these data sources, the noise and vibration assessment draws on environmental baseline data collated for

other topics, specifically road traffic data presented in ES Chapter 18 Traffic and transport, Volume I (Document reference 6.1, DCO Volume 6).

Table 15-7 Data sources used to inform the noise and vibration assessment

Source of data	Baseline data
Ordnance Survey (OS) Master Map [34]	Residential property locations, ground types (for noise modelling) and other building locations (checked for accuracy against other data sources (OS AddressBase and Google maps) in April 2025)
OS AddressBase [35]	Receptor addresses and building classifications (accessed November 2024)
OS Important Buildings [36]	Community facilities, commercial properties and land data (checked for accuracy against other data sources (OS AddressBase and Google maps) in April 2025)
Google maps [37]	Locations of residential and commercial properties, community facilities and ground types (accessed April 2025)
Department for Environment, Food and Rural Affairs (Defra) Noise Action Planning Important Areas Round 3 England [38]	Locations identified by Defra with high noise exposure, known as Noise Important Areas (NIAs) (accessed June 2023, data has not changed since publication in 2019)
Local Planning Authority planning portals [39, 40, 41, 42, 43]	Planning applications for development within the study areas, used to identify future baseline sensitive receptors (accessed February 2026)
DEFRA Strategic Noise Mapping [44]	Predicted road and railway baseline noise levels (accessed April 2025)

Site surveys

15.5.15 The study area noise and vibration baseline surveys undertaken were:

1. Unattended noise measurements, over a minimum four day period including a weekend, at locations representative of receptors likely to be worst-affected by operational noise from the AGP and the WRP site.
2. Unattended noise measurements, over a 24-hour period, at locations representative of receptors potentially affected by noise from temporary construction compounds or trenchless crossings.
3. Attended noise measurements at locations representative of receptors potentially affected by Proposed Development noise where it was not possible to provide sufficient security to leave equipment unattended. These surveys were only undertaken at times when the receptor is sensitive (e.g. outdoor amenity areas are not sensitive at night) and an impact is expected to occur (e.g. most construction works do not occur at night).

15.5.16 No baseline vibration survey was necessary as vibration criteria effects are assessed in terms of absolute levels, not in respect of a level relative to a baseline.

15.5.17 The methodology, location and duration of surveys have been agreed with all local planning authorities through ongoing engagement both by exchange of technical emails and during the Emissions and Transport EIA Working Group meetings. The

monitoring locations are shown in ES Figure 15.1 Noise and vibration direct effects study areas, sensitive receptors and monitoring locations, Volume III (Document reference 6.3, DCO Volume 6).

15.5.18 Monitoring equipment was located in a residential property garden (where access is granted by the resident) or, where this is not feasible, an alternative secure location such as mounted to a lamp post. Where the survey location is not considered sufficiently representative of the receptor, such as where it lies closer to a road, or is subject to different screening from a road, corrections have been made to the measured ambient levels following standard UK guidance such as CRTN [26]. As above, this detail has been agreed with all local planning authorities both by exchange of technical emails and during the Emissions and Transport EIA Working Group meetings.

15.5.19 All monitoring equipment conforms to the specifications for sound level meters of Class 1 as given by BS EN 61672-1:2013 [45]. The survey procedures gave due regard to the requirements of BS 7445-2 [24] and BS 4142 [46]. Monitoring results were processed to ensure that meteorological conditions were conducive to obtaining accurate and reliable noise data, based on the guidance in the aforementioned standards. Details on the baseline survey methodology are provided in ES Appendix 15.4 Acoustic terminology and baseline, Volume II (Document reference 6.2, DCO Volume 6).

Assessment methodology

15.5.20 The approach to assessment is set out in ES Chapter 5 EIA approach and methodology, Volume I (Document reference 6.1, DCO Volume 6). This has informed the approach used in this noise and vibration assessment.

15.5.21 The assessment of noise and vibration effects is based on the sensitivity of the receptor and the magnitude of the impact.

Sensitivity of receptors

15.5.22 Receptor types or NVSRs are broadly classified as either residential dwellings or non-residential, such as schools, hospitals or outdoor amenity areas. In accordance with the Guidelines for Environmental Noise Impact Assessment [30], the sensitivity of receptors to health and quality of life-related effects has been classified. This is based on their usage, using professional judgement, as defined in Table 15-8. Receptor sensitivity to building damage effects is discussed in the methodology for assessing construction vibration impacts.

Table 15-8 Definitions of the different receptor sensitivity levels to noise and/or vibration impacts

Sensitivity	Definition	Examples
Very high	Receptors where noise or vibration level changes may significantly affect their usage.	Certain hospital wards (e.g. operating theatres or high dependency units), auditoria, laboratories with highly vibration sensitive equipment.
High	Receptors where noise and/or vibration level changes may cause disturbance, protection is	Residential accommodation, private gardens, hospital wards, care homes, schools, universities, research facilities, places of worship and national parks (during the day, or at night where specific

Sensitivity	Definition	Examples
	required but some tolerance is expected.	night-time usages exist (e.g. SDNP is a Dark Sky Reserve)).
Medium	Receptors where noise and/or vibration level changes may cause some distraction or disturbance.	Offices, shops (including cafes), outdoor amenity areas during the day (including recreation, public amenity space/play areas), long distance footpaths (including Public Right of Way (PRoW), dog walking routes, bird watching areas, footpaths and other walking routes, visitor attractions, cycling routes (including rural roads), doctor's surgeries and sports facilities.
Low	Receptors where noise and/or vibration level changes are not expected to be detrimental.	Warehouses, light industry, car parks, and agricultural land.

Magnitude of impact

15.5.23 The assessment of magnitude of impact is based on comparison with the relevant noise and vibration criteria depending on the specific impact being considered. These impacts then feed into the effect significance matrix in Table 15-9. A summary of the methodology for determining the magnitude of impact is provided in the following sections. Detailed explanations are provided in ES Appendix 15.1 Construction noise and vibration assessment, Volume II (Document reference 6.2, DCO Volume 6), ES Appendix 15.2 Construction traffic noise assessment, Volume II (Document reference 6.2, DCO Volume 6) and ES Appendix 15.3 Operational noise assessment, Volume II (Document reference 6.2, DCO Volume 6).

Significance of effect

15.5.24 The significance of an effect is determined using the matrix shown in Table 15-9 combined with professional judgement. Separate assessment methods are used to determine the magnitude of each identified impact; these are discussed in paragraphs 15.5.29 to 15.5.64. Details of the professional judgement analysis are provided in relation to each impact. As stated in ES Chapter 5 EIA approach and methodology, Volume I (Document reference 6.1, DCO Volume 6), only moderate or major effects are considered significant and minor or neutral effects are not significant. Where an activity is not anticipated to occur, the assessment uses the term 'no effect'.

Table 15-9 Effect significance matrix

		Magnitude of impact			
		Major	Moderate	Minor	Negligible
Sensitivity (value) of receptor	Very high	Major	Major	Moderate	Minor
	High	Major	Moderate	Minor	Neutral
	Medium	Moderate	Minor	Neutral	Neutral
	Low	Minor	Neutral	Neutral	Neutral

15.5.25 The PPG-N [9] provides a relationship between various perceptions of noise, effect level and required action in accordance with the NPPF [8]. This is reproduced in Table 15-10.

Table 15-10 Planning Practice Guidance on Noise - noise exposure hierarchy

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. Can slightly affect the acoustic character of the area but not such that there would be a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level (LOAEL)			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there would be no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there would be a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level (SOAEL)			
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 would be 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
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	Avoid

15.5.26 Government policy for noise is based on community exposure response relationships and noise insulation of a typical dwelling. Consequently, an assessment based on LOAELs and SOAELs cannot be applied to all non-residential sensitive receptors. As such, non-residential receptors are considered

on a case-by-case basis by considering the applicable design criteria for good indoor/outdoor noise levels, this includes consideration of whether LOAELs and SOAELs are applicable to the specific receptor type.

15.5.27 There is an important distinction between the threshold for identifying significant adverse effects in accordance with the EIA Regulations and the specific identification of LOAEL and SOAEL, which have a particular meaning in planning policy. In particular, the SOAEL, the point at which a significant adverse effect on health and quality of life occurs, is not necessarily the same as the threshold at which a significant adverse effect occurs in EIA terms. Hence, an assessment of effect significance, in EIA terms, has been undertaken based on the determined magnitude of impact and receptor sensitivity. Where appropriate, a separate assessment of effects against identified LOAEL and SOAEL values has also been undertaken, to determine compliance with relevant planning policy.

15.5.28 The temporal scales identified in ES Chapter 5 EIA approach and methodology Volume I (Document reference 6.1, DCO Volume 6) have been used to classify the duration of effects. The indicative construction programme in ES Chapter 3 Proposed Development Description (Document reference 6.1, DCO Volume 6) shows that all construction activities in any one location will last less than five years; hence, all noise and vibration effects from construction phase activities are of short-term duration. The operational phase would last more than 15 years hence the duration of effects is long-term.

Construction airborne noise

15.5.29 A quantitative assessment of construction noise impacts has been undertaken, based on estimates of worst case construction noise levels at the closest identified NVSRs to the construction work at the point of peak construction. Worst case construction noise levels have been estimated in accordance with the methodology in BS 5228-1 [2] using 3D (three-dimensional) noise modelling software (SoundPLAN version 9.1).

15.5.30 The calculated construction noise levels at NVSRs have been compared against the following widely accepted[2] SOAELs:

1. Daytime – 75dB L_{Aeq}, or above the existing ambient if this is higher
2. Night – 55dB L_{Aeq}, or above the existing ambient if this is higher

15.5.31 The construction noise LOAELs[2] are as follows:

1. Daytime – 65dB L_{Aeq}, or above the existing ambient if this is higher
2. Night – 45dB L_{Aeq}, or above the existing ambient if this is higher

15.5.32 To avoid a potential conflict between the relevant legislative and policy requirements, the SOAELs are based on the thresholds for eligibility for noise insulation identified in BS 5228-1 Annex E.4. In accordance with that method, they therefore only apply to impacts lasting for more than ten days (or ten evenings/weekends or nights) in any 15. Aligning the SOAEL with noise insulation trigger thresholds is consistent with the consequences of noise exposure above the SOAEL identified in PPG-N, such as that people start "*avoiding certain activities during periods of intrusion; where there is no alternative ventilation,*

[2] For example High Speed 2, Longfield Solar Farm, A14 Cambridge to Huntingdon and Thames Tideway

having to keep windows closed most of the time because of the noise". It is also of note that the daytime SOAEL is consistent with the threshold proposed in the Wilson Report [47] to avoid interference with normal speech indoors, with windows closed. Windows and their noise insulation properties have improved substantially since the Wilson Report; the 75dB L_{Aeq} SOAEL is therefore likely to be precautionary for modern properties.

15.5.33 Where on-site mitigation is exhausted and the SOAEL is still predicted to be exceeded, the provision of noise insulation or equivalent off-site mitigation demonstrates compliance with the requirements of the CoPA and meets the first aim of the NPSE and NPSWRI (to avoid significant observed adverse effects on health and quality of life).

15.5.34 Construction noise levels between the LOAEL and the SOAEL have the potential to result in adverse effects on health and quality of life. Sufficient mitigation measures are therefore applied in such locations, to meet the second aim of the NPSE and NPSWRI (to mitigate and minimise other adverse impacts on health and quality of life).

15.5.35 ES Appendix 15.1 Construction noise and vibration assessment, Volume II (Document reference 6.2, DCO Volume 6) provides more detail on the assessment method.

15.5.36 Potential effects from airborne construction noise impacts lasting one month or more have been assessed using the criteria in Table 15-11, which are based on Example method 2 – 5dB(A) change described in Annex E3.3 of BS 5228-1. Taking account of noise level, duration and number of receptors affected, these impacts can be reported as a likely significant effect in accordance with the definitions provided in ES Chapter 5 EIA approach and methodology, Volume I (Document reference 6.1, DCO Volume 6). However, these effects are not considered to cause a 'material change in behaviour and/or attitude' (as described in Table 15-10 and taken from the PPG-N) and therefore do not cause a 'significant observed adverse effect' as defined in the PPG-N. Hence, the first aim of the NPSE and NPSWRI (avoid significant adverse impacts on health and quality of life) does not apply to these impacts.

Table 15-11 Construction noise magnitude of impact criteria (residential and non-residential receptors

Magnitude of impact	Construction noise level (dB $L_{Aeq,T}$)		
	Daytime*	Evenings and weekends**	Night-time***
Major	More than or equal to 75[1]	More than or equal to 65[1]	More than or equal to 55[1]
Moderate	More than or equal to 65[2] to less than 75[3]	More than or equal to 55[2] to less than 65[3]	More than or equal to 45[2] to less than 55[3]
Minor	More than or equal to 60[4] to less than 65[2]	More than or equal to 50[4] to less than 55[2]	More than or equal to 40[4] to less than 45[2]
Negligible	Less than 60[4]	Less than 50[4]	Less than 40[4]

*7:00am to 7:00pm weekdays and 7:00am to 13:00 Saturdays
**7:00pm – 11:00pm weekdays, 13:00 – 11:00pm Saturdays and 7:00am – 11:00pm Sundays
***11:00pm to 7:00am
[1] and at least 5dB above the baseline ambient noise level

Magnitude of impact	Construction noise level (dB $L_{Aeq,T}$)		
	Daytime*	Evenings and weekends**	Night-time***
[2] or 3dB above the baseline ambient noise level, whichever is the higher [3] or 5dB above the baseline ambient noise level, whichever is the higher [4] or the baseline ambient noise level, whichever is the higher			

15.5.37 The following additional factors can be considered to determine the effect significance for airborne construction noise:

1. The timing of the impact and sensitivity of the NVSR depending on usage.
2. The location of the impact at the NVSR – a receptor may contain areas which are more or less sensitive than others, for example in a care home, office spaces or kitchens would be considered less sensitive than bedrooms.
3. The proportion of the area affected (where a receptor is outdoors).
4. Design of the receptor affected, for example, construction of the building façade or ventilation strategy.

Construction ground-borne noise

15.5.38 Construction ground-borne noise levels have been calculated at the closest identified sensitive receptors to the tunnelling works, in order to determine likely worst case impacts, using the empirical calculation formula in BS 5228-2 [3]. Ground-borne noise is not relevant to trenchless construction works as this activity does not emit high levels of ground-borne noise but would emit airborne noise which has a much greater potential (than ground-borne noise) to be audible at NVSRs.

15.5.39 The magnitude of impact criteria for residential receptors are provided in Table 15-12.

Table 15-12 Construction ground-borne noise Significant Observed Adverse Effect Level and Lowest Observed Adverse Effect Level for residential receptors

Magnitude of impact	Construction ground-borne noise level (dB L_{ASmax})	NPSE/PPG category
Major	More than or equal to 50	-
Moderate	More than or equal to 45 to less than 50	SOAEL is 45dB L_{ASmax}
Minor	More than or equal to 35 to less than 45	LOAEL is 35dB L_{ASmax}
Negligible	Less than 35	-

15.5.40 For the assessment of construction ground-borne noise impacts on non-residential sensitive receptors, indoor noise level criteria have been identified as detailed in Table 15-13.

Table 15-13 Construction ground-borne noise criteria for non-residential receptors

Receptor type	Predicted indoor noise level (dB L_{ASmax})
Large auditoria, concert halls, theatres and sound recording and broadcast studios	25
Places of meeting for religious worship, courts, cinemas, lecture theatres, museums, hospitals with long-term care wards, small auditoria or halls	35
Offices, schools, colleges, medical centres, hotels, libraries	40

15.5.41 Where the criteria in Table 15-13 are predicted to be exceeded, or where moderate or major impacts are predicted at residential receptors, effects are potentially significant, subject to the additional factors identified in relation to airborne construction noise impacts (refer to paragraph 15.5.37).

Construction vibration

15.5.42 Construction vibration impacts are assessed for all activities which are a potentially significant source of vibration, such as tunnelling, piling and vibratory rollers/compactors, where these are proposed within 100m of any identified potentially sensitive receptors.

15.5.43 Vibration from construction sites at the worst case vibration sensitive receptors within the study area (those closest to the vibration source) are predicted in terms of the Peak Particle Velocity (PPV). Vibration levels from tunnelling operations have been predicted in terms of the Vibration Dose Value (VDV). This is explained in section 4.1 of ES Appendix 15.1 Construction noise and vibration assessment, Volume II (Document reference 6.2, DCO Volume 6).

15.5.44 Impacts are considered for both damage to buildings and annoyance to occupiers. Table 15-14 details PPV vibration levels and provides a semantic scale for the description of construction vibration effects on human receptors, based on guidance contained in BS 5228-2 [3].

Table 15-14 Construction vibration criteria for human receptors (annoyance) using Peak Particle Velocity

Vibration limit PPV ($mm.s^{-1}$)	Interpreted significance to humans	Magnitude of impact	NPSE/PPG Category
Less than 0.14	Vibration unlikely to be perceptible	Negligible	-
0.14 to less than 0.3	Vibration might just be perceptible in the most sensitive situations for most vibration frequencies associated with construction		
0.3 to less than 1.0	Vibration might just be perceptible in residential environments	Minor	LOAEL is $0.3mm.s^{-1}$
1.0 to less than 10.0	It is likely that vibration at this level in residential environments would cause complaint, but can be tolerated if prior warning and explanation has been given to residents	Moderate	SOAEL is $1.0mm.s^{-1}$

Vibration limit PPV ($mm.s^{-1}$)	Interpreted significance to humans	Magnitude of impact	NPSE/PPG Category
10.0 or more	Vibration is likely to be intolerable for any more than a brief exposure to this level	Major	-

15.5.45 Table 15-15 details VDV vibration levels for the assessment of construction vibration effects on human receptors, based on guidance contained in BS 6472-1 [25]. These values have been used for the assessment of impacts from tunnelling, due to the availability of source emission data using this parameter (for additional detail, see section 4 of ES Appendix 15.1 Construction noise and vibration assessment, Volume II (Document reference 6.2, DCO Volume 6)).

Table 15-15 Construction vibration criteria for human receptors (annoyance) using Vibration Dose Value

Vibration level VDV ($mm.s^{-1.75}$)		Magnitude of impact	NPSE/PPG Category	
Day	Night		Day	Night
Less than 0.4	Less than 0.2	Negligible	-	-
0.4 to less than 0.8	0.2 to less than 0.4	Minor	LOAEL is $0.4mm.s^{-1.75}$	LOAEL is $0.2mm.s^{-1.75}$
0.8 to less than 1.6	0.4 to less than 0.8	Moderate	SOAEL is $0.8mm.s^{-1.75}$	SOAEL is $0.4mm.s^{-1.75}$
1.6 or higher	0.8 or higher	Major	-	-

15.5.46 Construction vibration effects on humans are considered significant when it is determined that vibration levels would exceed the criteria for a major impact over at least one period of normal daytime working hours or overnight (11pm to 7am), or a moderate impact for a duration exceeding:

1. Ten or more days or nights in any 15 consecutive days or nights, or
2. A total number of days exceeding 40 in any six consecutive months

15.5.47 Table 15-16 provides building damage magnitude of impact criteria, based on guidance in BS 5228-2 [3] and BS 7385-2 [21].

Table 15-16 Construction vibration criteria for assessing building damage

Magnitude of impact	Damage risk	Continuous vibration level PPV ($mm.s^{-1}$)	Transient vibration level PPV ($mm.s^{-1}$)
Negligible	Negligible	Less than 6	Less than 12
Minor	Cosmetic	6 to less than 15	12 to less than 30
Moderate	Minor	15 to less than 30	30 to less than 60
Major	Major	30 or above	60 or above

15.5.48 In accordance with the guidance in BS 7385-2 [21], receptor sensitivity to vibration damage impacts is classified as follows:

1. Medium – reinforced or framed structures, industrial and heavy commercial buildings

2. High – un-reinforced or light framed structures, residential or light commercial type buildings
3. Very high – important structures known to be vulnerable to vibration damage

15.5.49 These sensitivities are combined with the predicted magnitude of impact (using Table 15-16) to determine the effect significance in accordance with the matrix in Table 15-9. No structures with very high sensitivity to potential vibration damage impacts were identified within the construction vibration study area. The guidance does not provide a relationship between the duration of a vibration level at the building and the risk of damage. Therefore, to consider a potential worst case, any predicted potential exceedance of the criterion is assessed as causing the identified impact, irrespective of likely duration.

