



Havant Thicket Reservoir – Main Pipeline works

HTR-WAB-PI-ZZ-RP-W-0015_S61 Construction Noise & Vibration Assessment

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For Construction

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Issue and Revision Record

Havant Thicket Reservoir – Main Pipeline Works

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1 Introduction

The objective of the Havant Thicket Reservoir Project is to provide a new resource to supply drinking water in the water-stressed Southeast of England while maximising the community and environmental benefits of a new raw water reservoir. Ward and Burke Construction Limited (WBCL) have been appointed by Portsmouth Water Limited (PW) to design, construct, and commission a new pipeline connecting Bedhampton Pumping Station to Havant Thicket Reservoir, including an emergency discharge structure at the Hermitage Stream, culvert upgrades and an Under Track Crossing.

1.1 Works Background

Portsmouth Water has outlined seven strategic drivers for this project to ensure continued focus on meeting the Project's objectives.

These project drivers are:

- **Quality:** Quality in procurement, design and delivery to deliver an exemplary project to serve Customers in the short, medium and long term,
- **Timeliness:** In service and operating by 2029 to support a major bulk transfer to Southern Water,
- **Innovation:** Develop best practices in the largest new reservoir project in the southeast for decades. Capture learning from companies working in partnership to deliver better value for Customers,
- **Flexibility:** Create a project that offers multiple uses and enables Portsmouth Water to be a strategic water supplier for the South over the medium and long term,
- **Responsibility:** Realise and build upon our health, safety and well-being goals,
- **Connectivity:** Positive connection for all stakeholders – Customers, the local community, regulators, staff, contractors, shareholders, commercial partners, environmental groups and individuals with a passion for the environment, and
- **Environment:** A positive contribution to local and internationally important habitats. Direct support for the Government's objective to reduce the damaging abstraction of water from rivers.

1.2 Scope of Document

This document includes the following items:

- S61 Construction Noise & Vibration Assessment

This document is required to discharge Conditions 27 and 31 of permission reference HBC APP/24/00405. The requirements of Condition 27 and Condition 31 and where within this document the requirements are addressed are set out in Table 1.1 and Table 1.2 below.

Table 1.1 – Condition 27 of APP/24/00405

Condition 27 – Noise and Vibration Monitoring	
<p>(1) Prior to the commencement of any noise and vibration intensive construction activities, including but not limited to shaft construction works, piling, compaction, tunnelling, open cut/trench works and heavy machinery operation, a noise and vibration monitoring regime shall be submitted to and approved in writing by the Local Planning Authority</p> <p>(2) The approved noise and vibration monitoring regime shall be implemented prior to and during all noise and vibration intensive activities, the regime shall include:</p> <p><u>Noise Monitoring</u></p> <p>i. Continuous real-time monitoring of construction noise levels (LAeq,T and LAF,max) at agreed receptor locations.</p> <p>ii. Noise alert thresholds set at agreed site noise limits, with instant notifications to the site manager for prompt decision making.</p> <p>iii. Implementation of appropriate mitigation actions in the event of any exceedances (e.g. dynamic adjustments to working methods)</p> <p>iv. Should the exceedance be of the red level threshold, Havant Borough Council would be notified in writing within 24 hours with details of the exceedance and any remedial actions taken.</p> <p>v. Weekly reporting to the Local Planning Authority summarising noise levels at each monitoring location, times and causes of any exceedance, construction activities happening at the time and the mitigation actions implemented and taken.</p> <p><u>Vibration Monitoring</u></p> <p>i. Continuous real-time tri-axial vibration monitoring with remote data storage, analysis, and transmission capabilities at sensor locations agreed in writing with the LPA.</p> <p>ii. Peak Particle Velocity (PPV) vibration alert levels will be set in line with the limits agreed with the LPA, with instant notifications sent to the site manager to enable prompt decision-making.</p> <p>iii. Implementation of appropriate mitigation actions in the event of any exceedances</p> <p>iv. Should the exceedance be of the red level threshold, Havant Borough Council would be notified in writing within 24 hours with detail of the exceedance and any remedial actions taken.</p> <p>v. Weekly reporting to the Local Planning Authority summarising vibration levels recorded at each sensor location, times and causes of any exceedance, construction activities happening at the time and the mitigation actions taken and implemented.</p> <p>The noise and vibration monitoring regime shall be maintained for the duration of all noise- and vibration-intensive construction activities.</p> <p>Reason: To protect the amenity of neighbouring occupiers and to ensure prompt mitigation of potential adverse impacts from noise and vibration emissions. To accord with policies DM10 & CS15 (Havant Borough Local Plan (Core Strategy) 2011), and the National Planning Policy Framework (2024).</p>	
Detail	Addressed
Continuous real time noise monitoring	App. A: Section 10 Para 2 App. A: Section 10.1
Noise alert thresholds	App. A: Table 12