15.5.50 The criteria adopted to assess construction vibration impacts are independent of baseline vibration levels; therefore, a baseline vibration survey is not required to inform the construction vibration impact assessment, as agreed in the Emission and Transport EIA Working Group (see paragraph 15.3.8).

Construction traffic noise

15.5.51 Construction traffic noise impacts along existing roads are estimated based on the likely change in road traffic noise level at a reference distance of 10m from the nearside carriageway (referred to as the Basic Noise Level (BNL)) as determined by CRTN [26]). This assessment incorporates a worst case assumption that a residential NVSR is present at 10m from the link, the 50m study area for indirect effects is applicable to calculations of actual road traffic noise levels, when required, as described in paragraph 15.5.53. The road links anticipated to be used by Proposed Development construction traffic are identified in ES Chapter 18 Traffic and transport, Volume I (Document reference 6.1, DCO Volume 6). Traffic flow data were supplied for each of these links, with and without the Proposed Development construction traffic. Where traffic flows are within the validated range of CRTN (at least 1000 vehicles per 18 hours), these data have been used to undertake the BNL calculations.

15.5.52 In order to determine impacts, the BNLs with and without the construction traffic are compared and the likely change is assessed using the impact magnitude criteria detailed in Table 15-17, which is reproduced from Table 3.17 of the DMRB [27].

Table 15-17 Traffic noise magnitude of impact at receptors

Magnitude of impact	Increase in Basic Noise Level of closest public road used for construction traffic (dB)
Negligible	Less than 1.0
Minor	Greater than or equal to 1.0 and less than 3.0
Moderate	Greater than or equal to 3.0 and less than 5.0
Major	Greater than or equal to 5.0

15.5.53 For any road links where the traffic flows are less than the validated CRTN [26] range, the closest NVSR to the link (which is within the indirect effects study area) has been identified. The haul route calculation method provided in BS5228-1 [2]

has been used to determine the change in HGV noise level from the road due to the additional construction vehicles at the identified NVSR. The magnitude of such noise impacts is determined using the construction noise assessment criteria in Table 15-17.

15.5.54 The same analysis of additional factors undertaken for assessing potential effect significance for construction noise (identified in paragraph 15.5.37) has been used to determine the effect significance for construction traffic noise impacts.

15.5.55 As the assessment of construction traffic noise impacts is solely based on noise level calculations, a baseline sound survey is not deemed necessary to inform such an assessment. If the calculations indicate the potential for likely significant effects, a baseline noise survey could be undertaken to inform the assessment, in accordance with guidance. This approach was agreed in the Emission and Transport EIA Working Group (see paragraph 15.3.8). The assessment (refer to section 15.8) concludes that traffic noise effects are not significant; hence, it is not considered that baseline surveys are required.

Operational noise

15.5.56 Operational noise effects on residential NVSRs have been assessed using the guidance set out in BS 4142 [46], which is the accepted UK standard for rating and assessing the impact of sound of an industrial and/or commercial nature. The basis of BS 4142 [46] is a comparison between the background sound level (a measure of the existing baseline sound level) in the vicinity of residential locations and the rating level of the noise source under consideration. The rating level of the noise source is its sound level (referred to as the specific sound level), plus a penalty if it contains features which are likely to draw attention to it or increase its perceived impact. Details on the assessment method are provided in ES Appendix 15.3 Operational noise assessment, Volume II (Document reference 6.2, DCO Volume 6).

15.5.57 The operational sound levels have been predicted at the identified receptors using 3D noise modelling software SoundPLAN version 9.1.

15.5.58 Background sound level data are derived from the baseline noise surveys, and the magnitude of impact assessed using the criteria shown in Table 15-18 which are based on BS 4142 [46].

Table 15-18 Operational noise magnitude of impact criteria

Rating level $L_{Ar,Tr}$ (dB)	Magnitude of impact	NPSE/PPG category
Less than or equal to Measured L_{A90}	Negligible	-
Measured L_{A90} + up to 5dB	Minor	LOAEL is rating level of L_{A90} + 5dB
Measured L_{A90} + more than 5dB to less than 10dB	Moderate	-
Measured L_{A90} + more than or equal to 10dB	Major	SOAEL is rating level of L_{A90} + 10dB

15.5.59 As shown in Table 15-18, the BS 4142 methodology is interpreted to mean that a difference between the rating level and background sound level of 5dB equates to

the LOAEL and a difference of 10dB equates to the SOAEL. The only exception to this is that the LOAEL for Break Pressure Tank (BPT)-K, IPS-G and the Invasive Non-Native Species (INNS) Treatment at Otterbourne Water Supply Works (WSW), which are in the WCC district, is 10dB below the background sound level, to accord with the WCC Technical Guidance for Noise [20].

15.5.60 Operational noise effects may be considered significant depending on the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. Impacts described as moderate or major magnitude in Table 15-18 may be considered significant, depending on the context. Of particular relevance to context for this assessment is that certain AGP are in areas where background sound levels are particularly low, in which case a minimum LOAEL (35dB $L_{Ar,Tr}$) is applied.

15.5.61 For BPT-K, IPS-G or INNS Treatment at Otterbourne WSW, if background sound levels are 45dB L_{A90} or below, the LOAEL would be set to 35dB $L_{Ar,Tr}$, as WCC require that the LOAEL is 10dB below the background sound level. For the remaining AGP (which are not in the WCC district), where background sound levels are 30dB L_{A90} or below, the LOAEL is set to 35dB $L_{Ar,Tr}$.

15.5.62 Emergency power generators would not be used during typical plant operation and would only be used in an emergency scenario during a power cut except for testing which would occur over a short period (expected to be no more than 30 minutes) once a month during daytime periods. Operational noise effects from emergency power generators have therefore been assessed separately, to account for the infrequent nature of their usage. Based on the WHO Guidelines for Community Noise [28], a criterion of 50dB L_{Aeq} has been adopted as the threshold for potentially likely significant effects for generator noise levels in gardens of residential properties.

15.5.63 A separate assessment has been undertaken for operational noise effects on non-residential NVSRs. The only identified non-residential NVSRs (as discussed in section 15.7) with the potential to experience operational noise impacts are those within 500m of the AGP. These include a hotel, offices, external amenity areas and a nursery. Outdoor noise level criteria have been identified as detailed in Table 15-19.

Table 15-19 Airborne noise criteria for non-residential receptors

Receptor type	Noise level (dB L_{Aeq} outdoors, free-field)	
	Daytime	Night-time
Hotel	50	45
Offices	55	N/A
Children's nursery and external amenity spaces	50	N/A

15.5.64 R36 (a residential care home) has been treated as a residential NVSR in order to assess potential likely worst case effects.

15.5.65 Where the airborne noise criteria for non-residential receptors criteria are predicted to be exceeded, the following additional factors have been incorporated into the assessment of effect significance:

1. The predicted change in ambient sound levels (where baseline noise levels are known).
2. The timing of the impact – night-time impacts are more likely to be considered significant than daytime impacts.
3. The location of the impact at the NVSR – a receptor may contain areas which are more or less sensitive than others, for example in a care home, office spaces or kitchens would be considered less sensitive than bedrooms.
4. The nature, times of use and design of the receptor.
5. The proportion of the area affected (where a receptor is outdoors).
6. Design of the receptor affected, for example, construction of the building façade or ventilation strategy.

Decommissioning

15.5.66 Decommissioning effects have been assessed qualitatively, considering which elements of the Proposed Development are anticipated to be removed and which would be left in-situ. Effects from decommissioning of the elements to be removed are considered to be no greater than those identified during their construction phase and are therefore assessed to be of the same significance as those assessed for construction. Where Proposed Development elements would be left in-situ, there are no noise and vibration effects.

15.6 Assumptions and limitations

15.6.1 This section provides a description of the assumptions and limitations to the noise and vibration assessment.

15.6.2 It has been assumed that future baseline sound levels would be the same or higher than existing; hence, assessment of impacts against the existing baseline considers a reasonable worst case. This assumption is explained in section 15.7.

15.6.3 ES Chapter 3 Description of the Proposed Development, Volume I (Document reference 6.1, DCO Volume 6) describes optionality in the Proposed Development design in the location of the River Meon crossing, compounds E-4 and E-6 and temporary access routes to compound M-3. In each case, the modelling been used to predict the impact of each identified option and the likely worst case impact has been reported.

15.6.4 The Contractor has not yet been appointed; hence, to undertake the construction noise and vibration level assessment, assumptions have been made regarding the plant and activities required to construct the Proposed Development. These have been based on the outline construction methodology and programme provided in ES Chapter 3 Description of Proposed Development, Volume I (Document reference 6.1, DCO Volume 6), as well as experience of previous similar projects. The assumptions are considered representative of a worst case. The assumed plant and equipment and noise emissions for the worst case activities are detailed in ES Appendix 15.1 Construction noise and vibration assessment, Volume II (Document reference 6.2, DCO Volume 6). Plant noise emissions are based on worst case data for the plant type in BS5228-1 [2], it is likely that the Contractor would use more modern (and therefore quieter plant) than assumed.

15.6.5 The method for constructing tunnel shafts has not been determined, methods that could be used are segmental lining, secant piling and diaphragm walls. The worst case construction method has been assumed, which for noise impacts is the secant piled method, due to the requirement for bored piling, and for vibration impacts is the diaphragm wall method. Details are provided in ES Appendix 15.1 Construction noise and vibration assessment, Volume II (Document reference 6.2, DCO Volume 6).

15.6.6 Some asset owners and/or operators may require that trenchless construction works under their asset (e.g. a road) must be undertaken on a 24-hourly basis, for example to reduce traffic disruption. Works duration would depend on several factors such as the exact trenchless technique used and ground conditions. ES Appendix 15.1 Construction noise and vibration assessment, Volume II (Document reference 6.2, DCO Volume 6) identifies the crossings for which these restrictions are anticipated, their length and the resultant duration of night-time working (based on a progression rate of 3m per 12-hour shift which is understood to be a reasonable worst case).

15.6.7 The construction road traffic noise assessment is reliant on the traffic data set out in ES Appendix 18.1 Transport Assessment, Volume II (Document reference 6.2, DCO Volume 6). Hence, any assumptions and limitations made in the generation of these data are also inherently assumed within this assessment. As discussed in the Transport Assessment, the construction traffic flow forecasts are based on an assumption that there would be more deliveries from Monday to Friday than on a Saturday. Hence, forecast weekday (i.e. AAWT) traffic flows are higher than if steady traffic flows had been assumed throughout the working week, ensuring that the assessment considers potential likely worst case impacts.

15.6.8 Calculations of noise from works at the bottom of proposed tunnel shafts (i.e. tunnelling) have incorporated an assumed 10dB of attenuation (based on guidance in BS 5228-1 Annex F), due to the shaft walls providing screening between the plant and NVSR. This is considered representative of a worst case scenario, i.e. the actual attenuation is likely greater than 10dB.

15.6.9 Noise modelling of IPS and BPT construction works assumes as a worst case scenario that CFA piling will be required to construct the building foundations. Vibration calculations for trenchless crossing pit construction assume vibratory piling is required, which is a worst case scenario.

15.6.10 Operational noise modelling of the AGP, WRP site and INNS Treatment plant at Otterbourne WSW is based on the practicable layouts included in ES Appendix 15.3 Operational noise assessment (Document reference 6.2, DCO Volume 6). These do not necessarily represent a worst case scenario; however, the primary mitigation identified in the Design Principles Document (Document reference 5.11, DCO Volume 5) and described in section 15.4 minimises the likelihood that the final layout would result in potential worst case noise levels at NVSRs. It is also impractical to attempt to derive a theoretical worst case layout for each site as this would vary depending on the receptor. The purpose of the noise modelling is to identify impacts and mitigation requirements based on a practicable layout. The final layout, plant requirements and noise emissions are subject to the detailed design of the WRP site, AGP and INNS Treatment at Otterbourne WSW, which will be developed following DCO consent. Worst case assumptions have therefore had to be made regarding the likely noise insulation performance of the fabric of

buildings or enclosures and the noise emissions from the plant, in particular that, where plant noise emissions are not known, these are limited to the maximum possible whilst not exceeding the Upper Action Value in The Control of Noise at Work Regulations 2005 [48]. Operational noise impacts are controlled by the commitment in the Design Principles Document (Document reference 5.11, DCO Volume 5) to incorporate sufficient mitigation into the final design to avoid adverse effects. Hence, irrespective of this limitation, effects would be no worse than those which have been assessed.

15.6.11 Noise from open-cut trenching is assumed to be radiated from a line source located at the shortest possible distance from these works to each NVSR i.e. the closest edge of the working width. According to the working width drawings in ES Chapter 3 Description of the Proposed Development, Volume I (Document reference 6.1, DCO Volume 6), the edge of the working width will be no more than 27m from the limits of the pipeline works. Hence, the line source is located up to 27m from the edge of the limits of the pipeline works, in the direction of the closest NVSR, and within the Order Limits. The modelling of noise from vehicles on the haul road assumes that the centre of the haul road is 2m inside the edge of the working width that is closest to the NVSR.

15.6.12 Works required to construct the haul road and associated temporary access points are currently anticipated to last less than 10-days in 15 consecutive days at any one location and are therefore excluded from the noise modelling.

15.6.13 At some trenchless crossings, the orientation of the Limits of Deviation restricts the location of a shaft as the microtunnelling would be undertaken in a straight line between the shafts. Where this is the case, calculations of noise and vibration emissions from works at the shafts have assumed the worst case potential shaft location.

15.6.14 Whilst the DCO application does not specify a maximum depth of the pipeline or AGP sites, the assessment conclusions still represent a likely worst assessment on the basis it is unlikely to result in changes to the noise or vibration emissions. A deeper pipeline could increase the duration of tunnel shaft excavation works. The only affect this would have on the assessment is that the shaft construction in compound E-1 is assumed not to overlap with the construction of BPT/IPS-E (these activities are anticipated to be separated by a period of approximately one year). This assumption is considered reasonable as the shaft depth would need to approximately double to extend the excavation duration by one year, which is not anticipated to occur.

15.6.15 For a standard open-cut pipeline construction, there would be a slight decrease in construction rate if the trench was deeper than assumed. Open-cut pipeline construction is not the worst case activity, so this limitation would not affect the conclusion on significance of residual effects, but it could introduce additional locations where mitigation is required.

15.6.16 The Outline CEMP (Document reference 7.1, DCO Volume 7) (see section 15.4) requires that the Contractor will produce an NVMP, to be submitted post-consent and prior to construction, that is based on the final construction methods, programme and Proposed Development design. This NVMP will include updated noise modelling and assessments in order to identify appropriate secondary mitigation measures to reduce construction noise effects. Hence, irrespective of

the limitations identified in relation to construction phase effects, these would be no worse than those which have been assessed.

15.6.17 Construction and operational phase noise and vibration impacts from a proposed pedestrian crossing and footpath at the WRP site are anticipated to be negligible and are excluded from the assessment scope. Similarly, a number of temporary structures have been identified as potentially requiring removal in Section H, Section J and Section L of the proposed Pipeline between the WRP site and Otterbourne Water Supply Works. The small structures will be dismantled and/or relocated as part of pre-construction/enabling activities and this will not require any additional plant or labour. Hence, the assessment identifies the potential likely worst case noise impacts from the pre-commencement/enabling activities and the removals works won't change this analysis so are excluded from the assessment scope.

15.6.18 Most of the INNS Treatment works involves the re-use of existing infrastructure at the Otterbourne WSW. The worst case scenario for noise and vibration is the potential requirement to construct a new INNS Treatment building which could be located anywhere in the INNS Treatment Limits of Deviation at Otterbourne WSW. An assessment of potential construction noise and vibration effects has been undertaken, assuming that the new building is constructed at the closest point within the Limits of Deviation to the nearby receptors.

15.6.19 Two noise impact assessments were undertaken for proposed upgrades to the Otterbourne WSW in 2019 (Capital Maintenance (Phase 2) Project) [49] and 2023 (Phases 2 and 3) [50]. Both assessments were based on a baseline noise level survey undertaken in 2018 and modelling of operational noise emissions. The Phase 2 improvements of the WSW were operational at the time of the baseline surveys undertaken in June to October 2024 to inform this assessment (as described in section 15.7). The assessment of operational noise impacts from the INNS Treatment plant at Otterbourne WSW has therefore used the 2018 survey to determine the baseline, and used the modelling undertaken in 2023 to identify the Otterbourne WSW noise emissions prior to the introduction of the INNS Treatment plant. The use of a 2018 baseline avoids the noise emissions from the Phase 2 improvements from being included in the baseline for this assessment. Likely worst case effects are therefore assessed due to the combined noise from the upgrades to Otterbourne WSW and the INNS Treatment plant. This assessment is therefore reliant on the robustness and accuracy of the survey and modelling data described in these reports, which were undertaken by a third party and have not been explicitly validated. The reports are considered to demonstrate application of best practice, compliance with relevant guidance and appropriate professional experience of the authors such that these data are considered reliable for use in this assessment.

15.6.20 The Phase 3 upgrades introduced three back-up power generators to be used in the event of a mains power outage; as they would only be used in an emergency and are not associated with the Proposed Development, their noise emissions have been excluded from this assessment.

15.6.21 The assessment considers the potential likely worst case effects due to operational noise from the INNS Treatment plant at Otterbourne WSW by assuming that a new building will be required and that this will be located at the closest point of the Limits of Deviation to the nearby receptors. Other design options for the INNS Treatment

at Otterbourne WSW involve re-use of existing infrastructure, which are anticipated to result in lower noise levels at receptors than the assumption of a proposed new building at a worst case location.

15.7 Baseline conditions

15.7.1 To provide an assessment of the likely significant effects of the Proposed Development (in terms of noise and vibration), it is necessary to identify and understand the baseline conditions in the study area. This provides a reference point against which potential changes in noise and vibration can be assessed.

Current baseline

15.7.2 This section provides a summary of baseline conditions in respect of noise and vibration, including the presence of the following within the maximum distances from the Proposed Development identified in paragraph 15.5.8:

1. NVSRs – residential dwellings and non-residential sensitive sites such as schools, parks, places of worship and particularly vibration sensitive locations such as buildings containing potentially vibration sensitive equipment (such as scientific laboratories or microelectronics manufacturing).
2. Road traffic NIAs – locations where the highest 1% of road traffic noise levels have been predicted, according to the Round 3 strategic noise mapping undertaken by Defra as part of its obligations under the END (2002/49/EC) [51], implemented in England by the Environmental Noise (England) Regulations 2006 (as amended) [5].

15.7.3 In addition to the above, the results of the baseline noise level surveys undertaken in June to October 2024 are provided. L_{Aeq} noise levels presented for the BS5228 assessment periods have been corrected, for differences in screening and distance to any dominant road traffic noise sources, as per section 5 of ES Appendix 15.4 Acoustic terminology and baseline, Volume II (Document reference 6.2, DCO Volume 6). For each survey location, the NVSRs intended to be represented are also presented.

15.7.4 Baseline information for each of the principal components set out in ES Chapter 3 Description of the Proposed Development, Volume I (Document reference 6.1, DCO Volume 6) is set out below.

The Water Recycling Plant site

15.7.5 The closest high sensitivity (refer to Table 15-8 for sensitivity definitions) human NVSRs have been identified to be the two residential dwellings at the end of Mill Lane to the north, at a minimum of around 180m from the Order Limits at the WRP site. These are identified as R1 (R denoting 'Receptor') and shown in ES Figure 15.1 Noise and vibration direct effects study areas, sensitive receptors and monitoring locations, Volume III (Document reference 6.3, DCO Volume 6).

15.7.6 No NIAs have been identified within 300m of the Order Limits at the location of the WRP site.

15.7.7 The Broadmarsh Business and Innovation Centre (R2) is around 70m from the Order Limits and is deemed a medium sensitivity NVSR. No businesses in this centre have been identified which would warrant a higher sensitivity classification.

15.7.8 The location of the WRP site is surrounded to the north and west by trunk roads (the A27 and A3(M)). Traffic on these roads is likely to be the dominant source in the baseline noise climate. Strategic noise mapping indicates baseline road traffic noise levels at the NVSRs on Mill Lane (the façades of the nearest noise sensitive buildings) are likely to be between 65 and 70dB $L_{Aeq,16h}$ (daytime) and 55 to 60dB $L_{Aeq,8h}$ (night-time).

15.7.9 Summaries of the results obtained from the attended and unattended noise measurements are presented in Table 15-20 and Table 15-21 respectively.

Table 15-20 Attended baseline noise measurement results – locations representative of receptors around the Water Recycling Plant site

Measurement position	Daytime (7:00am to 7:00pm) average noise level $L_{Aeq,12h}$ (dB)	Evening (7:00pm to 11:00pm) average noise level $L_{Aeq,4h}$ (dB)	Night-time (11:00pm to 7:00am) average noise level $L_{Aeq,8h}$ (dB)	Representative receptors
MN2	51	-*	-	Centre of R165 Broadmarsh Coastal Park
**Only daytime measurements undertaken as receptor is not sensitive at night*				

Table 15-21 Unattended minimum four-day duration baseline noise measurement results – locations representative of receptors around the Water Recycling Plant site

Measurement position	Representative daytime (7:00am to 11:00pm) background sound level $L_{A90,15min}$ (dB)	Representative night-time (11:00pm to 7:00am) background sound level $L_{A90,15min}$ (dB)	Representative receptors
ME5-1	57	45	R1, R2 - Broadmarsh Business and Innovation Centre, FR1 - Land south of Lower Road, R11 - Old Mill house

Pipelines between Budds Farm Wastewater Treatment Works and the Water Recycling Plant site

15.7.10 No human NVSRs have been identified within the direct effects study areas related to the Pipelines between Budds Farm Wastewater Treatment Works and the WRP site, other than those already captured in the description of the baseline around the WRP site.

Pipelines between the Water Recycling Plant site and Bedhampton Springs

15.7.11 The closest identified high sensitivity human NVSR to the Pipelines between the WRP site and Bedhampton Springs are two residential dwellings on Mill Lane (R1) at a minimum distance of around 6m from the Order Limits. Additional identified

high sensitivity NVSR are R3, which represents two residential dwellings at the northern end of Mill Lane at a minimum of around 75m from this section of the Order Limits, and R4, which represents two dwellings on Kings Croft Lane at a minimum distance of 19m.

15.7.12 No NIAs have been identified within 300m of this section of the Order Limits.

15.7.13 Strategic noise mapping indicates baseline road traffic noise levels at R3 and R4 are likely to be between 55 and 60dB $L_{Aeq,16h}$ and 50 to 55dB $L_{Aeq,8h}$.

15.7.14 No sources of audible operational noise are anticipated in the vicinity of the Pipelines between the WRP site and Bedhampton Springs; hence only 24-hour long unattended measurements were undertaken. A summary of the measurement results is presented in Table 15-22 (excluding those already reported in Table 15-20).

Table 15-22 24-hour duration unattended baseline noise measurement results – locations representative of receptors around the Pipelines between the Water Recycling Plant site and Bedhampton Springs

Measurement position	Daytime (7:00am to 7:00pm) average noise level $L_{Aeq,12h}$ (dB)	Evening (7:00pm to 11:00pm) average noise level $L_{Aeq,4h}$ (dB)	Night-time (11:00pm to 7:00am) average noise level $L_{Aeq,8h}$ (dB)	Representative receptors
ME4-1	56	54	51	R160 - Church of St Thomas, R163 - Bedhampton Community Centre, R194, R221 - Bedhampton Mariners Cricket Club and adjacent playing fields

Pipeline between the Water Recycling Plant site and Otterbourne Water Supply Works

15.7.15 The Pipeline between the WRP site and Otterbourne WSW (Sections D to M) runs through the residential areas of Farlington, Widley, Knowle, Wickham, Shedfield, Shirrell Heath and near isolated individual dwellings to the south of Waltham Chase, Bishops Waltham and Newtown.

15.7.16 Within the study area, 169 residential (i.e. high sensitivity) and 55 non-residential (sensitivity ranging from medium to very high) NVSRs have been identified, as detailed in ES Appendix 15.4 Acoustic terminology and baseline, Volume II (Document reference 6.2, DCO Volume 6). These are considered representative of the locations most likely to be potentially affected by noise and vibration from this component of the Proposed Development.

15.7.17 Three NIAs have been identified within 300m of the Order Limits:

1. ID 1855 on the A3(M), the asset owner is NH (Section D: The WRP site to Portsdown Hill)

2. ID 12609 on the A3, the asset owner is PCC (Sections D and E: Portsdown Hill to Boarhunt)
3. ID 6021 is on the M3, the asset owner is NH (Section M: Brambridge to Otterbourne WSW)

15.7.18 Strategic noise mapping indicates that the baseline noise levels at the NVSRs in the vicinity of A2030, A3(M) and the A27 range from 60 to 70dB $L_{Aeq,16h}$ and 55 to 65dB $L_{Aeq,8h}$. At NVSRs in proximity to A32, B2177 and the A334 the noise levels range from 55 to 65dB $L_{Aeq,16h}$ and 50 to 60dB $L_{Aeq,8h}$. At all other NVSR locations, Defra has not produced strategic noise mapping, indicating that the baseline noise levels at the NVSRs are likely to be less than 55dB $L_{Aeq,16h}$ and less than 50dB $L_{Aeq,8h}$.

15.7.19 Summaries of the results obtained from the 24-hour and minimum four-day duration noise measurements are presented in Table 15-23 and Table 15-24, for BS5228 and BS4142 assessment periods and metrics respectively.

Table 15-23 24-hour duration unattended baseline noise measurement results – locations representative of receptors around Sections D to M of the pipeline

Measurement position	Daytime (7:00am to 7:00pm) average noise level $L_{Aeq,12h}$ (dB)	Evening (7:00pm to 11:00pm) average noise level $L_{Aeq,4h}$ (dB)	Night-time (11:00pm to 7:00am) average noise level $L_{Aeq,8h}$ (dB)	Representative receptors
ME6-1	61	60	52	R164 - Fort Purbrook Activity Centre, R16 and, R17
ME13-3	51	44	36	R214
ME16-1	53	48	46	R161 - WMD Studios, R28 and , R29
ME17-1	53	44	45	R82 - Church of St Nicholas, R30, and R31
ME18-1	50	48	42	R33, and R34
MN1	49	43	37	R46
MW21	61	56	51	R54, R55 and, R58
MW17-1	70	67	62	R91 - The Forge, R89 and, R92
MW19-3	54	50	45	R68, R69, R70, R180, R181 and, R272
MW14	68	64	59	R98, R99, R100, R101, R184 and, R185
MW13	50	44	36	R256 - Play space at Torbay Farm, R255 - Allotments, football pitch and cricket club off Albany Road, R257 - A E Roberts, Woodlea Nurseries

Measurement position	Daytime (7:00am to 7:00pm) average noise level $L_{Aeq,12h}$ (dB)	Evening (7:00pm to 11:00pm) average noise level $L_{Aeq,4h}$ (dB)	Night-time (11:00pm to 7:00am) average noise level $L_{Aeq,8h}$ (dB)	Representative receptors
MW11	53	46	41	R104, R105, R109 and, R111
MW10	43	39	32	R106, R107 and R110
MW9-1	70	66	62	R118, R119 and, R120
MW8	52	47	41	R191
MW23	50	49	42	R128, R129, R130 and R131
MW6-1	46	41	41	R138 - Oakwood Lodge Farm Cottages and, R137
MW5	68	56	52	R143 - The Brambridge Arms and, R144
MW1-4	58	54	47	R150
MW4-1	59	50	42	R142, and R145
MW1	56	49	44	R153 - Oakwood Park Recreational Ground, Oakwood Park Play Area and Colden Common Football Club, R151, R152, R154 and, R156

Table 15-24 Minimum four-day duration unattended baseline noise measurement results – locations representative of receptors around Sections D to M of the pipeline

Measurement position	Representative daytime (7:00am to 11:00pm) background sound level $L_{A90,15min}$ (dB)	Representative night-time (11:00pm to 7:00am) background sound level $L_{A90,15min}$ (dB)	Representative receptors
ME10-1	39	29	R71 - Christ Church and, R20
MW22	41	28	R49, R64, R169 and, R273
ME19-1	47	27	R35 - Albany Business Centre, R36 - Albany Farm Care Home, and R37

Above Ground Plant

15.7.20 The IPSs are situated along the Pipeline between the WRP site and Otterbourne WSW; hence, the description of baseline conditions for these localities is also relevant to the AGP. However, due to the localised nature of the potential direct airborne impacts, specific information relating to the baseline in the operational

noise effects study area around each IPS has been identified. Traffic noise-related impacts are dependent on the road link and are not localised to the IPSs and. the NIAs in the relevant study areas are captured in the description of baseline conditions along the Pipeline between the WRP site and Otterbourne WSW.

Intermediate Pumping Station E

15.7.21 The closest high-sensitivity NVSRs to IPS-E are the residential dwellings on the east side of Dellcrest Path at around 150m away (R20). No high or very high sensitivity non-residential NVSRs have been identified within 500m of the IPS.

15.7.22 Strategic noise mapping indicates that the baseline noise levels at these NVSRs depend primarily on distance and screening from the A3 to the south and are predicted to range from 55 to 60dB $L_{Aeq,16h}$ and 50 to 55dB $L_{Aeq,8h}$.

15.7.23 Measurement location ME10-1 is representative of the identified receptors, the results of the baseline noise measurements at this location are detailed in Table 15-24. The representative background sound levels at this location are 39dB $L_{A90,15min}$ during the day and 29dB $L_{A90,15min}$ at night.

Intermediate Pumping Station F

15.7.24 The closest high-sensitivity NVSR to IPS-F is the Albany Farm assisted living residence (R36) on the east side of Wickham Road, at around 285m away. No high or very high sensitivity non-residential NVSRs have been identified within 500m of the IPS. The Albany Business Centre (R35) includes medium sensitivity offices at around 300m to the north-west of the site.

15.7.25 Strategic noise mapping indicates that the baseline noise levels at these NVSRs depend primarily on distance and screening from Wickham Road and range from 55 to 65dB $L_{Aeq,16h}$ and 50 to 60dB $L_{Aeq,8h}$.

15.7.26 Measurement location ME19-1 is representative of the identified receptors, the results are detailed in Table 15-24. The representative background sound levels at this location are 47dB $L_{A90,15min}$ during the day and 27dB $L_{A90,15min}$ at night.

Intermediate Pumping Station G

15.7.27 The closest high-sensitivity NVSRs to IPS-G are the residential dwelling and caravan (R49) on the south side of the unnamed road off Titchfield Lane, at around 12m to the south-west of the site, and the residential dwelling on Titchfield Lane (R169), at around 90m to the north-west. One high sensitivity non-residential NVSR (Kids Love Nature Wickham (a children's nursery)) (R50) has been identified at around 150m to the south-east of this IPS.

15.7.28 Strategic noise mapping indicates that the baseline noise levels in the vicinity are likely to depend primarily on distance and screening from Winchester Road, but Defra has not produced strategic noise mapping at the identified NVSRs, indicating that the baseline noise levels are likely to be less than 55dB $L_{Aeq,16h}$ and less than 50dB $L_{Aeq,8h}$.

15.7.29 Measurement location MW22 is representative of the identified receptors, the results are detailed in Table 15-24. The representative background sound levels at this location are 41dB $L_{A90,15min}$ during the day and 28dB $L_{A90,15min}$ at night.

Future baseline

15.7.30 The assessment of construction traffic noise impacts uses forecast traffic flows for the worst case 12-month construction period on each link. The peak year of construction is assumed to be 2031, which is the earliest that the peak construction traffic is anticipated. Later years would have higher baseline traffic flows so the calculated change in flows due to the Proposed Development is maximised by assuming the earliest possible construction year, thereby giving a worst case assessment.

15.7.31 The future baseline noise environment (i.e. identified receptors used in the assessment) includes committed developments for the assessment of operational phase impacts. The planning portals for each local planning authority have been reviewed in order to identify developments which could introduce future NVSRs with the potential to experience likely significant effects from the Proposed Development which are materially different to those identified in the current baseline. None of the identified developments were considered to have the potential to experience materially different construction phase effects from the NVSRs in the current baseline. Two developments were identified with the potential to experience materially different operational phase effects and have therefore been included in the assessment. These have been assigned 'Future Receptor' (FR) designations as follows:

1. FR1 – Manor Farm, Bedhampton, Phase 2 – residential development of up to 43 dwellings with associated infrastructure including access (HBC outline planning permission reference 24/00612), with proposed housing at a minimum of approximately 250m from the WRP site.
2. FR2 – Welborne Garden Village – residential development of up to 6,000 dwellings with associated infrastructure including access (FBC outline planning permission reference P/17/0266/OA). The neighbourhood known as Albany is the closest to the Proposed Development, with areas of residential development at a minimum of 22m from the site boundary to IPS-F. At the time of writing, a detailed planning application had not been submitted for the Albany neighbourhood; hence, the development layout is not fixed. To assess likely worst case impacts, it has been assumed that a dwelling would be located at the closest potential approach to IPS-F.

15.7.32 The assessments of other noise and vibration impacts have assumed that the future baseline noise conditions are similar to those which exist currently. This is in-line with good professional practice in noise and vibration EIA.

15.7.33 UK planning policy such as the NPPF requires that new development incorporates mitigation measures to reduce potential adverse noise impacts to a minimum. Hence, in general, developments which significantly increase noise in the study area would not be expected to be granted consent.

15.7.34 The baseline noise monitoring survey identifies the existing soundscape within the study area and the sources which are contributing to it. In the absence of evidence to the contrary, and in recognition of existing planning controls on noisy development (including future development), it is considered reasonable to assume that the contributing noise sources would not change over time. Hence, changes in future baseline noise levels will depend on the change in noise emissions from the identified sources.

15.7.35 In general, the sources which typically contribute to the baseline noise climate in the UK can be classified as transportation (aircraft, road traffic and railways), industrial and commercial (e.g. mechanical or electrical plant and farming machinery) and natural (e.g. animal calls, wind in trees, and water movement such as breaking waves or flowing rivers). At a particular location, the sources contributing to the baseline noise climate would depend on proximity to those noise sources and the noise emissions of those sources.

15.7.36 Transportation noise levels depend on individual vehicle (i.e. car, train or plane) noise levels and the frequency of events. Vehicle flows are generally expected to increase in line with expectations for macro-economic expansion; however, there is a clear trend for vehicle noise to be driven down by a combination of legislation, consumer expectations and the replacement of fossil fuels with electrical power sources. Similarly, industrial and commercial noise levels are reduced by the introduction of quiet machinery, but this is counter-balanced by site expansion and/or introduction of new development. Farm machinery noise levels would also be expected to reduce as old equipment is replaced with newer, quieter versions.

15.7.37 It is reasonable to anticipate that the trend for increased economic activity to increase baseline noise levels would be balanced out by the effect of planning controls and reductions in source noise emissions. This would result in no change in overall baseline noise conditions in the study area. No robust evidence has been identified that baseline noise levels are likely to reduce. Hence, construction and operational noise impacts are assessed against the current baseline.

15.8 Assessment of likely significant effects

15.8.1 This section presents the assessment of likely significant effects on noise and vibration resulting from the construction, operation and decommissioning of the Proposed Development. The likely significant effects of the Proposed Development are identified, taking into account primary and tertiary mitigation. Following assessment, the need for secondary mitigation is considered in section 15.9 and residual effects are explained in section 15.10.

Construction effects

The Water Recycling Plant site

15.8.2 The WRP site is anticipated to be constructed over an approximate three-year period. In order to assess the likely worst case effects, the construction activities for the WRP site have been grouped into work stages, each of which is anticipated to last for longer than one month. Due to this long duration, impacts are assessed against the SOAELs (identified in paragraph 15.5.30) and LOAELs (identified in paragraph 15.5.31 and the magnitude of impact criteria in Table 15-11). These work stages assume all sub-activities within the work stage occur simultaneously. The work stages are as follows:

1. Enabling works
2. Piling works
3. Pile caps and foundations civils' works
4. Buried utilities/civils' works (including cofferdam construction)

5. Steel frame building and cladding install
6. Site-wide Mechanical, Electrical, Instrumentation, Control and Automation install – Process plant
7. Site roads and reinstatement works

15.8.3 Also included in the modelling is the tunnelling of Section D of the Pipeline between the WRP site and Otterbourne WSW, which is understood to occur simultaneously with the WRP site construction works.

15.8.4 These activities would all be undertaken within the standard working hours for the Proposed Development (see ES Chapter 3 Description of the Proposed Development, Volume I (Document reference 6.1, DCO Volume 6)).

15.8.5 The construction activities have the potential to cause airborne noise (all work stages as listed above) and ground-borne vibration (cofferdam construction using sheet piling and ground compaction using vibratory compactor) impacts. ES Chapter 3 Description of the Proposed Development, Volume I (Document reference 6.1, DCO Volume 6)) states that bored piling methods would be used to construct the WRP. Bored piling generates low levels of vibration; hence, piling has been excluded from the assessment of vibration impacts for this component.

Airborne noise – residential NVSRs

15.8.6 In accordance with Rochdale envelope approach (as described in Planning Inspectorate Advice Note Nine: Rochdale Envelope [52][3]), worst case assumptions have been made in the construction noise level predictions (for example in terms of plant noise levels, on-time factors and locations (as detailed in section 15.6). Implementation of BPM (which is secured in the Outline CEMP (Document reference 7.1, DCO Volume 7) as described in section 15.4) is anticipated to result in lower noise levels at NVSRs than predicted. Implementation of BPM would also be expected to increase the potential tolerance of residents to periods of high noise levels, for example through providing clear lines of communication. It is not possible to robustly quantify these reductions in impact. Therefore, a worst case assessment has been undertaken which does not specifically account for many of the potential benefits of BPM.

15.8.7 The detailed calculations presented in ES Appendix 15.1 Construction noise and vibration assessment, Volume II (Document reference 6.2, DCO Volume 6), show that the worst case predicted construction noise levels at any residential NVSR are 59dB $L_{Aeq,T}$ (at R1), i.e. below the LOAEL (of 65dB $L_{Aeq,T}$, as identified in paragraph 15.5.31).

15.8.8 These works would last for more than one month; hence, the criteria in Table 15-11 are applicable. ES Appendix 15.1 Construction noise and vibration assessment, Volume II (Document reference 6.2, DCO Volume 6) shows that, at all residential NVSRs, the impact during the daytime is negligible and during the evening and weekends period, the likely worst case impact is minor. The only time when construction is proposed to be undertaken during the 'evening and weekends' period in BS 5228-1 is from 13:00 to 17:00 on a Saturday. The sensitivity of

[3] The Rochdale Envelope approach involves assessing the maximum parameters for the elements of the Proposed Development where flexibility needs to be retained over certain details which are not finalised at the time of the application.

residential NVSRs is high; hence, without secondary mitigation, according to Table 15-9, the significance of these temporary, short-term effects would be neutral during the daytime and minor adverse during the evenings and weekends, which is not significant.

Airborne noise – non-residential noise and vibration sensitive receptors

15.8.9 The detailed calculations presented in ES Appendix 15.1 Construction noise and vibration assessment, Volume II (Document reference 6.2, DCO Volume 6), shows that the worst case predicted noise level from the construction of the WRP site, at non-residential NVSRs, is 65dB $L_{Aeq,T}$ at R165 (Broadmarsh Coastal Park) i.e. below the SOAEL (of 75dB $L_{Aeq,T}$, as identified in paragraph 15.5.30) but equal to the LOAEL. This assessment considers impacts on human NVSRs; hence, this park is only sensitive to noise when people are present, which will be during occasional visits. Hence, adverse effects on health and quality of life are not anticipated and the LOAEL does not apply to R165. Nevertheless, the identified primary and tertiary mitigation measures (described in section 15.4) will be applied to the works and demonstrate compliance with the second aim of the NPSE (to mitigate and minimise adverse effects).