Implementation of appropriate mitigation for noise exceedances	App. A: Section 6.2 App. A: Section 6.3 App. A: Section 10 Para 3-4
Alert in writing to HBC after red noise threshold exceedance	App. A: Section 10 Para 3
Weekly noise monitoring reporting	App. A: Section 10 Para 4
Continuous real-time vibration monitoring	App. A: Section 10 Para 2 App. A: Section 10.2
PPV alert levels	App. A: Table 13
Implementation of appropriate mitigation for vibration exceedances	App. A: Section 6.2 App. A: Section 6.3 App. A: Section 10 Para 3-4
Alert in writing to HBC after red vibration threshold exceedance	App. A: Section 10 Para 3
Weekly vibration monitoring reporting	App. A: Section 10 Para 4

Table 1.2 – Condition 31 of App/24/00405

Condition 31 – Acoustic Screening	
<p><i>All shaft work areas will be bound on all sides by solid site hoarding, to a height of 2.4 meters. The hoarding shall be constructed from solid, imperforate panels with a minimum mass of 10 kg/m². The edges and joints between panels will be sealed to ensure full acoustic integrity.</i></p> <p><i>Where the Construction Environmental Management Plan (CEMP) identifies acoustic control as a priority near noise-sensitive locations (including but not limited to residential premises, hospitals, schools), the site hoarding shall be enhanced to achieve a mass not less than 17 kg/m².</i></p> <p><i>The open-cut sections of the pipeline, specifically Sections P2 and P9, shall not be enclosed by hoarding. However, mobile noise barriers in accordance with details to be agreed pursuant to Condition 30(ii) shall be used as a minimum during construction works near St Thomas More's School and Bidbury School, to break the line of sight between the noise sources and the schools. Where necessary, additional fixed acoustic barriers shall also be provided to achieve effective noise control.</i></p> <p><i>Reason: In the interests of the amenities of local residents and to safeguard the health and well-being of residents and other land users during construction. To accord with policies DM10 & CS15 (Havant Borough Local Plan (Core Strategy) 2011), and the National Planning Policy Framework (2024).</i></p>	
Detail	Where addressed
Shaft Area Hoarding	App. A: Section 6.3 Table 4
Site Hoarding for Sensitive Receptors	App. A: Section 6.3 Table 4
Open-cut Noise barriers	App. A: Section 6.3 Table 4

The relevant phase/s of the condition (listed in Table 1.1 and Table 1.2) this document revision seeks to address are specified in Table 1.3 below. Previously discharged phases of the condition, as well as those to be discharged in future submissions, are also listed.

Table 1.3 – Phase Submission Checklist

Phase Ref	Elements Covered	Discharge in this Submission
1	Pipeline Section P0 [FUW] (Bedhampton, associated infra.)	
2a	Pipeline Section P0 [WAB] Shaft W1 works (ex. Shaft)	✓
2b	Pipeline Sections P1/P2 Shafts W2/W3	✓
3	Pipeline Sections P3/P4 Shafts W3/W4/ED	✓
4	Pipeline Sections P5/P6 Shafts ED/W5/W6	✓
5	Pipeline Sections P7/P8 Shafts W6/W7/W8	✓
6	Pipeline Section P9	✓
7	Pipeline Section P10 [FUW] (Reservoir, associated infra.)	
8	Purbrook Way Culvert	
9	Dunsbury Way Culvert	
10	Middle Park Way Culvert	
N/A	Shaft W1 (subject of separate Reserved Matters Application APP/24/00204 linked to original outline planning permission APP/20/00991)	✓ (Previously Discharged)