15.8.10 ES Chapters 8 Terrestrial and freshwater biodiversity, Volume I (Document reference 6.1, DCO Volume 6), ES Chapter 12 Land use and agriculture, Volume I (Document reference 6.1, DCO Volume 6) and ES Chapter 13 Landscape and visual, Volume I (Document reference 6.1, DCO Volume 6) consider potential effects of noise and vibration on other receptor types/topics.

15.8.11 This predicted noise level at R165 equates to a moderate impact during the daytime and a major impact during the evenings and weekends. Impacts at all other NVSRs are no worse than minor.

15.8.12 According to Table 15-8, the sensitivity of R165 during the daytime is medium. The noise level calculation point for R165 is set 10m back from the closest approach of the park to the WRP site. Across most of this park, noise levels are anticipated to be below 65dB L_{Aeq}. On this basis, construction noise impacts during the daytime are minor and during the evening and weekends are moderate, equating to temporary, short-term effects of neutral and minor adverse significance respectively, which are not significant.

Ground-borne vibration from sheet piling and ground compaction

15.8.13 Table 15-25 lists the minimum set-back distances at which the vibration level criteria relevant to the potential for human annoyance (see Table 15-14) and cosmetic building damage (see Table 15-16) are calculated to occur for sheet piling and ground compaction activities. The building damage criteria for continuous vibration have been applied to all activities except percussive piling, which is considered transient. These set-back distances are relevant to all components of the Proposed Development where the relevant activity is proposed.

Table 15-25 Ground-borne vibration set-back distances, vibratory compaction

Activity	Set-back distance at which vibration level (PPV indoors, ground-floor) occurs for human annoyance impacts (m)			Set-back distance at which level (PPV outdoors) occurs for building damage impacts (m)		
	Minor (0.3mm.s^{-1} (LOAEL))	Moderate (1.0mm.s^{-1} (SOAEL))	Major (10mm.s^{-1})	Minor	Moderate	Major
Sheet piling (vibratory)*	292	116	20	15	9.1	5.3
Sheet piling (percussive)*	675	270	46	36	21	18
Vibratory compaction (start-up)	123	48	7.2	5.5	2.7	1.1
Vibratory compaction (steady state)	87	38	7.3	5.8	3.2	1.5

* Calculation methods are only validated up to distances of up to 111m from the piling; hence, calculations of distances further than this should be treated with caution

15.8.14 The only identified NVSRs within the 100m study area for ground-borne vibration effects are the medium sensitivity offices at R2. This receptor type is not used as a residence and the occupants are considered unlikely to be particularly sensitive to vibration; hence, as discussed in paragraph 15.5.26, it is not considered appropriate to apply the LOAEL and SOAEL at R2. This receptor is a minimum of 60m from the closest location at which ground compaction works could be undertaken, and 50m from the cofferdam location.

15.8.15 Based on the results in Table 15-25, when ground compaction activities are undertaken within 87m (steady state running) or 123m (start-up and shut-down) of R2, human annoyance impacts of minor magnitude could occur. The effect would be temporary, short-term and, according to Table 15-9, neutral, which is not significant.

15.8.16 The compaction activities would be further than 6m from the closest identified NVSR; hence, building damage impacts would be negligible. Receptor sensitivity is medium; hence, the effect would be temporary, short-term and neutral, which is not significant.

15.8.17 If sheet piling is used to construct the cofferdam, human annoyance impacts of moderate magnitude could occur. The effect would be temporary, short-term and minor, which is not significant.

15.8.18 The piling activities would be further than 36m from the closest identified NVSR; hence, building damage impacts would be negligible. Receptor sensitivity is medium; hence, the effect would be temporary, short-term and neutral, which is not significant.

Pipelines between Budds Farm Wastewater Treatment Works and the Water Recycling Plant site

15.8.19 As discussed in section 15.7, no human NVSRs have been identified within the direct effects study areas related to the Pipelines between Budds Farm Wastewater Treatment Works and the WRP site, other than those already

captured in the description of the baseline around the WRP site. Hence, the effects from construction of this aspect of the Proposed Development are captured in the assessment of effects from construction works at the WRP site

Pipelines between the Water Recycling Plant site and Bedhampton Springs

15.8.20 The Pipelines between the WRP site and Bedhampton Springs comprise two sections of trenchless construction, two sections of open-cut construction and a section of above-ground pipeline construction works. The construction activities have the potential to cause airborne noise (temporary construction compound setup, trenchless construction works and above-ground pipeline construction) and ground-borne vibration (trenchless crossing pit construction, microtunnelling and ground compaction) impacts. These activities would occur simultaneously with construction of the tunnel shaft in the WRP site for Section D of the Pipeline between the WRP site and Otterbourne WSW; hence, noise from this activity has been included in the modelling, where appropriate.

15.8.21 Temporary construction compound setup is anticipated to last for less than one month but more than ten days in any 15 consecutive days; hence, the month-long (i.e. magnitude of impact) criteria in Table 15-11 are not applicable to this activity.

Airborne noise – residential noise and vibration sensitive receptors

15.8.22 The results of the airborne noise modelling of each construction activity are presented in ES Appendix 15.1 Construction noise and vibration assessment, Volume II (Document reference 6.2, DCO Volume 6). Based on these results, the magnitude of impact from the worst case activity at residential NVSRs has been identified.

15.8.23 The predicted noise levels exceed the daytime SOAEL (of 75dB $L_{Aeq,T}$, as identified in paragraph 15.5.30) by 2 or 3dB at the worst-affected NVSR (R1). Works which exceed the SOAEL are trenchless crossing shaft excavation, micro-tunnelling and pipe installation in temporary construction compound B-1. Without mitigation, these predicted exceedances of the SOAEL could cause significant adverse effects on health and quality of life, which must be avoided to comply with the first aim of the NPSE.

15.8.24 The remaining predicted worst case daytime construction noise levels are between the LOAEL and SOAEL at R3 and below the LOAEL at all other identified residential NVSRs. The predicted exceedances of the LOAEL must be *"mitigated and minimised"* in accordance with the second aim of the NPSE (to mitigate and minimise adverse effects). The identified primary and tertiary mitigation measures (described in section 15.4) demonstrate compliance with this aim.

15.8.25 The impact magnitude of activities lasting at least one month have been determined using the criteria in Table 15-11. During the daytime, likely worst case predicted impacts are major at R1 and moderate at R3. During the evenings and weekends period, the following likely worst case (moderate and major only) impacts are predicted:

1. Major at R1 and R3 (trenchless crossing shaft excavation, micro-tunnelling and pipe installation in temporary construction compound B-1 and temporary construction compound B-2, respectively).

2. Moderate at R194 (trenchless crossing shaft excavation, micro-tunnelling and pipe installation in temporary construction compound B-2).

15.8.26 The criteria for moderate impacts are exceeded during the evenings and weekends by a maximum of 10dB (pipeline installation noise at R1).

15.8.27 The only proposed night-time works for the construction of the Pipelines between the WRP site and Bedhampton Springs are in the WRP site. Impacts from these works are below the LOAEL and of negligible impact at all residential NVSRs.

15.8.28 Residential NVSRs are of high sensitivity; hence, the predicted moderate and major impacts result in moderate adverse and major adverse effects, respectively. Without secondary mitigation, these temporary short-term effects are considered likely significant. Likely worst case effects at each identified residential NVSR are detailed in Table 15-26.

Table 15-26 Predicted likely worst case construction noise effects at residential receptors along the Pipelines between the Water Recycling Plant site and Bedhampton Springs

NVSR	Location	Likely worst case level of effect (all temporary, short-term and adverse)		
		Daytime	Evenings and weekends	Night
R1	Mill Lane, Bedhampton	Major	Major	Neutral
R3	Mill Lane, Bedhampton	Moderate	Major	Neutral
R4	Kings Croft Lane, Havant	Neutral	Neutral	Neutral
R194	Edward gardens, Havant	Minor	Moderate	Neutral

Airborne noise – non-residential noise and vibration sensitive receptors

15.8.29 The predicted noise levels at non-residential NVSRs have been compared against the daytime and night-time LOAEL and SOAEL values identified in paragraphs 15.5.31 and 15.5.30 respectively. During the daytime, predicted noise levels are below the LOAEL except at three NVSRs, at which they are between the LOAEL and SOAEL. At night, predicted construction noise levels are below the LOAEL at all non-residential NVSRs except R165 (Broadmarsh Coastal Park), where they exceed the SOAEL. This NVSR is not occupied at night; hence, the predicted exceedance of the SOAEL would not result in significant effects on health and quality of life. The first aim of the NPSE (to avoid significant effects on health and quality of life) is therefore complied with, without the need for secondary mitigation.

15.8.30 The predicted noise levels at non-residential NVSRs have also been compared against the criteria in Table 15-11 to determine the magnitude of impact.

15.8.31 During the daytime, all likely worst case impacts are no worse than minor, except for moderate impacts at:

1. R165 (Broadmarsh Coastal Park), due to trenchless crossing shaft excavation works in the WRP site.

15.8.32 During the evenings and weekends period, the likely worst case impacts are:

1. Moderate at R11 (Old Mill House), due to shaft excavation, micro-tunnelling and pipe installation works in temporary construction compound B-1.

2. Major at R165 (Broadmarsh Coastal Park), due to trenchless crossing shaft excavation, micro-tunnelling and pipe installation works in the WRP site.
3. Moderate at R2 (Broadmarsh Business and Innovation Centre), due to shaft excavation works in the WRP site.
4. Moderate at R160 (Church of St Thomas), due to shaft excavation, micro-tunnelling and pipe installation works in temporary construction compound B-1.

15.8.33 All other impacts during the evenings and weekends are no worse than minor. Impacts from trenchless construction works at night are major at R165 and negligible at all other NVSRs.

15.8.34 R11 is of high sensitivity; hence, the predicted moderate impact equates to effects of moderate (evenings and weekends) significance, which is likely significant. The predicted likely worst case noise level is equal to the evenings and weekends moderate impact threshold at this NVSR.

15.8.35 R2 and R160 are unoccupied and therefore not sensitive to noise during the proposed working hours in the evenings and weekends period (13:00 to 17:00 on Saturdays); hence, the effects on these NVSRs are neutral, which are not significant.

15.8.36 Across most of R165 (a medium sensitivity receptor), construction noise levels are anticipated to be below 65dB L_{Aeq}. On this basis, construction noise impacts during the daytime are minor, and during the evening and weekends are moderate, equating to neutral and minor adverse effects, respectively, which are not significant.

15.8.37 R11 is self-catering accommodation (high sensitivity) and the only non-residential NVSR of those identified in paragraphs 15.8.31 and 15.8.32 which is noise-sensitive at night, due to the presence of overnight guests. Night-time impacts at R11 are negligible; hence, all night-time effects at night are temporary, short-term and neutral, which are not significant.

15.8.38 Likely worst case effects at each identified non-residential NVSR are detailed in Table 15-27.

Table 15-27 Predicted likely worst case construction noise effects at non-residential receptors along the Pipelines between the Water Recycling Plant site and Bedhampton Springs

NVSR	Classification	Sensitivity	Likely worst case level of effect adverse		
			Daytime	Evenings and weekends	Night
R2	Business Park	Medium	Minor	Minor	Neutral
R11	Self-catering Accommodation	High	Minor	Moderate	Neutral
R160	Religious buildings and grounds	High	Minor	Minor	Neutral
R165	Open space and recreation	Medium	Minor	Minor	Neutral

NVSR	Classification	Sensitivity	Likely worst case level of effect adverse		
			Daytime	Evenings and weekends	Night
R221	Open space and recreation	Medium	Neutral	Neutral	Neutral

Ground-borne vibration from trenchless construction works

15.8.39 Table 15-28 lists the minimum set-back distances at which the vibration level criteria for human annoyance impacts are calculated to occur for vibratory piling and microtunnelling (criteria are as per Table 15-14). Also presented in the table are the minimum set-back distances at which the vibration level criteria for building damage impacts (shown in Table 15-16) are calculated to occur.

Table 15-28 Ground-borne vibration set-back distances for trenchless crossings and vibratory piling

Activity	Set-back distance at which vibration impact is predicted to occur for human annoyance (m)			Set-back distance at which vibration impact is predicted to occur for building damage (m)		
	Minor	Moderate	Major	Minor	Moderate	Major
Microtunnelling	39	15	1.7	1.4	Not anticipated	
Trenchless crossing shaft construction (vibratory piling)	292	116	20	15	9.1	5.3

15.8.40 The closest identified NVSR to the proposed trenchless crossing compounds is R1, at around 16m from the closest approach of temporary construction compound B1-1. The trenchless construction works have the potential to result in minor human annoyance impacts; hence the effect would be temporary, short-term and minor adverse which is not significant. The works would be further away than the identified distance threshold for the onset of minor building damage impacts; hence, the effect would be permanent and neutral which is not significant.

15.8.41 In order to determine impacts from vibratory piling of trenchless crossing shaft construction, the worst case location for a shaft has been identified. The orientation of the trenchless crossing between temporary construction compounds B1-1 and B1-2 requires that the shaft would be at the northern end of temporary construction compound B1-1, at a minimum distance of 25m from the closest residential property (R1). If vibratory piling is used for construction of a shaft at this location, moderate human disturbance impacts are predicted. Trenchless shaft construction is anticipated to last for ten days; the duration of vibratory piling is therefore anticipated to be shorter than this; hence, potential likely worst case human annoyance effects are temporary, short-term and minor adverse, which are not significant. The works would be further away than the identified distance threshold for the onset of minor building damage impacts; hence, these effects would be permanent and neutral which is not significant.

Ground-borne vibration from ground compaction works

15.8.42 Ground compaction activities are also anticipated within the trenchless crossing compounds. According to the results in Table 15-25, vibration levels may exceed the SOAEL at R1 and human annoyance impacts of moderate magnitude could occur. The duration of the ground compaction activities within 38m of R1 is considered unlikely to exceed the ten-day minimum period for the occurrence of likely significant effects. Hence, the level of human annoyance effects would be temporary, short-term and minor adverse, which is not significant. The works would be further away than the identified distance threshold for the onset of minor building damage impacts; hence, these effects would be permanent and neutral which is not significant.

Pipeline between the Water Recycling Plant site and Otterbourne Water Supply Works

15.8.43 Section D of the Pipeline between the WRP site and Otterbourne WSW would be constructed using tunnelling. Airborne noise from tunnelling activities would be emitted from the tunnel launch shaft which would be located at the temporary construction compound at the WRP site. The tunnel reception shaft would be located at temporary construction compound E-1 located north of Portsdown Hill Road (B2177) which would be accessed from Portsdown Hill Road (B2177). The tunnelling would occur simultaneously with WRP site construction. The impact of this simultaneous construction is determined in the assessment of WRP site construction effects and therefore the noise from WRP site construction and tunnelling of Section D is excluded from the modelling of noise from the construction of the Pipeline between the WRP site and Otterbourne WSW.

15.8.44 An intermediate tunnel shaft would be located within temporary construction compound D-1 located south of Portsdown Hill Road (B2177) and west of Gillman Road which would be accessed from Gillman Road.

15.8.45 The remaining Sections of the Pipeline between the WRP site and Otterbourne WSW (Sections E to M) are to be constructed using trenched open-cut methods, with some trenchless crossings proposed along the route.

15.8.46 The following construction activities have the potential to cause airborne noise impacts:

1. Temporary construction compound setup
2. Sectional site compound operation
3. Above Ground Plant construction
4. Tunnel shaft construction
5. Trenchless crossing shaft construction
6. Trenchless construction works (microtunnelling)
7. Open-cut road crossings
8. Open-cut trenching (mobile)

15.8.47 Tunnelling of section D could cause ground-borne noise and vibration impacts and ground compaction, tunnel shaft construction and vibratory piling of trenchless crossing shafts could cause vibration impacts.

Airborne noise – residential noise and vibration sensitive receptors

15.8.48 The works at the WRP site would occur simultaneously with works to construct Pipelines between the WRP site and Bedhampton Springs, and the airborne noise impacts of these simultaneous activities is assessed in the assessment of that element of the Proposed Development (see paragraphs 15.8.2 to 15.8.12). Hence, airborne noise impacts due to construction works in the WRP site have been excluded from the following assessment.

15.8.49 Due to the large number of residential NVSRs included in the construction noise modelling for the Pipeline between the WRP site and Otterbourne WSW, it is not considered appropriate to detail the predicted impact at each one in this section (details of predicted impacts are provided in ES Appendix 15.1 Construction noise and vibration assessment, Volume II (Document reference 6.2, DCO Volume 6). Based on the modelling results, the number of residential NVSRs at which potential noise impacts are below the LOAEL, between the LOAEL and SOAEL, and exceed the SOAEL, are shown in Table 15-29. The number of receptors potentially exposed to impacts of minor, moderate or major magnitude from construction works noise are shown in Table 15-30.

15.8.50 Detail on the predicted exceedances of the SOAEL are provided in Table 15-31. Detail on the predicted exceedances of the threshold value for moderate impacts are provided in Table 15-32.

Table 15-29 Number of residential noise and vibration sensitive receptors along the Pipeline between the Water Recycling Plant site and Otterbourne Water Supply Works at which impacts are less than Lowest Observed Adverse Effect Level, Lowest Observed Adverse Effect Level to Significant Observed Adverse Effect Level and greater than Significant Observed Adverse Effect Level

Activity	Daytime			Night		
	<LOAEL	LOAEL to SOAEL	>SOAEL	<LOAEL	LOAEL to SOAEL	>SOAEL
Temporary construction compound setup	123	32	0	N/A	N/A	N/A
Sectional site compound operation	138	17	0	N/A	N/A	N/A
AGP – BPT, IPS	34	8	0	N/A	N/A	N/A
Tunnel shaft construction	9	1	0	N/A	N/A	N/A
Trenchless crossing shaft construction	101	44	10	N/A	N/A	N/A
Open-cut road crossings	39	14	13	3	3	6
Open-cut pipe installation	62	81	7	N/A	N/A	N/A
Trenchless crossing	133	19	3	4	10	18

Table 15-30 Number of residential noise and vibration sensitive receptors along the Pipeline between the Water Recycling Plant site and Otterbourne Water Supply Works at which impacts are predicted

Activity	Daytime			Evening and weekends			Night		
	Minor	Moderate	Major	Minor	Moderate	Major	Minor	Moderate	Major
Temporary construction compound setup	3	6	0	1	12	5	N/A	N/A	N/A
Sectional site compound operation	17	16	0	36	51	17	N/A	N/A	N/A
AGP – BPT, IPS	3	8	0	2	5	8	N/A	N/A	N/A
Tunnel shaft construction	1	1	0	1	2	1	N/A	N/A	N/A
Trenchless crossing	23	18	2	16	42	20	2	11	19

Table 15-31 Predicted exceedances of the Significant Observed Adverse Effect Level at residential noise and vibration sensitive receptors along the Pipeline between the Water Recycling Plant site and Otterbourne Water Supply Works

NVSR	Location	Activity description	Activity location	Predicted exceedance of SOAEL (dB)	
				Daytime	Night-time
R24	Southwick Road, Portsmouth	Road crossing	Section E crossing Southwick Road	-	6
R26	Southwick Road, Portsmouth			-	1
R39	Hoads Hill, Wickham	Trenchless crossing**	Temporary construction compound G-1 and G-2	3	N/A*
R41	Mayles Lane, Wickham		Temporary construction compound G-3	1	
R49	Titchfield Lane, Wickham	Pipeline construction	Section G	5	
R51	Titchfield Lane, Wickham	Road crossing	Section G crossing Local Access Road	1	
R53	Titchfield Lane, Wickham	Pipeline construction	Section G	1	
R54	Winchester Road, Wickham	Trenchless crossing**	Temporary construction compound G-7 and H-1	2	
R55	Blind Lane, Wickham		Temporary construction compound H-1	1	
R66	High Street, Shirrell Heath	Trenchless crossing**	Temporary construction compound H-3	5	18
R68	Nightingale Crescent, Shirrell Heath		Temporary construction compound H-4	-	11
R69	High Street, Shirrell Heath			-	13
R70	High Street, Shirrell Heath			5	19
R86	High Street, Shirrell Heath		Temporary construction compound H-3 and H-4	-	4
R83	Castle Farm Lane, Wickham	Road crossing	Section G crossing Castle Farm Lane	6	N/A*
R87	Alma Lane, Upham	Road crossing	Section H crossing Alma Lane	1	4
R88	Sciviers Lane, Lower Upham	Road crossing	Section L crossing Sciviers Lane	1	N/A*
R93	Gamblins Lane, Shirrell Heath	Trenchless crossing**	Temporary construction compound H-4	4	17
R94	Gamblins Lane, Shirrell Heath			-	9

NVSR	Location	Activity description	Activity location	Predicted exceedance of SOAEL (dB)	
				Daytime	Night-time
R97	Sandy Lane, Waltham Chase	Pipeline construction	Section J	7	N/A*
R104	Wintershill, Durley	Trenchless crossing **	Temporary construction compound K-4	3	N/A*
R123	Mortimers Lane, Lower Upham	Road crossing	Section L crossing Mortimers Lane	-	10
R126	Mortimers Lane, Lower Upham			-	1
R132	Winchester Road, Fair Oak	Pipeline construction	Section J	1	N/A*
R140	Lordswood, Highbridge	Trenchless crossing**	Temporary construction compound L-9 and L-10	-	8
R141	Lordswood, Highbridge		Temporary construction compound L-10	-	12
R142	Highbridge Road, Highbridge		Temporary construction compound L-10	4	6
R144	Bambridge, Bambridge		Temporary construction compound L-10	-	2
R145	Highbridge Road, Highbridge		Temporary construction compound L-10	-	6
R147	Wardle Road, Highbridge			-	9
R170	Highbridge Road, Highbridge			4	0
R180	High Street, Shirrell Heath		Temporary construction compound H-4	-	13
R181			Temporary construction compound H-3	-	8
R182			Temporary construction compound H-3	-	10
R187	Prickets Hill, Shedfield		Haul route Section H (daytime) and Temporary construction compound H-3 (night-time)	1	1
R193	Sandy Lane, Waltham Chase	Road crossing	Section J crossing Sandy Lane	2	N/A*
R195	Private tracks, Shedfield		Section H crossing private tracks	4	
R196	Prickets Hill, Shedfield		Section H crossing Prickets Hill	3	

NVSR	Location	Activity description	Activity location	Predicted exceedance of SOAEL (dB)	
				Daytime	Night-time
R199	Titchfield Lane, Wickham		Section G crossing restricted Local Access Road	5	
R270	Pigeon House Lane		Section E	3	
R271	Forest lane, Wickham	Pipeline construction	Section F	2	
R272	Nightingale Crescent, Shirrell Heath	Trenchless crossing**	Temporary construction compound H-4	-	13
R274	Alma Lane, Upham	Road crossing	Section H crossing Alma Lane	-	14
R277	Mortimers Lane, Lower Upham		Section L crossing Mortimers Lane	-	16

* Night-time works lasting at least 10-days in 15 consecutive days are not proposed

** The worst case daytime trenchless activity is shaft construction, while at night, it is microtunnelling

Table 15-32 Difference between predicted noise level and threshold level for moderate impacts at worst-affected noise and vibration sensitive receptors along the Pipeline between the Water Recycling Plant site and Otterbourne Water Supply Works

NVSR	Location	Activity description	Activity location	Difference between predicted noise level and threshold for moderate impact (dB)		
				Daytime	Evening and weekends	Night-time
R12	Bishop's Waltham	Compound operation	Temporary construction compound K-2	-	2	N/A*
R18	Grant Road, Havant	Tunnel shaft construction	Temporary construction compound D-1	-	1	
R19	Meadow Edge, Widley		Temporary construction compound E-1	6	16	
R20	Dellcrest Path, Widley	AGP Construction	BPT/IPS-E	-	1	

NVSR	Location	Activity description	Activity location	Difference between predicted noise level and threshold for moderate impact (dB)		
				Daytime	Evening and weekends	Night-time
R22	Portsdown Hill Road, Widley	Compound operation	Temporary construction compound E-2	-	3	
R28	Portchester Lane, Southwick		Temporary construction compound E-5	-	2	
R33	Whitedell Lane, Fareham	Trenchless crossing	Temporary construction compound F-1	-	9	
R39	Wickham Road, Wickham		Temporary construction compound G-1	6	9	
R40	Castle Lane, Wickham		Temporary construction compound G-1	-	4	
R41	Mayles Lane, Wickham		Temporary construction compound G-3	5	15	
R43	Manor close, Wickham		Temporary construction compound G-2	-	5	
R46	Tanfield Lane, Wickam		Temporary construction compound G-5	-	6	
R47	Tanfield Lane, Wickam		Temporary construction compound G-4	-	1	
R48	Mayles Lane, Wickham		Temporary construction compound G-3	-	6	
R49	Titchfield Lane, Wickham	AGP Construction	IPS-G/compound G-6	9	19	
R51	Titchfield Lane, Wickham		IPS-G/compound G-6	2	12	
R52	Titchfield Lane, Wickham		IPS-G/compound G-6	1	11	

NVSR	Location	Activity description	Activity location	Difference between predicted noise level and threshold for moderate impact (dB)		
				Daytime	Evening and weekends	Night-time
R53	Titchfield Lane, Wickham	Trenchless crossing	Temporary construction compound G-7	4	14	
R54	Winchester Road, Wickham		Temporary construction compound H-1	4	9	
R55	Blind Lane, Wickham		Temporary construction compound H-1	3	8	
R56	Blind Lane, Wickham		Temporary construction compound H-1	-	8	
R57	Draper Road, Wickham		Temporary construction compound H-1	-	7	
R59	Blind Lane, Wickham	Compound operation	Temporary construction compound H-2	-	9	
R60	Mill Lane, Wickham		Temporary construction compound H-2	-	4	
R62	Draper Road, Wickham	Trenchless crossing	Temporary construction compound H-1	-	5	
R64	Titchfield Lane, Wickham	AGP Construction	Temporary construction compound G-6	-	9	
R65	Pricketts Hill, Wickham	Compound operation	HGV movement in Section H	-	3	N/A*
R66	High Street, Shirrell Heath	Trenchless crossing	Temporary construction compound H-3	11	21	28
R68	Nightingale Crescent, Shirrell Heath		Temporary construction compound H-4	4	13	15

NVSR	Location	Activity description	Activity location	Difference between predicted noise level and threshold for moderate impact (dB)		
				Daytime	Evening and weekends	Night-time
R69	High Street, Shirrell Heath		Temporary construction compound H-4	6	15	17
R70	High Street, Shirrell Heath		Temporary construction compound H-4	11	20	23
R83	Castle Farm Lane, Wickham	Compound operation	HGV movement in Section F	-	3	N/A*
R86	High Street, Shirrell Heath	Trenchless crossing	Temporary construction compound H-3 and H-4	-	6	14
R90	Blackhorse Lane, Shirrell Heath		Temporary construction compound H-5 (daytime)/H-4 (night-time)	-	6	9
R93	Gamblins Lane, Shirrell Heath		Temporary construction compound H-4	10	20	27
R94	Gamblins Lane, Shirrell Heath		Temporary construction compound H-4	4	14	19
R97	Sandy Lane, Waltham Chase	Compound operation	HGV movement in Section J	-	3	N/A*
R103	Bishop's Waltham	Compound operation	Temporary construction compound K-2	-	4	N/A*
R104	Wintershill, Durley	Trenchless crossing	Temporary construction compound K-4	8	18	
R105	Wintershill, Durley	Compound operation	Temporary construction compound K-3	1	10	
R106	Manor Road, Durley	Trenchless crossing	Temporary construction compound K-4	3	13	

NVSR	Location	Activity description	Activity location	Difference between predicted noise level and threshold for moderate impact (dB)		
				Daytime	Evening and weekends	Night-time
R107	Manor Road, Durley		Temporary construction compound K-4	-	9	
R109	Sciver's Lane, Durley		Temporary construction compound K-4	-	6	
R110	Manor Road, Durley		Temporary construction compound K-3	-	4	
R111	Wintershill, Durley		Temporary construction compound K-4	-	2	
R112	Wintershill, Durley		Temporary construction compound K-5	-	5	
R114	Sciviers Lane, Durley	AGP construction	BPT-K	6	16	
R127	Winchester Road, Fisher's Pond	Trenchless crossing	Temporary construction compound L-5 and L-6	-	2	
R128	Winchester Road, Fair Oak			4	14	
R129	Winchester Road, Fair Oak	Compound operation	Temporary construction compound L-4	3	13	
R130	Winchester Road, Fair Oak		Temporary construction compound L-4	3	12	
R131	Winchester Road, Fair Oak		Temporary construction compound L-4	-	5	
R132	Winchester Road, Fair Oak	Trenchless crossing	Temporary construction compound L-3	-	6	

NVSR	Location	Activity description	Activity location	Difference between predicted noise level and threshold for moderate impact (dB)		
				Daytime	Evening and weekends	Night-time
R136	Main Road, Fair Oak		Temporary construction compound L-6	-	5	
R137	Nob's Crook, Fair Oak		Temporary construction compound L-8	-	3	
R139	Bishopstoke Lane, Highbridge	Trenchless crossing	Temporary construction compound L-9/L-10 (night-time)	-	3	9
R140	Lordswood, Highbridge			3	13	18
R141	Lordswood, Highbridge		Temporary construction compound L-10	4	14	22
R142	Highbridge Road, Highbridge	Temporary construction compound setup (daytime and evening and weekends), trenchless crossing (night-time)	Temporary construction compound L-10	7	16	13
R145	Highbridge Road, Highbridge	Trenchless crossing	Temporary construction compound L-10	1	5	15
R146	Lordswood, Highbridge		Temporary construction compound L-10	-	7	9
R147	Wardle Road, Highbridge		Temporary construction compound L-10	2	12	19

NVSR	Location	Activity description	Activity location	Difference between predicted noise level and threshold for moderate impact (dB)		
				Daytime	Evening and weekends	Night-time
R148	Bishopstoke Lane, Highbridge		Temporary construction compound L-10	-	5	9
R151	Greenacres Drive, Otterbourne		Temporary construction compound M-3	-	8	N/A*
R152	Greenacres Drive, Otterbourne		Temporary construction compound M-3	-	8	
R154	Greenacres Drive, Otterbourne		Temporary construction compound M-3	-	3	
R155	Highbridge Road, Highbridge		Temporary construction compound L-10	-	3	9
R156	Greenacres Drive, Otterbourne		Temporary construction compound M-3	-	6	N/A*
R167	Grindall Field, Wickam		Temporary construction compound G-1	-	3	
R169	Titchfield Lane, Wickham	AGP construction	IPS-G/compound G-6	4	14	
R170	Sciviers Lane, Lower Upham	Compound operation	HGV movement in Section K	-	3	
R172	Winchester Road, Wickham	AGP construction	Temporary construction compound G-6	-	10	

NVSR	Location	Activity description	Activity location	Difference between predicted noise level and threshold for moderate impact (dB)		
				Daytime	Evening and weekends	Night-time
R173	Bishopstoke Lane, Highbridge	Trenchless crossing	Temporary construction compound L-10	-	-	2
R178	St Annes, Shirrell Heath		Temporary construction compound J-1	-	4	N/A*
R179	Winchester Road, Shirrell Heath		Temporary construction compound H-5	-	6	-
R180	High Street, Shirrell Heath		Temporary construction compound H-4	5	14	17
R181	High Street, Shirrell Heath		Temporary construction compound H-3	-	10	12
R182	High Street, Shirrell Heath		Temporary construction compound H-3	1	11	20
R186	St Annes, Shirrell Heath		Temporary construction compound J-1	-	5	N/A*
R187	Prickets Hill, Shedfield		Temporary construction compound H-3	-	2	11
R188	High Street, Shirrell Heath		Temporary construction compound H-3	-	-	6
R189	High Street, Shirrell Heath		Temporary construction compound H-3	-	1	9
R191	Portsmouth Road, Fair Oak		Temporary construction compound L-2	-	7	N/A*
R192	Portsmouth Road, Fair Oak		Temporary construction compound L-2	-	4	

NVSR	Location	Activity description	Activity location	Difference between predicted noise level and threshold for moderate impact (dB)		
				Daytime	Evening and weekends	Night-time
R195	Pricketts Hill, Shedfield		Temporary construction compound H-3	-	2	5
R197	Private track, Otterbourne		Temporary construction compound M-1	-	1	-
R199	Titchfield Lane, Wickham	AGP construction	IPS G	-	10	N/A*
R214	New Down Lane, Widley		BPT/IPS E	-	3	
R272	Nightingale Crescent, Shirrell Heath	Trenchless crossing	Temporary construction compound H-3 and H-4	5	14	17
R273	Titchfield Lane, Wickham	AGP Construction	IPS-G/compound G-6	6	16	N/A*
R274	Alma Lane, Lower Upham	Compound operation	HGV movement in Section K	-	3	
* Night-time works lasting at least one month are not proposed						

15.8.51 It can be seen from Table 15-31 that the NVSR with the greatest predicted exceedance of the daytime and night-time SOAEL is R70 (5dB daytime and 19dB at night). The residential NVSRs with the potential to experience exceedances of the SOAEL are as follows:

1. Southwick Road, Portsmouth (R24 and R26)
2. Outskirts of Wickham (R39, R41, R49, R51, R53 to R55, R83 and R199)
3. Near the proposed trenchless crossing under High Street, Shirrel Heath (between temporary construction compound H-3 and temporary construction compound H-4) (R66, R68 to R70, R86, R93, R94, R180 to R182, R187 and R272)
4. Near the proposed trenchless crossing under Winters Hill, Durley (between temporary construction compound K-3 and temporary construction compound K-4) (R104)
5. Near the proposed trenchless crossing under Highbridge Road and the railway line, Highbridge (temporary construction compounds L-9 and L-10) (R88, R140 to R142, R144, R145, R147 and R170)
6. Alma Lane, Upham (R87 and R274)
7. Sandy Lane, Waltham Close (R97 and R193)
8. Outskirts of Lower Upham (R123, R126 and R277)
9. Outskirts of Shedfield (R187, R195 and R196)

15.8.52 Without mitigation, these predicted exceedances of the SOAEL could cause significant adverse effects on health and quality of life, which must be avoided to comply with the first aim of the NPSWRI and NPSE.

15.8.53 ES Appendix 15.1 Construction noise and vibration assessment, Volume II (Document reference 6.2, DCO Volume 6) includes information on the likely duration of 24-hr trenchless construction works. This shows that there are two trenchless crossings at which night-time works are anticipated to last for at least one month (WRP site to Budds Farm and Highbridge Road and Railway (compounds L-10 and M-1)) and one crossing anticipated to last 20 nights (High Street and Lane – compounds H-3 and H-4). The remaining night-time trenchless construction works are anticipated to last for up to 4 nights. To consider potential likely worst case impacts and recognising the particular sensitivity of the night-time period, the night-time trenchless construction works between H-3 and H-4 have been assessed for significant effects even though they are unlikely to last for one-month.

15.8.54 Table 15-32 shows that the worst-affected NVSRs due to impacts lasting at least one month during the daytime are R66 and R70, with an 11dB exceedance of the moderate threshold value, due to trenchless construction works in temporary construction compound H-4. During the evenings and weekends, R66, R70 and R93 are the worst-affected, with a 21dB exceedance at R66 and a 20 dB exceedance at R70 and R93 due to the trenchless construction works between temporary construction compounds H-3 and H-4. During the night, R66 is the worst-affected, with a 28dB exceedance due to trenchless construction works in temporary construction compound H-3. Residential NVSRs are of high sensitivity; hence, without mitigation, the predicted construction noise impacts of moderate and major magnitude result in temporary, short-term effects that are moderate

adverse and major adverse, respectively, which are considered likely significant in EIA terms. The residential NVSRs with the potential to experience major adverse effects are in the following areas:

1. West side of Dell Close and Meadow Edge, Widley (R19)
2. Outskirts of Wickham (R39, R41, R48, R49, R51 to R55, R60, R199, R273, R64, R169, R172, R199 and R273)
3. Near the proposed trenchless crossing under High Street, Shirrel Heath (between temporary construction compound H-3 and temporary construction compound H-4) (R66, R68 to R70, R86, R93, R94, R180 to R182, R187 and R272)
4. Near the proposed trenchless crossing under Winters Hill, Durley (between temporary construction compound K-3 and temporary construction compound K-4) (R104 to R106 and R114)
5. Eastern side of Hillview Manor Park, Fair Oak, Eastleigh (R128 to R130)
6. Near the proposed trenchless crossing under Highbridge Road and the railway line, Highbridge (temporary construction compounds L-9 and L-10) (R140 to R142, R145, R147 and R155)

Airborne noise – non-residential noise and vibration sensitive receptors

15.8.55 The details of the assessment methodology and results of the noise modelling of works, including the predicted magnitude of impact at each NVSR, are provided in ES Appendix 15.1 Construction noise and vibration assessment, Volume II (Document reference 6.2, DCO Volume 6).

15.8.56 The predicted noise levels at non-residential NVSRs have been compared against the daytime and night-time LOAEL and SOAEL values identified in paragraphs 15.5.31 and 15.5.30 respectively. Most of the predicted noise levels are below the LOAEL during the day and night, except for the following. During the daytime, predicted construction noise levels are between the LOAEL and SOAEL at thirteen NVSRs and above the SOAEL at R85 (site of Wickham Festival), R162 (Wickham Park Golf Club) and R269 (Cemetery at Old St Matthew's Church). None of these NVSRs are occupied for extended periods; hence, adverse effects on health and quality of life are not anticipated and it is not appropriate to apply the LOAEL and SOAEL at these locations.

15.8.57 At night, noise levels are between the LOAEL and SOAEL at two NVSRs and above the SOAEL at the following three NVSRs:

1. R67 (New Place Hotel) and R258 (The Alma Inn), due to trenchless construction works and road crossing works respectively. Individual residents of hotel accommodation are only present for short periods; hence, it is not considered that the predicted exceedances of the SOAEL at these NVSRs could result in significant effects on health and quality of life.
2. R259 (Upham Village Hall) due to road crossing works. This NVSR is not occupied at night; hence, the predicted exceedance of the SOAEL would not result in significant effects on health and quality of life.

15.8.58 The above demonstrates that the first aim of the NPSE (to avoid significant effects on health and quality of life) is complied with in relation to this impact at non-residential NVSRs, without the need for secondary mitigation.

15.8.59 The magnitude of impact and sensitivity of the NVSR have been used to identify the significance of the identified temporary, short-term effects, in accordance with Table 15-9. The predicted likely worst case effect, at each non-residential NVSR, is detailed in Table 15-33. For brevity, receptor names are excluded from the table but, for those NVSRs at which moderate or major impacts are predicted, names are provided in paragraph 15.8.60.