Appendix A: S61 Construction Noise & Vibration Assessment

Section 61 - Construction Noise & Vibration Assessment

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Havant Thicket Reservoir Pipeline

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C01	14/01/2025	First issue	AF	HM	HA
C02	16/05/2025	Scheme updates	AF	HM	HM
C03	05/08/2025	Planning updates	AF	HM	HM
C04	12/09/2025	Minor updates in response to PW comments	AF	HM	HM
C05	24/09/2025	Minor updates in response to PW comments	AF	HM	HM

Certifying Body

Sweco are full members of the ANC:



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Appendix A – Glossary of Acoustic Terminology

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1 Introduction

Sweco UK has been commissioned by Ward & Burke Construction Ltd (W&B) to provide technical acoustic expertise in support of an application for prior consent under Section 61 (S61) of the Control of Pollution Act 1974¹ (CoPA) relating to the planned construction of Havant Thicket Reservoir Pipeline, Hampshire.

Havant Thicket Reservoir is an environmental-led project from Portsmouth Water (PW) aiming to protect the River Test and River Itchen. These chalk streams are currently used by Southern Water as part of their supply network serving West Sussex and Hampshire. The reservoir will facilitate a shared bulk water supply between Southern Water and Portsmouth Water and aims to provide an alternative and sustainable water supply to reduce the draw required from these rare chalk streams.

The reservoir works comprise two primary elements: the construction of the reservoir, and the construction of a water pipeline adjoining the reservoir to Bedhampton Pumping Station. This report and the details contained herein relate to the construction of the pipeline only; works associated with the construction of the reservoir are beyond the scope of this application for prior consent.

To that end, this report has been prepared in general accordance with the Association of Noise Consultants' (ANC) *Construction Noise – A good practice guide to the preparation, submission and management of Section 61 consents*². This report presents the following information:

Table 1: Summary of Supporting Information	
Information Presented	Report Section
Name and address of main contractor	Section 3
Address or location of works	Section 3
Duration of Works	Section 3
Particulars of the works to be carried out	Section 4
Methods used in each stage of the development	Section 4
Working hours	Section 5
Construction plant and equipment	Section 6 and Appendix C
Noise and vibration mitigation measures	Section 6
Baseline acoustic conditions	Section 7
Predicted noise levels	Section 8
Predicted vibration levels	Section 9
Noise and vibration monitoring	Section 10
Community liaison/Key contacts	Section 11

Whilst every effort has been made to ensure that this report is easily understood, it is technical in nature; a Glossary of Terms is included in Appendix A to assist the reader.

¹ Control of Pollution Act 1974 (legislation.gov.uk). Accessed September 2024.

² *Construction Noise – A good practice guide to the preparation, submission and management of Section 61 consents*, 2021, Association of Noise Consultants

2 Policy, Standards and Guidance Documents

2.1 Overview

A summary of the policy, standards and guidance documents used to inform the information presented herein are provided below. Further details are provided in Appendix B.

- Control of Pollution Act, 1974
- National Planning Policy Framework³ (NPPF), 2024
- Noise Policy Statement for England⁴ (NPSE), 2010
- Planning Practice Guidance – Noise⁵, 2019
- British Standard 5228-1:2009+A1:2014⁶ (BS 5228-1)
- British Standard 5228-2:2009+A1:2014⁷ (BS 5228-2)
- Association of Noise Consultants (ANC) Construction Noise – A good practice guide to the preparation, submission and management of Section 61 consents, 2021
- Havant Borough Core Strategy Local Development Framework⁸, 2011
- Havant Borough Council Draft Building a Better Future Plan⁹, 2025

A review of the local Planning Policy for Havant Borough Council was undertaken, including the Core Strategy (adopted March 2011), Local Plan (Allocations) (adopted July 2014) and Draft Building a Better Future Plan (2025). No specific guidance relating to S61 consents or Code of Construction Practice was identified; however, a summary of the policies related to noise are presented in Appendix B for reference.