Table 15-33 Predicted construction noise effects at non-residential receptors along the Pipeline between the Water Recycling Plant site and Otterbourne Water Supply Works

NVSR	Classification	Sensitivity	Likely worst case significance of effect		
			Daytime	Evenings and weekends	Night
R35	Business park	Medium	Neutral	Neutral	Neutral
R36	Healthcare facilities	High	Neutral	Neutral	Neutral
R50	Schools and education	High	Moderate	Minor	Neutral
R67	Hotel	High	Minor	Moderate	Major
R71	Religious buildings and grounds	High	Neutral	Neutral	Neutral
R72	Restaurant	Medium	Neutral	Neutral	Neutral
R82	Religious buildings and grounds	Medium	Neutral	Minor	Neutral
R85	Open space and recreation	Medium	Neutral	Minor	Neutral
R91	Restaurant	Medium	Neutral	Neutral	Neutral
R113	Events venue	High	Moderate	Neutral	Neutral
R124	Open space and recreation	Medium	Neutral	Neutral	Neutral
R138	Hotel	High	Neutral	Minor	Neutral
R143	Restaurant	Medium	Neutral	Neutral	Neutral
R153	Open space and recreation	Medium	Neutral	Minor	Neutral
R161	Recording studio	Very high	Minor	Major	Minor
R162	Open space and recreation	Medium	Neutral	Minor	Neutral
R164	Community centres	High	Neutral	Neutral	Neutral
R166	Restaurant	Medium	Neutral	Minor	Neutral
R231	Open space and recreation	Medium	Neutral	Neutral	Neutral
R232	Open space and recreation	Medium	Neutral	Neutral	Neutral
R238	Gym	Medium	Neutral	Neutral	Neutral
R240	Gym	Medium	Neutral	Neutral	Neutral

NVSR	Classification	Sensitivity	Likely worst case significance of effect		
			Daytime	Evenings and weekends	Night
R246	Open space and recreation	Medium	Neutral	Neutral	Neutral
R247	Open space and recreation	Medium	Neutral	Neutral	Neutral
R249	Schools and education	High	Neutral	Minor	Neutral
R250	Open space and recreation	Medium	Neutral	Neutral	Neutral
R253	Open space and recreation	Medium	Neutral	Neutral	Neutral
R254	Restaurant	Medium	Neutral	Neutral	Neutral
R255	Open space and recreation	Medium	Neutral	Neutral	Neutral
R256	Open space and recreation	Medium	Neutral	Neutral	Neutral
R257	Shop	Medium	Neutral	Neutral	Neutral
R258	Hotel	High	Neutral	Neutral	Neutral
R259	Community centres	High	Neutral	Neutral	Neutral
R263	Open space and recreation	Medium	Neutral	Minor	Neutral
R264	Restaurant	Medium	Neutral	Neutral	Neutral
R265	Schools and education	High	Neutral	Neutral	Neutral
R267	Hotel	High	Neutral	Minor	Neutral
R268	Shop	Medium	Neutral	Neutral	Neutral
R269	Religious buildings and grounds	Medium	Neutral	Neutral	Neutral
R275	Community centres	High	Minor	Moderate	Neutral
R276	Healthcare facility	High	Neutral	Minor	Neutral

15.8.60 Moderate and major (i.e. potentially significant) adverse effects are predicted at the following NVSRs:

1. R50 (Kids Love Nature Kindergarten at Wickham) – moderate adverse during the daytime and major adverse during the evening and weekends due to IPS-G construction works; however, this NVSR is not noise sensitive during the evening and weekend period. Hence, daytime effects are considered likely significant without secondary mitigation and evening and weekend effects are not significant.
2. R67 (New Place Hotel) – moderate adverse during the evening and weekends and major adverse at night due to trenchless construction works in temporary construction compound H-4. The criteria in BS5228-1 for weekend working

provide periods of respite for dwellings exposed to high noise levels during normal weekdays, recognising that people are relaxing at home at these times; however, this is not likely to be the case for people staying in a hotel. Holiday accommodation is only occupied in short periods (typically one or two weeks at a time); hence, the potential for adverse effects to occur is reduced. In recognition of these ameliorating factors, it is not considered appropriate to apply the reduced (i.e. more onerous) evenings and weekends criterion to this NVSR and the daytime effect is considered representative. The identified night-time effects are considered likely significant without secondary mitigation.

3. R113 (Winters Hill Hall) – moderate adverse during the daytime and major adverse during the evening and weekends, due to BPT-K construction. This NVSR is an events venue and is generally not occupied for more than one day at a time. As with R67, it is not considered appropriate to apply the evenings and weekends criterion to this NVSR and the daytime effect is considered representative. These effects are considered likely significant without secondary mitigation.
4. R161 (WMD Studios) – major adverse during the evenings and weekends, due to operation of temporary construction compound E-5. This NVSR (a recording studio) will have a high degree of noise insulation incorporated into the building fabric in order to achieve appropriate internal noise levels for its function. It is therefore unlikely to be highly sensitive to changes in outdoor airborne noise levels. As with R67, it is not considered appropriate to apply the evenings and weekends criterion to this NVSR and the daytime effect is considered representative; hence, effects are not significant.
5. R275 (Park Place Centre) – moderate adverse during the evening and weekends, due to construction of IPS-G. This NVSR is occupied continuously by members of a religious order; hence, the identified effects during the evening and weekend period are considered representative, i.e. likely significant without mitigation.

Ground-borne noise – residential noise and vibration sensitive receptors

15.8.61 As explained in paragraph 15.5.38, ground-borne noise impacts are only assessed for tunnelling works; hence are only relevant to Section D of the Pipeline (the only section involving tunnelling). Table 15-34 lists the minimum set-back distances (slant distance from the top of the tunnel) at which the ground-borne noise level criteria for impacts on residential receptors (see Table 15-15) are calculated to occur for tunnelling activities.

Table 15-34 Ground-borne noise set-back distances, tunnelling, residential noise and vibration sensitive receptors along the Pipeline between the Water Recycling Plant site and Otterbourne Water Supply Works

Set-back distance at which ground-borne noise level occurs (m)		
Minor (35dB L_{ASmax})	Moderate (45dB L_{ASmax})	Major (50dB L_{ASmax})
50	33	26

15.8.62 The Limits of Deviation show that Section D of the Pipeline between the WRP site and Otterbourne WSW could be directly underneath residential NVSRs in Bedhampton and Portsmouth. Hence, the minimum distance to the NVSR is solely

dependent on the Pipeline depth. ES Chapter 3 Description of the Proposed Development, Volume I (Document reference 6.1, DCO Volume 6) states that the minimum tunnel launch shaft depth would vary from approximately 11m to approximately 21m below-ground level and (depending on ground-conditions) likely worst case impacts are expected at the minimum depth. The exact depth of the tunnel as it is underneath residential properties is not known but it is apparent that impacts of moderate and major magnitude could occur. However, the Tunnel Boring Machine (TBM) is anticipated to progress at a rate of around 20m per day; hence, noise levels are only anticipated to be above the major threshold for a maximum of one day and above the moderate threshold for a maximum of three days. Given this short duration of impact, the level of effect is considered no worse than minor adverse, which is temporary, short-term and not significant.

Ground-borne noise – non-residential noise and vibration sensitive receptors

15.8.63 Two non-residential NVSRs have been identified within 100m of the Limits of Deviation for Section D of the Pipeline between the WRP site and Otterbourne WSW. R72 (George Inn) is inside the Limits of Deviation and R164 (Fort Purbrook Activity Centre) is a minimum of 60m away. For both these NVSRs, the applicable indoor noise level criterion (see Table 15-13) is 40dB L_{ASmax}, which is calculated to occur at 40m from the tunnel.

15.8.64 It is therefore apparent that the criterion for potentially significant effects would not be exceeded at R164 (a high sensitivity receptor) but, based on the depth parameters used for the assessment on residential receptors, could be exceeded at R72 (medium sensitivity). Given the identified progression rate of around 20m per day; noise levels are only anticipated to be above the criterion for three days. Given this short duration of impact and that the sensitivity is medium, the level of effect is considered no worse than minor adverse, which is temporary, short-term and not significant.

Ground-borne vibration from tunnel construction works

15.8.65 Table 15-35 lists the minimum set-back distances at which the vibration level criteria for human annoyance impacts (criteria are as per Table 15-14) and building damage impacts (Table 15-16) are calculated to occur for tunnel shaft construction.

Table 15-35 Ground-borne vibration set-back distances for tunnel shaft construction along the Pipeline between the Water Recycling Plant site and Otterbourne Water Supply Works

Activity	Set-back distance at which vibration impact is predicted to occur for human annoyance (m)			Set-back distance at which vibration impact is predicted to occur for building damage (m)		
	Minor	Moderate	Major	Minor	Moderate	Major
Tunnel shaft construction	50	22	4.8	4.3	2.3	Not anticipated

15.8.66 The closest NVSR to a tunnel shaft is R19 (residential dwellings on Meadow Edge, Widley), which is around 11m from the Limits of Deviation within temporary construction compound E-1. At this distance, moderate human disturbance

impacts are predicted. Shaft construction is anticipated to last for 150 days. Hence, without mitigation, potential likely worst case human annoyance effects are temporary, short-term and moderate adverse, which are likely significant.

15.8.67 Table 15-15 details VDV vibration levels for the assessment of human annoyance effects from vibration due to tunnelling, based on guidance contained in BS 6472-1. ES Appendix 15.1 Construction noise and vibration assessment, Volume II (Document reference 6.2, DCO Volume 6), provides data from TRL Report 429 [53] which shows that the VDV due to tunnelling is highly unlikely to exceed $0.18ms^{-1.75}$ at any NVSR. This equates to a negligible impact during the day and night; hence, effects would be temporary, short-term and neutral, which is not significant.

15.8.68 Calculations have been undertaken of vibration emissions from tunnelling in order to assess the potential for building damage impacts to occur, as reported in ES Appendix 15.1 Construction noise and vibration assessment, Volume II (Document reference 6.2, DCO Volume 6). These show that the distance threshold for the onset of minor impacts is 11m from the tunnel. The tunnel depth is at least 11m; hence, building damage impacts are anticipated to be negligible and effects would be permanent and neutral, which is not significant.

Ground-borne vibration from trenchless construction works

15.8.69 The closest identified NVSR to a worst case location for a proposed trenchless crossing pit is R66 (residential dwelling on High Street in Shirrell Heath), at around 19m from temporary construction compound H-3. According to the distance thresholds in Table 15-28, the trenchless construction works have the potential to result in minor human annoyance impacts. Hence, the effects would be temporary, short-term and minor adverse, which are not significant. The works would be further away than the identified distance threshold for the onset of minor building damage impacts; hence, these effects would be permanent and neutral, which is not significant.

15.8.70 According to the results in Table 15-28, if vibratory piling is undertaken at the closest approach of this compound to the NVSR, major impacts are predicted. Trenchless shaft construction is anticipated to last for ten days; the duration of vibratory piling is therefore anticipated to be shorter than this; hence, potential likely worst case human annoyance effects are temporary, short-term and minor adverse, which is not significant. The works would be further away than the identified distance threshold for the onset of minor building damage impacts; hence, these effects would be permanent and neutral, which is not significant.

Ground-borne vibration from ground compaction works

15.8.71 Ground compaction is anticipated to be required at the proposed compounds and during re-instatement of the open-cut pipeline. For works at temporary construction compounds, R142 (residential dwelling on Highbridge Road, Highbridge) would be the worst-affected, at 6m from temporary construction compound L-10. Based on the results in Table 15-25, vibration levels may exceed the SOAEL, and human annoyance impacts of major magnitude could occur. Temporary construction compound setup is expected to last between 20 and 30 days. Ground compaction works would not be undertaken over this entire period and the compound sizes are

relatively large compared to the distance to the NVSR. The duration of the ground compaction activities within 38m (equipment start-up or shutdown) or 48m (steady state running) of any identified NVSR is not expected to exceed the 10-day minimum period for the occurrence of likely significant effects (as explained in paragraph 15.5.46). It is considered that the effect without mitigation is temporary, short-term and minor adverse which is not significant.

15.8.72 The identified NVSR which is sensitive to ground-borne vibration impacts and closest to the sections of the Order Limits involving open-cut trenching works has been identified as R49 (residential dwelling known as Meon Runn near to the proposed location of IPS-G), at around 1.5m from the closest approach of the Order Limits. There is also a residential caravan (R273) located inside the Order Limits next to this property. Vibration levels may exceed the SOAEL (1mm.s^{-1} as identified in Table 15-14), and human annoyance impacts of major magnitude could occur. However, as detailed in ES Appendix 15.1 Construction noise and vibration assessment, Volume II (Document reference 6.2, DCO Volume 6) re-instatement works are anticipated to progress at a rate of 300m/week or around 60m per day. The duration of the ground compaction activities within 38m (equipment start-up or shutdown) or 48m (steady state running) of any identified NVSR would not exceed the 10-day minimum period for the occurrence of likely significant effects (as explained in paragraph 15.5.46). It is considered that the effect without mitigation is therefore temporary, short-term and minor adverse which is not significant.

15.8.73 The compaction activities could be located at the identified distance threshold for the onset of major building damage impacts (30mm.s^{-1} as identified in Table 15-16). As discussed in paragraph 15.5.49, the assessment of building damage effects does not consider impact duration, to consider a potential worst case. Receptor sensitivity is high; hence, without mitigation, the effect would be permanent and major adverse which is likely significant.

Above Ground Plant

15.8.74 Construction noise and vibration impacts from construction of the AGP are included in the assessment of the Pipeline between the WRP site and Otterbourne WSW above. Hence, these are not discussed further in this section.

Invasive Non-Native Species Treatment at Otterbourne Water Supply Works

15.8.75 If required, the construction of the new INNS Treatment building would involve typical construction plant, working within the standard consented hours of the project. The building will have an approximate footprint of 288m^2, sit on shallow footings and no earthworks or piling are required. Details are provided in ES Chapter 3 Description of the Proposed Development, Volume I (Document reference 6.1, DCO Volume 6).

15.8.76 The closest receptors are on the west side of Otterbourne WSW and comprise Oakwood Park Recreational Area (R153) and the residential dwellings on the east side of Greenacres Drive (R156), at approximately 62m and 220m respectively from the INNS Treatment Limits of Deviation at Otterbourne WSW.

15.8.77 The works are commonplace and building construction occurs regularly at these distances from nearby receptors without causing significant disturbance. The good

practice mitigation measures identified in the Outline CEMP (Document reference 7.1, DCO Volume 7) (see section 15.4) will reduce noise and vibration emissions from the works. Given the standard nature of the proposed construction works and the control measures that will be in place, the impact of noise and vibration from construction of a new INNS Treatment building is considered no worse than minor. Receptor sensitivity is high; hence, the effect would be temporary, short-term and minor adverse which is not significant.

Noise from off-site construction traffic

15.8.78 ES Appendix 18.1 Transport assessment, Volume II (Document reference 6.2, DCO Volume 6), details the roads links subject to increased vehicle movements during the construction of the Proposed Development. These road links are presented in ES Figure 18.2 Heavy Goods Vehicle access routes, Volume III (Document reference 6.3, DCO Volume 6).

15.8.79 Traffic data for these road links were provided for a baseline plus committed development ('without the Proposed Development' scenario) and baseline plus committed development plus construction traffic ('with the Proposed Development' scenario). The data are provided for the peak year of construction, assumed to be 2031, which is the earliest that the peak construction traffic is anticipated. Later years would have higher baseline traffic flows so the calculated change in flows due to the Proposed Development is maximised by assuming the earliest possible construction year.

15.8.80 For each road link, BNLs were calculated with and without the Proposed Development to determine the short-term relative change from construction traffic. The road links assessed are provided in full detail in ES Report Appendix 15.2 Construction traffic noise assessment, Volume II (Document reference 6.2, DCO Volume 6).

15.8.81 Traffic data for these road links were also provided for a baseline without committed development scenario for the assumed peak construction year. In order to assess potential cumulative traffic noise effects, the change in BNL between the 'with Proposed Development' scenario and the 'baseline without committed development' scenario. The road links assessed are provided in full detail in ES Report Appendix 15.2 Construction traffic noise assessment, Volume II (Document reference 6.2, DCO Volume 6).

15.8.82 The CRTN calculation method does not account for any potential changes in vehicle noise over time. Hence, the magnitude of impact is only dependent on the change in traffic flow, so assuming the earliest realistic construction year ensures a likely worst case effect has been determined.

15.8.83 In the assessment of Proposed Development effects, a less than 1dB change in BNL (a negligible magnitude of impact according to Table 15-17) is predicted along all road links with a flow of more than 1,000 vehicles per 18 hrs. On New Down Lane, the flow is lower than this value; hence, the change in HGV noise has been calculated using alternative methodology to be 1.6dB (a minor magnitude of impact). These calculations are detailed in full in ES Report Appendix 15.2 Construction traffic noise assessment, Volume II (Document reference 6.2, DCO Volume 6).

15.8.84 In the assessment of cumulative effects, a negligible magnitude of impact is predicted along all road links except two (B2177 (4) and B3037), on which the impact is minor. It should be noted that the identified minor impact on both links is a result of the committed development traffic, impacts from the Proposed Development construction traffic are negligible.

15.8.85 To assess a potential likely worst case effect, there are assumed to be residential NVSRs along all the identified road links i.e. receptors of high sensitivity. The likely worst case effects on NVSRs, due to the identified minor magnitude impacts, would be temporary, short-term and minor, which is not significant.

Operational effects

15.8.86 In accordance with Rochdale envelope approach, worst case (i.e. maximum) plant noise emissions have been assumed (as detailed in section 15.6) in the operational noise level predictions. Implementation of the mitigation hierarchy included in the Design Principles Document (Document reference 5.11, DCO Volume 7) would result in lower noise levels at NVSRs than predicted. It is not possible to robustly quantify these reductions in impact. Therefore, a worst case assessment has been undertaken which does not account for this mitigation.

The Water Recycling Plant site

Airborne noise – residential noise and vibration sensitive receptors

15.8.87 As discussed in paragraph 15.5.56, an assessment has been undertaken in accordance with the guidance contained in BS4142:2014+A1:2019 to determine whether noise emissions associated with the operation of the WRP site is likely to give rise to adverse impacts at the closest residential receptors. Three-dimensional (3D) noise modelling has been undertaken to predict WRP site noise levels at the likely worst-affected residential NVSRs: R1 and R3 (residential dwellings on Mill Lane, R4 (two dwellings on Kings Croft Lane) and FR1 (proposed residential development at Manor Farm, Bedhampton). Modelling details and results are provided in ES Appendix 15.3 Operational noise assessment, Volume II (Document reference 6.2, DCO Volume 6).

15.8.88 According to BS 4142, the magnitude of impact at each NVSR is determined based on the difference between the background sound level and the predicted WRP site rating level. The significance of effect is determined considering the context in which the sound occurs.

15.8.89 Representative background sound levels at R1 and FR1 (see paragraph 15.8.91 to explain the omission of R3 and R4) have been identified from the baseline survey. The analysis undertaken to determine these values is described in ES Appendix 15.4 Acoustic terminology and baseline, Volume II (Document reference 6.2, DCO Volume 6). The sound emissions from the WRP site would be present 24 hours a day, seven days a week; hence, the noise impact at residential receptors has been assessed against the representative night-time background sound levels.

15.8.90 The rating level of the operational sound from the WRP site has been identified by considering whether any acoustic penalties are required. The sound would be relatively continuous and not contain significant peaks or tonal components;

hence, corrections for tonality, intermittency and impulsivity are not required. In order to consider a worst case scenario, a +3dB penalty for 'other sound characteristics' (specific sound will be "*readily distinctive against the residual acoustic environment*") has been applied.

15.8.91 Background sound levels are not available at all NVSRs at which the WRP site noise levels have been predicted. The modelling results in ES Appendix 15.3 Operational noise assessment, Volume II (Document reference 6.2, DCO Volume 6), show that predicted WRP site noise levels at the remaining NVSRs (R3 and R4) are at least 5dB lower than those at R1 and FR1. Background sound levels at R3 and R4 are highly unlikely to be 5dB lower than those at R1 and FR1, and therefore impacts would be worst case at R1 and FR1. Hence, the assessment has determined impacts on R1 and FR1 only, and these are considered below.

15.8.92 Table 15-36 presents the predicted WRP site operational noise levels at R1 and FR1, an assessment in accordance with BS 4142 and the comparison with the identified LOAEL and SOAEL values identified in Table 15-18.

15.8.93 The predicted noise levels, with the emergency generators running, and comparison with the threshold of 50dB L_{Aeq} for potentially likely significant effects, is presented in Table 15-37. Note this is a different assessment method from that which applies to operational noise without the generators; hence, the results are presented differently.