2.2 Ordnance Survey

This report and the assessments contained herein utilise Ordnance Survey digital map data © Crown copyright 2024. All rights reserved. License number AC0000808122.

³ National Planning Policy Framework, 2023, Department for Levelling Up, Housing and Communities

⁴ Noise Policy Statement for England (NPSE), 2010, Department for environment, Food and Rural Affairs ('DEFRA')

⁵ Planning Practice Guidance – Noise, 2019, Department for Levelling Up, Housing and Communities

⁶ British Standard 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*, 2014, British Standards Institution ('BSI')

⁷ British Standard 5228-2:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration*, 2014, British Standards Institution ('BSI')

⁸ Havant Borough Core Strategy Local Development Framework, 2011, Havant Borough Council

⁹ Draft Building a Better Future Plan, 2025, Havant Borough Council

3 Site Description and Development Proposals

3.1 Principal Contractor

W&B are acting as Principal Contractor for this project; their UK office address is:

Ward & Burke Construction Limited
25-26 Ivor Place
London
United Kingdom
NW1 6HR
Phone: 02045 871240

3.2 Site Description and Location

Havant Thicket Reservoir is a new reservoir development aiming to provide a sustainable source of drinking water to the water-stressed southeast of England. The reservoir site is located between Rowlands Castle and Leigh Park in Havant, Hampshire, and is bordered to the north by Forestry England woodland at Havant Thicket, and to the south by Staunton Country Park.

The reservoir development comprises two main parts: the construction of the reservoir itself, and the construction of a pipeline to connect the reservoir to Bedhampton Pumping Station, located approximately 4km due south of Havant Thicket.

This report and the information contained herein relates specifically to the construction of the pipeline. The construction of the reservoir is beyond the scope of this document and application for prior consent.

The pipeline works will be undertaken using a combination of open-trench and micro-tunnelling works. Further details of the particulars of the works to be carried out are provided in Section 4.

Table 2 presents a summary overview of the works phasing/areas and a simplified programme of start and end dates, as provided by W&B. Note, this programme is provided for context but does not represent the final/confirmed programme which is subject to change due to factors beyond the remit of this S61 application.

Figure 1 presents a drawing of the pipeline layout and shaft locations, to be read in conjunction with Table 2.

For reference, 'P'X 1500' refers to the DN1500 tunnel pipeline, with 'PX 1650' referring to the DN1650 tunnel pipeline, both of which form this dual pipeline scheme.

Table 2: Works Phasing/Durations and Simplified Programme			
Phase/ Area	Elements covered	Start Date (programme month)	End Date (programme month)
Area 1	Shaft W1	3	3
	P0 Pipework	14	14
	Shaft W1 Fitout / Backfill	13	14
Area 2	Shaft W2	1	3
	P1 1500	7	10
	P1 1650	3	7
	P1 Tunnel Pipework	10	11
	Shaft W2 Fitout / Backfill	12	14
Area 2/3	P2 Opencut (W2 to W3)	9	12
Area 3	Shaft W3	6	7
	Shaft W3 Fitout / Backfill	20	20
Area 4	Shaft W4	4	6
	P3 1500	12	14
	P3 1650	7	10
	P3 Tunnel Pipework	17	18
	P4 1500	15	17
	P4 1650	10	12
	P4 Tunnel Pipework	19	20
	Shaft W4 Fitout / Backfill	22	23
Area ED	Shaft ED (including piling)	7	9
	Shaft ED Fitout / Backfill	25	30
Area 5	Shaft W5	10	11
	P5 1500	18	21
	P5 1650	12	15
	P5 Tunnel Pipework	23	24
	P6 1500	21	23
	P6 1650	15	18
	P6 Tunnel Pipework	25	26
	Shaft W5 Fitout / Backfill	29	30
Area 6	Shaft W6 (including piling)	12	13
	Shaft W6 Fitout / Backfill	33	33
Area 7	Shaft W7	13	15
	P7 1500	24	27
	P7 1650	18	21
	P7 Tunnel Pipework	30	32
	P8 1500	27	30
	P8 1650	21	24
	P8 Tunnel Pipework	33	33
	Shaft W7 Fitout / Backfill	35	36
Area 8	Shaft W8	16	17
	Shaft W8 Fitout / Backfill	35	36
	P9 Opencut (W8 to Res)	9	28
Note: Pipe section P0 is located within the Bedhampton Pumping Station area and will comprise above-ground pipelaying.			

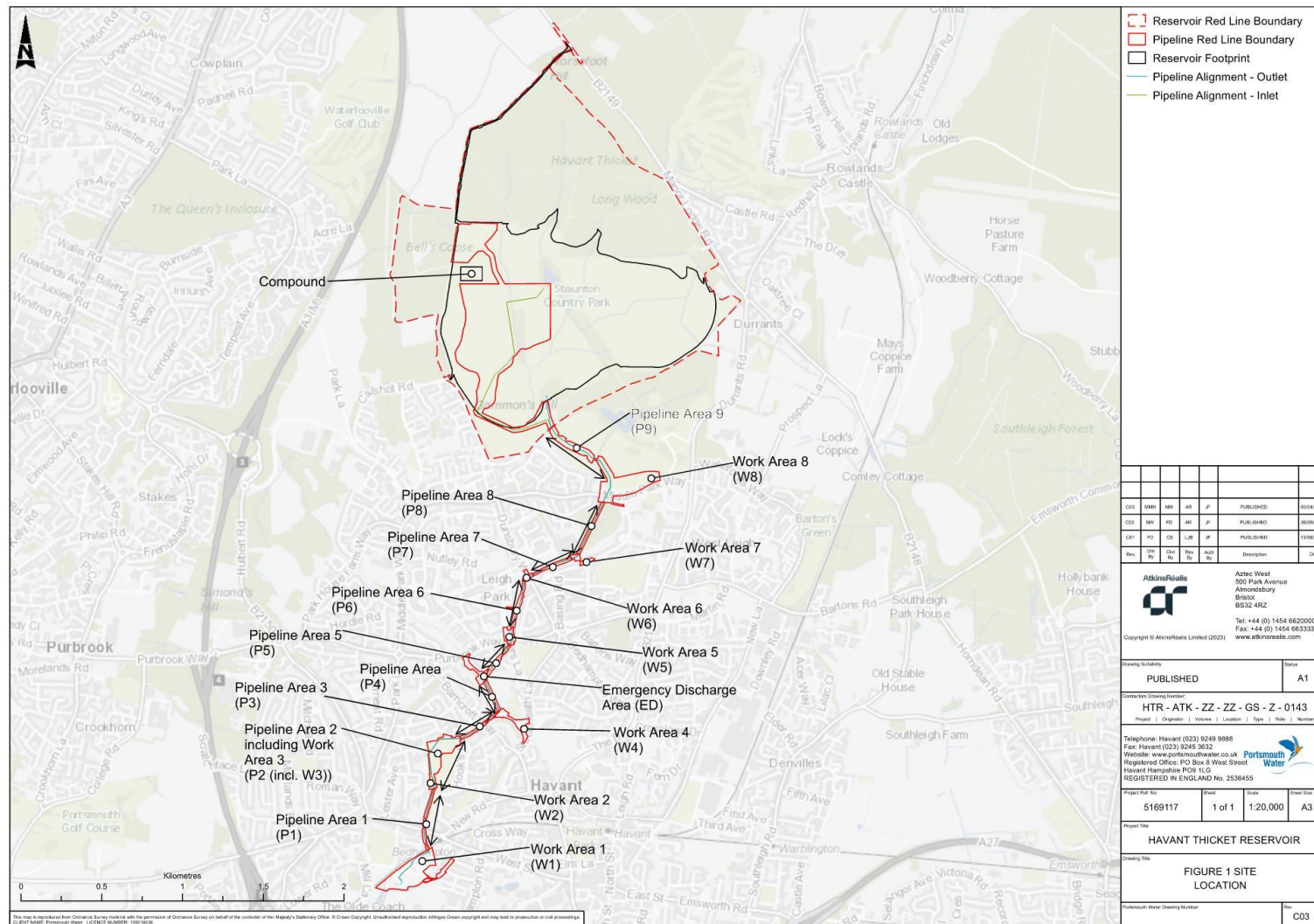


Figure 1 – Pipeline Section and Shaft Locations (not to scale) (to be read in conjunction with Table 2)

4 Construction Methods and Particulars

The reservoir pipeline will be constructed using a combination of open cut trench works, and micro-tunnelling techniques (comprising launch shaft, tunnelling, and reception shaft). Open cut trench works will be used in two areas: the council playing fields adjacent to Havant RFC (P2 in Figure 1), and the land in the south-west of Staunton Country Park (P9 in Figure 1).

A summary of the construction techniques to be used are presented below. Details of the plant associated with each construction activity is provided in Appendix C.

Table 3: Construction Techniques to be Used	
Construction method	Description of works
Shaft construction	<p>The tunnelling activities will comprise a launch and reception shaft, as outlined above. The shafts will be prepared and excavated from ground level using the plant detailed in Appendix C. The construction plant and equipment will be similar at each shaft location – the key differences are slight variations in shaft size and depths, but the construction methodology and resulting noise and vibration remains consistent.</p> <p>There are a total of 9 No. shafts, W1 to W8 and the emergency discharge (ED) chamber – 4 No. launch shafts and 5 No. reception shafts.</p> <p>Shaft construction works will take place during daytime hours only (refer to Section 5 for defined operation times).</p>
Launch shaft (above ground equipment)	<p>The 4 No. launch shafts host the bulk of tunnelling equipment, with tunnel drives or pipes leaving in 2 No. separate directions at each launch shaft (typically 4 No. tunnel drives per shaft). The tunnel boring machine (TBM) is operated from ground level at each shaft, with excavated material pumped from the cutting face to the separation plant and muck bay. Plant at the launch shaft includes craneage to facilitate lifting operations for the TBM and concrete tunnel pipes, lubrication systems for the TBM, the separation plant, and generators to power the above equipment; refer to Appendix C.