Table 15-36 Water Recycling Plant site operational noise assessment, residential noise and vibration sensitive receptors, generators not running

NVSR	Location	Predicted specific sound level (dB $L_{Aeq,T}$)	Rating level (dB $L_{Ar,T}$)	Night-time background sound level (dB L_{A90})	Difference between rating level and background sound level (dB)	Comparison with SOAEL and LOAEL	Magnitude of impact
R1	Mill Lane, Bedhampton	58	61	45	16	6dB above SOAEL	Major
FR1	Land south of Lower Road, Bedhampton	57	60	45	15	5dB above SOAEL	Major

Table 15-37 Water Recycling Plant site operational noise assessment, residential noise and vibration sensitive receptors, generators running

NVSR	Location	Predicted specific sound level (dB $L_{Aeq,T}$)	Difference between specific sound level and 50dB L_{Aeq} noise level threshold (dB)
R1	Mill Lane, Bedhampton	58	8
FR1	Land south of Lower Road, Bedhampton	58	8

15.8.94 It can be seen from Table 15-36 that predicted noise levels at the WRP site (with emergency generators not running) without mitigation are up to 6dB above the SOAEL. Hence, WRP site operational noise effects at residential NVSRs, without generator running, are permanent, major adverse and likely significant.

15.8.95 Table 15-37 shows that predicted noise levels at the WRP site (with emergency generators running) without mitigation are up 8dB above the threshold of 50dB L_{Aeq} explained in paragraph 15.5.62. As the generators would only run occasionally and for short periods, WRP site with generator running operational impacts at residential NVSRs are considered moderate and the receptor sensitivity is high. Effects without mitigation are therefore moderate adverse, temporary, long-term and likely significant.

Airborne noise – non-residential noise and vibration sensitive receptors

15.8.96 Potential noise impacts are only anticipated at two non-residential NVSRs: R2 (Broadmarsh Business and Innovation Centre) and R165 Broadmarsh Coastal Park. The noise level criterion at R2 is 55dB L_{Aeq} (as shown in Table 15-19) and at R165 (external amenity space) it is 50dB L_{Aeq}. The predicted operational noise levels are 58dB L_{Aeq} at R2 and 59dB L_{Aeq} at R165, with or without the generator running. Hence, at R2 the criterion is exceeded by 3dB and the criterion at R165 is exceeded by 9dB, with or without generators running.

15.8.97 Baseline sound levels were measured at location MN2 (as shown in ES Figure 15.1 Noise and vibration direct effects study areas, sensitive receptors and monitoring locations, Volume III (Document reference 6.3, DCO Volume 6) which is representative of the centre of R165 (Broadmarsh Coastal Park). To assess likely worst case impacts, the WRP site noise levels have been predicted at a location set 10m back from the closest approach of the park to the WRP site. R165 is much closer to the nearby roads; hence, baseline noise levels at R165 are higher than measured at MN2. Baseline noise levels at this location were determined from the strategic noise mapping to be 59dB $L_{Aeq,07:00am\ to\ 07:00pm}$, 55dB $L_{Aeq,\ 07:00pm\ to\ 11:00pm}$ and 46dB $L_{Aeq,07:00pm\ to\ 07:00am}$. The park is not considered noise sensitive at night and the generators would not be tested during the evening; hence, predicted noise levels at this worst case location are below the baseline during the sensitive time periods. Across the remainder of this park, noise levels would be below 50dB L_{Aeq}. Hence, operational noise impacts at R165 (a medium sensitivity receptor) without generators running are considered no worse than minor. Effects are therefore neutral and permanent, which is not significant. Operational noise impacts at R165 with generators running are also considered minor; hence effects are considered neutral, temporary, long-term and not significant.

15.8.98 R2 is a business park and not occupied at night; hence, it is only sensitive to effects during the daytime. In order to assess daytime effects at R2, the daytime baseline noise levels have been identified from strategic noise mapping data to be 59dB $L_{Aeq,07:00am\ to\ 07:00pm}$. Predicted noise levels from the WRP site are below the baseline; hence, the change in noise level at the receptor is unlikely to be perceptible. On this basis, operational noise impacts at R2 (medium sensitivity) with or without generators running are considered no worse than minor. Operational noise effects with generators running are therefore neutral, permanent and not significant. Effects at R2 with generators running are considered neutral, temporary, long-term and not significant.

Above Ground Plant

15.8.99 For each item of plant to be incorporated at IPS and BPT, the same modelling and assessment approach for the operation noise impacts of the WRP site have been undertaken.

Airborne noise – residential noise and vibration sensitive receptors

15.8.100 Representative background sound levels at the likely worst-affected NVSRs have been identified from the baseline survey. The analysis undertaken to determine these values is described in ES Appendix 15.4 Acoustic terminology and baseline, Volume II (Document reference 6.2, DCO Volume 6) Airborne noise – residential NVSRs. In each case the representative background sound level is very low (below 30dB L_{A90}). ES Appendix 15.3 Operational noise assessment, Volume II (Document reference 6.2, DCO Volume 6) explains that the assessment of impacts is based on a comparison with either the background sound level or 30dB L_{A90}, whichever is the higher.

15.8.101 Table 15-38 presents the predicted operational noise levels at the residential NVSRs for each IPS and the comparison with the identified LOAEL and SOAEL values.

Table 15-38 Above Ground Plant operational noise assessment, residential noise and vibration sensitive receptors, generators not running

AGP	NVSR	Location	Predicted specific sound level (dB $L_{Aeq,T}$)	Rating level (dB $L_{Ar,T}$)	Night-time background sound level (dB L_{A90})	Difference between rating level and measured background sound level or 30dB L_{A90}, whichever is the higher (dB)	Comparison with SOAEL and LOAEL	Magnitude of impact
IPS and BPT-E	R20	Dellcrest Path, Portsmouth	37	40	29	+10	Equal to SOAEL	Major
IPS-F	R36	Albany Farm Care Home	32	35	27	+5	Equal to LOAEL	Minor
	FR2	Welborne Garden Village	49	52	27	+22	12dB above SOAEL	Major
IPS-G	R49	Titchfield Lane, Wickham	50	53	28	+23	13dB above SOAEL	Major
	R51	Cold Harbour Close	39	42	28	+12	2dB above SOAEL	Major
	R52	Little Park Mansions	41	44	28	+14	4dB above SOAEL	Major
	R64	Cold Harbour Farm	40	43	28	+13	3dB above SOAEL	Major
	R169	Gardeners Cottage	44	47	28	+17	7dB above SOAEL	Major
	R172	Cold Harbour Close	36	39	28	+9	4dB above LOAEL and 1dB below SOAEL	Medium
	R273	Titchfield Lane, Wickham	48	51	28	+21	11dB above SOAEL	Major
BPT-K	R114	Sciviers Lane, Durley	43	46	Not measured*	+16	6dB above SOAEL	Major

AGP	NVSR	Location	Predicted specific sound level (dB $L_{Aeq,T}$)	Rating level (dB $L_{Ar,T}$)	Night-time background sound level (dB L_{A90})	Difference between rating level and measured background sound level or 30dB L_{A90}, whichever is the higher (dB)	Comparison with SOAEL and LOAEL	Magnitude of impact
* Background sound levels were not measured at R114; however, according to strategic noise mapping data, baseline road and railway noise levels are low; hence, to assess likely worst case effects, the background sound level has been assumed to be below 30dB L_{A90}.								

15.8.102 It can be seen from Table 15-38 that predicted operational noise effects exceed the LOAEL at all NVSRs except one and exceedances of the SOAEL are anticipated at all except two NVSRs. The likely worst case impact magnitude is major, which at receptors of high sensitivity, results in an effect of major significance. Hence, without secondary mitigation, likely worst case AGP operational noise effects at residential NVSRs are permanent and likely significant.

15.8.103 As explained in paragraph 15.5.62, emergency power generators would only be used in an emergency scenario during a power cut, except for monthly testing on a weekday during the daytime for a number of minutes. Effects of emergency generator operational noise in gardens of residential properties have therefore been assessed against a criterion of 50dB L_{Aeq} for likely significant effects. The predicted noise levels, with the emergency generator running, and comparison with the 50dB L_{Aeq} threshold, is presented in Table 15-39.

Table 15-39 Above Ground Plant operational noise assessment, residential noise and vibration sensitive receptors, generators running

AGP	NVSR	Predicted specific sound level (dB LAeq,T)	Difference between specific sound level and 50dB LAeq noise level threshold (dB)
IPS and BPT-E	R20	38	-12
IPS-F	R36	38	-12
	FR2	56	+6
IPS-G	R49	51	+1
	R51	46	-4
	R52	46	-4
	R64	42	-8
	R169	46	-4
	R172	42	-8
	R273	50	0
BPT-K	R114	47	-3

15.8.104 The criterion of 50dB L_{Aeq} for likely significant effects from generator noise is typically higher than that used for normal plant operations. It is therefore possible for significant effects to be predicted due to noise from normal operations (which is assessed against a lower criterion), whilst the short periods of higher noise levels at NVSRs during generator testing do not lead to significant effects. Details of the operational noise assessment methodology are provided in ES Appendix 15.3 Operational noise assessment, Volume II (Document reference 6.2, DCO Volume 6).

15.8.105 Table 15-39 shows that the threshold for likely significant effects is anticipated to be exceeded at FR2 close to IPS-F; hence, without mitigation, effects on this NVSR are temporary, long-term and likely significant. AGP emergency generator operational noise effects are temporary, long-term and not significant at any other NVSRs.

Airborne noise – non-residential noise and vibration sensitive receptors

15.8.106 Table 15-40 presents the predicted operational noise levels from IPS-G and BPT-K at the nearby non-residential NVSRs (with and without generators running) and the comparison with 50dB $L_{Aeq,T}$ criterion. No non-residential NVSRs have been identified with the potential to be impacted by noise from IPS and BPT-E or IPS-F.

15.8.107 All identified non-residential NVSRs are sufficiently far from the AGP such that operational noise levels would be below the relevant noise level criterion; hence, operational noise effects from AGP at non-residential NVSRs without generators running would be permanent and not significant. Operational noise impacts from AGP at non-residential NVSRs with generators running would be no worse than minor. The identified NVSRs are of high sensitivity; hence, effects are minor adverse, temporary, long-term and not significant.

Table 15-40 Above Ground Plant operational noise assessment, non-residential noise and vibration sensitive receptors

AGP	NVSR	Predicted specific sound level without generators (dB $L_{Aeq,T}$)	Difference between specific sound level and 50dB L_{Aeq} noise level threshold (dB)	Predicted specific sound level with generators (dB $L_{Aeq,T}$)	Difference between specific sound level and 50dB L_{Aeq} noise level threshold (dB)
IPS-G	R50	39	-11	44	-6
	R275	38	-12	43	-7
BTP-K	R113	42	-8	44	-6

Invasive Non-Native Species Treatment at Otterbourne Water Supply Works

Airborne noise – residential noise and vibration sensitive receptors

15.8.108 As discussed in section 15.6, the assessment of operational noise from the INNS Treatment plant at Otterbourne WSW utilises the results of a baseline noise level survey undertaken in 2018, as described in the Otterbourne WSW Capital Maintenance (Phase 2) Project Baseline Noise And Vibration Survey Report [49] to identify background sound levels in the absence of the Otterbourne WSW. The combined impacts of the noise from Otterbourne WSW, including the proposed 'phase 2' upgrades, have been assessed using the results of 3-d modelling of noise from the proposed INNS Treatment plant and the predicted noise levels at receptors given in the 'GTBJV Otterbourne Water Supply Works Improvements Phases 2 And 3 Operational Sound Assessment' [50].

15.8.109 Table 15-41 presents the predicted night-time operational noise levels from Otterbourne WSW, including the sound from the INNS Treatment plant at Otterbourne WSW, at the closest residential NVSR, along with a comparison with the identified LOAEL and SOAEL values.

Table 15-41 Invasive Non-Native Species Treatment at Otterbourne WSW operational noise assessment, residential noise and vibration sensitive receptors

NVSR	Location	Predicted specific sound level (dB $L_{Aeq,T}$)	Rating level (dB $L_{Ar,T}$)	Night-time background sound level (dB L_{A90})	Difference between rating level and measured background sound level or 30dB L_{A90}, whichever is the higher (dB)	Comparison with SOAEL and LOAEL	Magnitude of impact
R156	Greenacres Drive	37	40	34	+6	5dB above LOAEL	Moderate

15.8.110 It can be seen from Table 15-38 that predicted operational noise effects exceed the LOAEL but do not exceed the SOAEL. The likely impact magnitude is moderate, which at receptors of high sensitivity, results in an effect of moderate significance. Hence, without secondary mitigation, likely worst case INNS Treatment plant operational noise effects at residential NVSRs near Otterbourne WSW are permanent and likely significant.

Airborne noise – non-residential noise and vibration sensitive receptors

15.8.111 The predicted operational noise level from Otterbourne WSW, including the sound from the INNS Treatment plant, at the centre of the nearby non-residential NVSR (R153), is 43dB $L_{Aeq,T}$. This is 7dB below the 50dB $L_{Aeq,T}$ criterion for the onset of potentially significant effects. Hence, operational noise effects at non-residential NVSRs would be permanent and not significant.

Decommissioning effects

15.8.112 For those elements of the Proposed Development to be removed, effects from decommissioning of the Proposed Development are considered to be no greater than those identified during the construction phase and are therefore assessed as being the same as construction effects. The significance of effects resulting from decommissioning of these elements is therefore the same as reported as for the construction effects.

15.8.113 The specific method of decommissioning of the Proposed Development is uncertain at present as the engineering approaches would evolve over time. Any decommissioning works in connection with the Proposed Development would be undertaken using good industry practice and would comply with all relevant statutory requirements applicable at the time. Any decommissioning works would take place in the context of the regulatory framework in place at that time, which may include a requirement to seek additional consents, permits or licences.

15.8.114 As the buried pipeline infrastructure would be left in-situ, the construction impacts associated with tunnelling, trenchless crossings and open-cut trenching would not occur during the decommissioning phase. Hence, ground-borne noise impacts (which are associated with tunnelling) are not anticipated. Potential impacts of decommissioning would therefore be limited to works to remove above-ground assets (the WRP site and AGP). Such works are not anticipated to result in high noise emissions and the construction activities with high vibration emissions would not be required. Taking account of the good industry practice measures that would be adopted, it is considered that effects would be not significant. Nevertheless, a worst case assumption has been made that decommissioning effects would be the same as the effects to construct the WRP site and AGP. Hence, without secondary mitigation, the following impacts have the potential to cause temporary and likely significant effects:

1. Airborne noise at residential NVSRs due to decommissioning works at the WRP site on Saturday afternoons.
2. Airborne noise at residential NVSRs due to decommissioning of IPS-G and BPT-K.
3. Airborne noise at non-residential NVSRs due to decommissioning of IPS-G and BPT-K.

15.8.115 Likely worst case noise impacts on NVSRs from off-site decommissioning traffic would be minor, resulting in temporary, short-term minor adverse effects, which is not significant.

15.9 Mitigation, monitoring and enhancement

15.9.1 Mitigation measures are defined in ES Chapter 5 EIA approach and methodology, Volume I, (Document reference 6.1, DCO Volume 6) with primary mitigation and tertiary mitigation for noise and vibration being presented in section 15.4 of this chapter.

Secondary mitigation

15.9.2 Secondary mitigation measures have been identified for those impacts which are assessed as likely to result in significant effects for construction airborne noise, construction ground-borne vibration and operational airborne noise. Secondary measures have not been identified for the remaining impacts as these are not predicted to be likely significant.

Construction airborne noise effects

15.9.3 The Outline CEMP (Document reference 7.1, DCO Volume 7) (see section 15.4) secures that the Contractor will produce an NVMP, to be submitted post-consent and prior to construction, that is based on the final construction methods, programme and Proposed Development design. This NVMP will include updated noise modelling and assessments in order to identify appropriate secondary mitigation measures to reduce construction noise effects.

15.9.4 The general approach to mitigation has applied the following hierarchy:

1. Avoidance of noise and vibration by, for example, selection of quiet/low vibration plant.
2. Control noise and vibration at source by, for example, maximising the distance from sources of potentially high noise and vibration levels to NVSRs where possible, utilising screening from existing landforms or structures and introducing additional silencers or enclosures.
3. Implement management measures, such as avoiding noisy activities near to NVSRs during sensitive times of day.
4. Introduce additional screening to obstruct line of sight between the source and receptor, for example boundary screening.

15.9.5 Avoidance and control of noise and vibration at source is primarily implemented through the tertiary good practice mitigation measures secured in the Outline CEMP (Document reference 7.1, DCO Volume 7). It is apparent that the majority of identified significant effects are due to the proposed working on Saturday afternoons; hence, the Outline CEMP (Document reference 7.1, DCO Volume 7) secures a tertiary mitigation measure that works, where practicable, will be scheduled to reduce noise and vibration emissions at highly sensitive times. The extent to which such restrictions can be implemented are not known at this stage; hence, the assessment has been based on worst case assumptions that all activities will be undertaken on Saturday afternoons. The activities which are responsible for causing likely significant effects have been reviewed and the

working hours of the following activities could be restricted to avoid Saturday afternoons. This potential additional mitigation measure is secured in the Outline CEMP (Document reference 7.1, DCO Volume 7), which will be included in the NVMP where required and practicable:

1. Tunnel shaft construction (compounds D-1 and E-1)
2. Construction of BPT/IPS-E, IPS-G and BPT-K
3. Trenchless crossing of the River Meon (compounds G-4 or G-5)
4. Trenchless crossing of Winters Hill in Durley (compound K-4)
5. Trenchless crossing of Winchester Road (compounds G-7 and H-1)
6. Temporary construction compound setup (compound B1-1, B1-2, D-1, H-5, J-1, K-3, K-4 K-5 and L-10)
7. Site sectional compound operation (E-1, E-2, E-3, E-4a, E-5, E-6b, G-1, G-6, G-7, H-2, H-4, J-1, J-2, K-2, K-3, L-4 and M-3)

15.9.6 In order to control noise at source, a secondary mitigation measure secured in the Outline CEMP (Document reference 7.1, DCO Volume 7), is that, where practicable, the trenchless crossing launch pit will be located in the compound which is furthest from NVSRs. As described in section 15.6, for each trenchless crossing, a worst case assumption has been made that the launch pit would be located in the worst possibly located compound i.e. closest to affected NVSRs. Locating the launch pit in the following compounds would potentially remove the identified potentially significant effects from this activity:

1. G-4 or G-5 (crossing River Meon)
2. K-5 (Winters Hill)
3. M-1 (Highbridge Road and the railway line)

15.9.7 At this stage, it is not possible to determine whether the compound which is preferable from a noise perspective could be used for a launch pit, due to other factors such ground conditions which are not known, and a balance may need to be struck in relation to other impacts (such as traffic flows) associated with using the worst case compound. It may be possible for the Contractor to use methods other than the worst case which has been assessed and the NVMP will specify the final mitigation package, which may allow the worst case compound location to be used.

15.9.8 Based on the results of the assessments of airborne noise impacts presented in section 15.8, temporary noise screening is likely to be required as secondary mitigation to screen receptors at which a significant effect is predicted, or an exceedance of the SOAEL. In relation to noise barriers, BS 5228-1 suggests to "*assume an approximate attenuation of 5dB when the top of the plant is just visible to the receiver over the noise barrier, and of 10dB when the noise screen completely hides the sources from the receiver.*" This indicates that the proposed type of mitigation would be able to provide a 'good' degree of mitigation (i.e. 10dB of noise reduction). The locations at which screening is anticipated to be required have been broken down into the principal components of the Proposed Development, as follows and secured in the Outline CEMP (Document reference 7.1, DCO Volume 7). As the potential secondary mitigation measures to constrain working hours and adopt preferred trenchless compound for the launch pit are subject to the NVMP, the identified screening locations do not account for these

mitigation measures. The assessment determines where screening may be required, based on the worst case assumptions made regarding the construction plant and methodologies described in section 15.6 Final details of temporary screening will be provided in the NVMP (identified in section 15.4 as a tertiary mitigation measure), which will be secured in the final CEMP, preparation of which is secured by a requirement in the DCO.