</p> <p>With the exception of Shaft W2 (serving pipe section P1), all launch shafts will be active during daytime hours only except for exceptional circumstances. Shaft W2 may operate 24/7 for approximately 14 days (total over 2 separate periods) due to the restriction associated with the under-track crossing north of shaft W1.</p>
Reception shaft (above ground equipment)	<p>The 5 No. reception shafts receive the TBM at the end of each drive. With shaft construction finished, these areas will remain inactive and 'quiet' until TBM retrieval is needed.</p>
Tunnelling	<p>The tunnelling activities will comprise the boring of 2 No. tunnels for the tunnelled length of the corridor, with a diameter of between 1.5m – 2m. The tunnel drives and depths vary in each section, however noise at ground level from the TBM is likely to be negligible due to the expected cover above each tunnel drive. Noise during tunnelling will therefore arise from the launch shaft machinery.</p> <p>Vibration is expected to arise as the TBM progresses along the route, resulting from the underground excavation of material. The bulk of the pipeline (7 No. of the 9 No. total sections) is to be tunnelled, with no noticeable visual or noise impact at the surface.</p> <p>The TBM will progress at a speed of approximately 1m/hour or 10m/day. As such, it is expected that worst-case vibration effects will be observed at individual receptors for no more than one to two days.</p>
Open cut	<p>2 No. of the 9 No. total sections are to be open cut works, namely section P2 and section P9, near the start and end of the pipeline respectively. These works are more mobile than the shaft works, with plant and equipment following the pipeline as it progresses. Refer to Appendix C for associated equipment.</p>

Table 3: Construction Techniques to be Used	
Construction method	Description of works
Product pipe installation (launch & reception)	With tunnelling works complete, internal product pipes are to be installed within the concrete tunnel pipes. Pipes will typically be installed at the launch shaft locations, with a winch system at the reception shaft pulling the pipes through as they are installed, until the pipe string is complete.
Shaft fit-out	Every shaft is to be fitted out following product pipe installation, and then backfilled upon completion of the pipeline works. The equipment to complete this will be similar to that used in the construction of the shafts.
Vibratory sheet piling	Vibratory sheet piling will be deployed at Shaft W6 and Shaft ED as part of the initial shaft construction works, with the piles removed on completion. The piling works will take approximately 10 days to three weeks and will utilise an excavator mounted vibro-hammer piling method. Percussive piling will be avoided, where practicable, as part of the best practicable means (BPM) for the works. Where initial site inspections allow, push-in piling methods will be used where practicable to almost entirely negate the noise and vibration emissions.
Welfare/De-watering generators	All shafts will incorporate a small, silenced, generator operating 24/7 for the duration of the works to provide power to the site welfare unit and sensitive equipment, as well as de-watering equipment. These generators will be housed wholly within an acoustic enclosure, or behind acoustic screens and will be sized as small as practicable.
Haul Road/Works Access	To facilitate the construction of the shaft compounds, works access and haul roads will be created in several locations: serving Shaft W4, serving Shaft ED, and running approximately parallel to pipe section P2 (between shaft W2 and W3). Works access and haul roads will be constructed during the initial period of each shaft construction; each haul road will be deconstructed and returned to its original state upon completion of works in that area.

5 Working Hours

The working hours for the reservoir pipeline have been confirmed by W&B as follows.

No noisy construction works on the reservoir pipeline sites shall take place outside the hours of 08:00-18:00 Monday to Friday or 08:00-13:00 on Saturday and no Sunday working, with the exception of specific works agreed in writing with the Local Planning Authority in advance, including details of the task, dates, and duration of works.

No works shall take place on Bank or Public Holidays. This is to respect the interest of local amenities and residents.

The only works proposed to occur outside the working hours defined above are as follows:

- The tunnelling works at shaft W2, for the pipeline section P1, will operate continuously (day and night) for a period of approximately 14 days, comprising two 7-day periods approximately three months apart. Shaft W2 is the launch point for the under-track crossing north of shaft W1 which will require works to be undertaken during the daytime and night-time period until complete.
- All shafts/works locations will require a small generator to be operational 24/7 for the duration of the works to provide power to the site welfare units and sensitive equipment, and for de-watering purposes. As stated below, these generators will be located within an acoustic enclosure or located behind an acoustic screen.
- Although every effort will be made to undertake works within the described working hours, in certain circumstances, tunnelling works may be extended past regular hours to avoid unfavourable or unsafe tunnelling conditions and to avoid any potential unforeseen issues or damage to tunnelling equipment.

5.1 Communication of Programme and Working Hours

Prior to works commencing, W&B will arrange a coordination meeting with representatives from Havant Borough Council (HBC) to provide assurance that the planned works and mitigation measures will be implemented as per this S61 application. Should any deviation from the S61 or programme be identified by W&B as a result of on-site conditions, HBC will be notified and appropriate action taken.

Prior to commencing each stage/phase of the programme, W&B will provide Havant Borough Council a running programme of the working hours for each task being undertaken. This running programme will be provided to facilitate effective communication between W&B and HBC, and to provide an informative basis by which any concerns raised by local residents will be addressed.

In cases where evening work overruns (bullet point 3 above), an email will be sent to a pre-determined representative at HBC describing the nature and duration of the overrun. This approach has been agreed in principle following written consultation with HBC Environmental Health Department (dated 10/02/2025).

In cases where works are required to occur outside of the core working hours described above, W&B will also consult with the Project Environmental Advisor in order to identify and mitigate, insofar as is possible, any potential ecological impacts arising from the works.