15.9.9 Regarding impacts from the Pipelines between the WRP site and Bedhampton Springs, screening may be required to protect R1, R3 (two residential dwellings at the north end of Mill Lane) and R194 (residential receptors on Edward Gardens, Havant) from the noise of works in temporary construction compounds B-1 and B-2.

15.9.10 Regarding the impacts of Sections D to M of the Pipeline between the WRP site and Otterbourne WSW, screening may be required to protect all of the residential NVSRs identified in Table 15-31 and Table 15-32, as well as the predicted exceedances of the LOAEL identified in ES Appendix 15.1 Construction noise and vibration assessment, Volume II (Document reference 6.2, DCO Volume 6), from the works at the identified locations. It may also be required to protect the following non-residential NVSRs (as identified in paragraph 15.8.60): R50 (Kids Love Nature Kindergarten at Wickham), R67 (New Place Hotel), R113 (Winters Hill Hall) and R275 (Park Place Centre).

15.9.11 Site sectional compound operations are predicted, based on the assumptions assessed, to result in likely significant effects due to noise from working on Saturday afternoons. If it is not possible to restrict Saturday afternoon operations, it is anticipated that careful layout of the compounds, locating noisy plant/activities away from NVSRs and utilising existing or proposed screening (e.g. storage bunds and welfare facilities), along with enclosures and silencers, could reduce noise levels at receptors by a further 5 to 10dB. With this mitigation in place, residual effects from compound operations are not expected to be significant. Incorporating the 10dB reduction from screening and restrictions on Saturday afternoon works, the daytime SOAEL is not predicted to be exceeded at any NVSR. However, exceedances of the night-time SOAEL are predicted, as follows:

1. R66 and R182 (High Street, Shirrell Heath) – exceedance of up to 8dB, due to trenchless construction works at temporary construction compound H-3.
2. R68 (Nightingale Crescent, Shirrell Heath) – exceedance of 1dB, due to trenchless construction works at temporary construction compound H-4.
3. R69, R70 and R180 (High Street, Shirrell Heath) – exceedance of up to 9dB, due to trenchless construction works at temporary construction compound H-4.
4. R93 (Gamblins Lane, Shirrell Heath) – exceedance of 7dB, due to trenchless construction works at temporary construction compound H-4.
5. R123 and R277 (Mortimers Lane, Lower Upham) – exceedance of up to 6dB, due to night-time road crossing works at the crossing of Mortimers Lane.
6. R141 (Lordswood, Highbridge) – exceedance of 2dB, due to trenchless construction works at temporary construction compound L-10.
7. R272 (Nightingale Crescent, Shirrell Heath) – exceedance of 3dB, due to trenchless construction works at temporary construction compound H-3 and H-4.

8. R274 (Alma Lane, Upham) – exceedance of 4dB, due to night-time road crossing works at the crossing of Alma Lane.

15.9.12 Incorporating the 10dB reduction from screening and restrictions on Saturday afternoon works, the likely exceedances of the threshold for the onset of moderate adverse effects are predicted at the following NVSRs:

1. R66, R69, R70, R86, R180 and R182 (High Street, Shirrell Heath) – exceedance of threshold by 5 to 11dB (evenings and weekends) and 7 to 18dB (night), due to trenchless construction works at temporary construction compound H-3 or H-4.
2. R86 (High Street, Shirrell Heath) – exceedance of night-time threshold by 4dB, due to trenchless construction works at temporary construction compound H-4.
3. R93 and R94 (Gamblins Lane, Shirrell Heath) – exceedance of threshold by 10 and 4dB (evenings and weekends) respectively and 17 and 9dB (night) respectively, due to trenchless construction works at temporary construction compound H-4.
4. R140 and R141 (Lordswood, Highbridge) – exceedance of evenings and weekends threshold by 3dB and 4dB respectively, and of the night-time threshold by 8dB and 12dB respectively, due to trenchless construction works at temporary construction compound L-10.
5. R142 and R145 (Highbridge Road, Highbridge) – exceedance of evenings and weekends threshold by 4dB (R142 only), and of the night-time threshold by 3dB and 5dB respectively, due to trenchless construction works at temporary construction compound L-10.
6. R147 (Wardle Road, Highbridge) – exceedance of evenings and weekends threshold by 2dB, and of the night-time threshold by 9dB, due to trenchless construction works at temporary construction compound L-10.
7. R68 and R272 (Nightingale Crescent, Shirrell Heath) – exceedance of threshold by 4dB (evenings and weekends) and 5 and 7dB (night) respectively, due to trenchless construction works at temporary construction compound H-4.
8. R187 (Prickets Hill, Shedfield) exceedance of night-time threshold by 1dB, due to trenchless construction works at temporary construction compound H-3.

15.9.13 In order to mitigate the noise from trenchless construction works in compound L-10 and either H3 or H-4, it is likely that a temporary acoustic enclosure will be required. The Outline CEMP (Document reference 7.1, DCO Volume 7) secures a potential mitigation measure, that will be included in the NVMP if required, to install a large temporary acoustic enclosure over the trenchless crossing equipment. Such acoustic enclosures are known to provide in the region of 30 dB of mitigation; hence, with this mitigation in place, residual noise effects of trenchless construction works would be below the SOAEL and not significant.

15.9.14 Exceedances of the night-time SOAEL by up to 6dB (at R277) are also predicted due to noise from night-time road crossing works. These works are of short duration (ten nights is the assumed worst case scenario) and therefore would not cause likely significant effects as impacts are shorter than one month. It may be practicable to complete the noisy aspects of the work in less than ten nights, in

which case significant effects on health and quality of life would not occur. If it is not practicable to reduce the activity duration to shorter than ten nights, then a combination of reductions in assumed on-times of the loudest plant items (circular saws, operating for 30% of the time, and an excavator with pneumatic breaker operating for 20% of the time), use of quieter construction plant and enclosure of these noisy activities, could reduce overall activity noise levels by at least 6dB, which would eliminate all predicted exceedances of the SOAEL.

15.9.15 As described in section 15.4, the Outline CEMP (Document reference 7.1, DCO Volume 7) secures that the Contractor applies for Section 61 consents under the Control of Pollution Act 1974. For consent to be granted the local planning authority must consider that the methods and the mitigation proposed are considered to demonstrate that sufficient mitigation has been adopted to reduce construction noise and vibration impacts.

15.9.16 Additional secondary mitigation measures secured in the Outline CEMP (Document reference 7.1, DCO Volume 7) that the NVMP and Section 61 consent applications will consider and apply where relevant and practicable are:

1. Further limiting working hours to avoid the most noise-sensitive times such as weekends.
2. Selection of quieter plant, equipment or working methods.
3. Use of additional silencers, screening and/or enclosures.
4. Reduce intensity of works (e.g. numbers or on-time of noisy equipment such as circular saws or pneumatic breakers). Interspersing of noisy works between quieter works to provide periods of respite.
5. Phasing of the works to ensure that the noisiest operations are performed during the least sensitive times and vice-versa.
6. Review of the construction programme to reduce the duration of the works at the closest approach to properties where practicable to give periods of respite.

15.9.17 The detail of secondary mitigation measures proposed to mitigate likely significant effects cannot be prescribed at this stage and will be determined by the Contractor following the DCO application, should the DCO be granted. For example, the temporary construction compound used as the launch pit would only be defined upon receipt of additional information on ground conditions, therefore it is not practical to determine final temporary construction compound layouts and some plant requirements for construction activities may change. Nevertheless, the Outline CEMP (Document reference 7.1, DCO Volume 7) secures that sufficient mitigation measures will be implemented to avoid significant effects and exceedances of the SOAEL, thereby demonstrating compliance with the first aim of the NPSE and NPSWRI to avoid likely significant effects on health and quality of life. Due to the practicalities of constructing the Proposed Development, some adverse noise effects are inevitable; however, the Outline CEMP (Document reference 7.1, DCO Volume 7) also secures that all mitigation measures identified as practicable by the Contractor and necessary due to predicted exceedances of the LOAEL will be implemented. This demonstrates compliance with the second aim of the NPSE and NPSWRI (to mitigate and reduce other adverse impacts on health and quality of life).

Construction ground-borne vibration effects

15.9.18 As with construction airborne noise effects, the Outline CEMP (Document reference 7.1, DCO Volume 7) secures a range of ground-borne vibration mitigation measures which are considered to represent BPM. With this primary and tertiary mitigation implemented, the only works with the potential to cause likely significant effects are:

1. Tunnel shaft construction in temporary construction compound E-1, if the tunnel shaft is with 22m of a residential dwelling, which is considered unlikely to occur.
2. Vibratory ground compaction works which last for more than one day within 7.3m of a residential dwelling (annoyance effects), or any vibratory ground compaction works within 3.2m of an un-reinforced or light framed structure (building damage effects).

15.9.19 Where, in spite of the primary and tertiary mitigation, likely significant effects are anticipated to remain, the following secondary mitigation measures will be considered and included in the NVMP, where applicable and practicable:

1. Using low-vibration methods of shaft excavation, such as segmental lining or secant piling
2. Using a compactor with one or more of the following:
   a. A single drum
   b. A drum amplitude of less than 0.5mm
   c. A wider drum, ideally at least 2m
3. Adoption of non-vibratory ground compaction methods

15.9.20 The Contractor will select the mitigation measures from the options secured in the Outline CEMP (Document reference 7.1, DCO Volume 7), or other measures if deemed appropriate and relevant, to achieve the required overall vibration level attenuation. These measures will be included in the NVMP (preparation of which will be secured through the DCO Requirement to submit a final CEMP).

15.9.21 It is also important to establish a good working relationship with the occupants of the dwellings to manage any disturbance (where occupants are receptive to communications), e.g. by providing prior notification of the works, evidence that building damage would not occur and/or undertaking the works at the closest approach to the property when the occupants are not present, where feasible. Communication with residents has not been relied on as a measure to mitigate the identified potentially significant effects within the assessment.

Operational airborne noise effects

15.9.22 Without secondary mitigation, likely significant effects are predicted due to operational airborne noise. At this early stage in the design there is significant uncertainty around impacts at NVSRs. Hence, worst case assumptions have been made regarding plant noise emission levels, in particular that, where plant noise emissions are not known, these are limited to the maximum possible whilst not exceeding the Upper Action Value in The Control of Noise at Work Regulations 2005 [48].

15.9.23 The mitigation secured in the Design Principles Document (Document reference 5.11, DCO Volume 5) includes that the Contractor will be required to design the WRP site, AGP and INNS Treatment at Otterbourne WSW to ensure that operational noise levels at NVSRs do not exceed the LOAEL. The mitigation hierarchy to be applied is identified in the Design Principles Document. Example mitigation options which could be included in the development design are as follows:

1. Selection of quiet plant
2. Silencers
3. Enclosing items of noisy outdoor plant
4. Upgraded acoustic enclosures
5. Upgraded building fabric
6. Installation of acoustic roller shutter doors
7. Adjustment of site layout to place buildings between source and receiver
8. Noise screens/barriers

15.9.24 Based on the worst case modelling which has been undertaken, potentially required secondary mitigation measures from the above options to avoid exceedances of the LOAEL have been identified in ES Appendix 15.3 Operational noise assessment, Volume II (Document reference 6.2, DCO Volume 6). The residual operational noise effects at all NVSRs are no worse than permanent and minor i.e. not significant.

Decommissioning airborne noise effects

15.9.25 Based on the qualitative assessment undertaken, which assumes that decommissioning effects, for those elements of the Proposed Development to be removed, are the same as the relevant construction effects, secondary mitigation is likely to be required for the following impacts:

1. Airborne noise at residential NVSRs due to decommissioning works at the WRP site on Saturday afternoons.
2. Airborne noise at residential NVSRs due to decommissioning of IPS-G and BPT-K.
3. Airborne noise at non-residential NVSRs due to decommissioning of IPS-G and BPT-K.

15.9.26 The secondary measures currently proposed for mitigation of the airborne noise effects from the construction of the WRP site, IPS-G and BPT-K (restrictions to AGP construction working hours and screening) will also be required to mitigate the identified decommissioning effects.

Monitoring

15.9.27 As discussed in section 15.4, the Contractor, post-consent, will undertake a scheme of noise and vibration monitoring and assessment periodically during construction. Details of the monitoring will be defined in the NVMP and any Section 61 application submitted post-consent, which will be agreed with the local planning authorities prior to commencement and is secured by the DCO requirement to

submit a final CEMP which will be produced and submitted for approval in accordance with the corresponding requirement in Schedule 2 to the draft DCO (Document reference 3.1, DCO Volume 3).

15.9.28 No likely significant adverse effects are identified during the operational phase of the Proposed Development that would require monitoring. In order to address the eventuality of a complaint about operational noise from the Proposed Development, the OEMP (Document Reference 7.7, Volume 7) secures the operation of an Environmental Management System by the Contractor, based on the requirements of ISO 14001:2015, which will include procedures for dealing with complaints.

15.9.29 Any requirements for noise or vibration monitoring during decommissioning would be determined in order to be compliant with the regulatory framework in place at that time, including additional consents, permits or licences that may be required.

15.10 Summary of residual effects

15.10.1 This section provides a summary of the residual effects relating to the construction, operation and decommissioning of the Proposed Development with regard to noise and vibration receptors. Table 15-42 provides a high-level summary of these effects.

15.10.2 Without secondary mitigation, construction airborne noise effects were identified to be potentially significant. The following potential secondary mitigation measures have therefore been secured in the Outline CEMP (Document reference 7.1, DCO Volume 7), which will be included in the NVMP where required and practicable:

1. Constrain working hours to avoid Saturday afternoon working for certain activities.
2. Locate the trenchless crossing launch pit in the compound which is furthest from NVSRs.
3. Introduce temporary acoustic screening between works and NVSRs.
4. Design site sectional compound layouts to reduce noise levels at NVSRs.
5. Use acoustic enclosures to cover trenchless construction works.
6. Complete open-cut road crossing night-time works in less than 10 nights, use quieter plant than assumed and/or acoustic enclosures.

15.10.3 With these measures in place, residual construction airborne noise effects are not significant.

15.10.4 Without secondary mitigation, construction ground-borne vibration effects were also identified to be potentially significant. The following potential secondary mitigation measures have therefore been secured in the Outline CEMP (Document reference 7.1, DCO Volume 7), which will be included in the NVMP where required and practicable:

1. Using low-vibration methods of shaft excavation.
2. Using low-vibration or non-vibratory ground compaction methods.

15.10.5 With these measures in place, residual construction ground-borne vibration effects are not significant.

15.10.6 Without secondary mitigation, likely significant effects are also predicted due to operational airborne noise. Potentially required secondary mitigation measures (those which currently appear most appropriate from the options identified in the Design Principles Document (Document reference 5.11, DCO Volume 5)) to avoid exceedances of the LOAEL have been identified in ES Appendix 15.3 Operational noise assessment, Volume II (Document reference 6.2, DCO Volume 6). The residual operational noise effects at all NVSRs are no worse than permanent and minor i.e. not significant.

15.10.7 Without secondary mitigation, likely significant effects are also predicted due to airborne noise from certain decommissioning activities. The secondary measures currently proposed for mitigation of the airborne noise effects from the identified activities would result in residual effects that are not significant.

15.10.8 The remaining identified impacts (ground-borne noise and noise from off-site construction traffic) are predicted to result in effects which are not significant, without the need for secondary mitigation. Therefore, the residual effects of these impacts are the same as those reported in section 15.8.

Table 15-42 Summary of residual effects

Effect	Receptor	Residual effects		
		Construction	Operation	Decommissioning
Direct temporary airborne noise effects	Occupants of residential dwellings	Short-term and minor adverse (not significant)	Minor adverse and long-term (not significant)	No worse than short-term and minor adverse (not significant)
	Users of non-residential locations	Short-term and minor adverse (not significant)	Minor adverse and long-term (not significant)	No worse than short-term and minor adverse (not significant)
Direct temporary ground-borne noise effects	Occupants of residential dwellings	Short-term and minor adverse (not significant)	Scoped out	No effect
	Users of non-residential locations	Short-term and minor adverse (not significant)	Scoped out	No effect
Direct temporary ground-borne vibration effects	Occupants of residential dwellings	Short-term and minor adverse (not significant)	Scoped out	Short-term and minor adverse (not significant)
	Users of non-residential locations	Short-term and minor adverse (not significant)	Scoped out	Short-term and minor adverse (not significant)
Indirect (i.e. due to traffic flow changes) temporary noise effects	Occupants of residential dwellings	Short-term and minor adverse (not significant)	Scoped out	Short-term and minor adverse (not significant)
	Users of non-residential locations	Short-term and minor adverse (not significant)	Scoped out	Short-term and minor adverse (not significant)

Effect	Receptor	Residual effects		
		Construction	Operation	Decommissioning
Direct permanent airborne noise effects	Occupants of residential dwellings	Scoped out	Minor adverse (not significant)	Scoped out
	Users of non-residential locations	Scoped out	Minor adverse (not significant)	Scoped out
Direct permanent vibration effects	Buildings	Minor adverse (not significant)	Scoped out	No worse than minor adverse (not significant)

Common noise level parameters

Defined Term	Description
L_p L_{pA} (or L_A)	The instantaneous sound pressure level (L_p). The A-weighted instantaneous sound pressure level (L_{pA} or L_A). This is the root mean square size of the pressure fluctuations in the air. This level can fluctuate wildly even for seemingly steady sounds. To make sound level meters easier to read the values on the display are smoothed or damped out. This is effectively done by taking a rolling average of the previous 0.125 seconds (s) (FAST time constant) or the previous 1s (SLOW time constant).
L_{AF}, L_{AS}	The letters F or S are added to the subscripts in the notation to indicate when the FAST or SLOW time constant has been used. These are often omitted but it is good practice to include them.
L_{max} L_{Amax} L_{AFmax}	The maximum instantaneous sound pressure level (L_{max}), The A-weighted maximum instantaneous sound pressure level (L_{Amax}). The A-weighted maximum instantaneous sound pressure level with a FAST time constant (L_{AFmax}). This is the highest instantaneous sound pressure level reached during a measurement period.
L_{min} , L_{Fmin}	The opposite of the L_{max} is the minimum instantaneous sound pressure level or L_{min} It is good practice to include the letter which identifies the time constant used as this can make a significant difference to the value.
$L_{N,T}$ $L_{AN,T}$ $L_{AFN,T}$ $_N$ = %age value, 0-100 $_T$ = measurement time e.g. L_{A90}, L_{A10}, $L_{AF90,\ 5\ min}$	The percentage exceedance sound pressure level ($L_{N,T}$), The A-weighted percentage exceedance sound pressure level ($L_{AN,T}$), the A-weighted percentage exceedance sound pressure level with a FAST time constant ($L_{AFN,T}$). This is the sound pressure level exceeded for N% of the time T. e.g. If an A-weighted level of x dB is exceeded for a total of six minutes within one hour, the level will have been above x dB for 10% of the measurement period. This is written as $L_{A10,1hr}$ = x dB. L_{A0} (the level exceeded for 0 % of the time) is equivalent to the L_{Amax} and L_{A100} (the level exceeded for 100 % of the time) is equivalent to the L_{Amin}. It is good practice to include the letter which identifies the time constant used as this can make a significant difference to the value.
$L_{eq,T}$ $L_{Aeq,T}$ $_T$ = measurement time e.g. $L_{Aeq,5min}$	The equivalent continuous sound pressure level over period T ($L_{eq,T}$),. The A-weighted equivalent continuous sound pressure level over period T ($L_{Aeq,T}$). This is effectively the average sound pressure level over a given period. As the decibel is a logarithmic quantity the L_{eq} is not a simple arithmetic mean value. The L_{eq} is calculated from the raw sound pressure data. It is not appropriate to include a reference to the FAST and SLOW time constants in the notation.

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