6 Construction Equipment & Mitigation

6.1 Equipment

The construction equipment proposed to be used during the pipeline works has been categorised at the planning stage by AtkinsRéalis as part of the Environmental Statement Chapter 12 Noise & Vibration (ESNV) for the development¹⁰. W&B has confirmed the plant allowances are accurate insofar as is possible for this S61 application.

The full equipment tables are provided in Appendix C, including the associated Sound Pressure Level at 10m, quantity and percentage on-times. This equipment schedule has been used in the prediction of construction noise and vibration levels in accordance with BS 5228-1 and ANC Good Practice Guide.

6.2 Mitigation – Best Practicable Means

The following mitigation measures have been incorporated into the construction methods to minimise noise and vibration emissions and are considered to be in accordance with current best practicable means (BPM).

W&B has committed to achieving BPM for all activities. All efforts will be made to implement BPM for all construction activities to minimise noise and vibration emissions at source. It is recognised that the individual measures listed below may not be possible to implement in all circumstances; however, W&B will review on a case-by-case basis. All works will be undertaken with due regard for BPM and consideration of the noise and vibration thresholds set out in Section 10.

For the defined works, BPM includes:

- All mobile plant and equipment used on-site will be sourced, where possible, to include proprietary acoustic panels for operational noise reduction. These acoustic panels will be fitted and maintained for the duration of the works whilst equipment is operational.
- All mobile plant and equipment will be switched off when not in use.
- All equipment will be well maintained, including dampers and silencers.
- Faulty equipment will be removed from use.
- Restrict the number of vehicles allowed on site.
- Only plant which complies with the relevant EU/UK noise limits applicable to that equipment or is in no way noisier than would be expected from the noise levels quoted in BS 5228-1 will be used.
- Using vibration-generating equipment at the minimum vibration amplitude where practicable.
- When the vibratory roller must work at maximum amplitude, works will not take place within 5m of residential buildings to eliminate the risk of damage.
- Avoid percussive piling and use low vibration or push-in sheet piling where site conditions allow.
- If required, use rotary bore piling to loosen up soil before sheet piling.

¹⁰ HTR-ATK-ZZ-ZZ-RP-Z-0112 C04 *Environmental Statement Volume 2: Main Report Revised Chapter 12 Noise and Vibration*, 2024, AtkinsRéalis

- Where practicable, using a 'dead rolling' method when vibratory rollers are required for compaction activities, which involves not applying the vibration system on the rolling equipment.
- Tunnelling will be carried out at depths greater than 5m at most locations which mitigates the likelihood of any damage being caused to receptors.
- Vibration monitoring is to be carried out at receptors closer than 5m from the tunnelling works.
- Ensuring that all staff and operatives are briefed on the requirement to minimise nuisance from site activities via toolbox talks.
- Where practicable, Polyfan/PCT grinding and cutting discs will be used which have lower noise and vibration levels than conventional discs.
- Regular noise surveys including octave band analysis, where appropriate, will be undertaken throughout the works, during grinding, drilling and other noise generating activities to ensure plant is operating as expected and that all applicable mitigation is in place.
- Any equipment/plant that appears to be generating high noise levels will be checked for any potential faults by a competent plant fitter/mechanic and removed from site if found unsuitable. Alternative plant/equipment will be investigated for suitability to carry out the work if required.
- Works are to be carried out in accordance with Section 72 of the Control of Pollution Act 1974 and Section 79 of the Environment Protection Act 1990. These works are to be detailed in site, and task specific, RAMS throughout the project.
- Vehicle movements are likely to be a contributing noise source at the construction compound and at shaft locations. A Construction Traffic Management Plan (CTMP) (HTR-WAB-PI-ZZ-PL-W-0003) is to be developed to highlight and mitigate the effects of any potential construction traffic noise. Deliveries of material to and from site compounds will be spaced out evenly to minimise the peak noise of construction traffic.
- Where noisy works are due to take place in proximity to St Thomas More's School as part of the Section P2 open cut trench, these works will be programmed to occur during the summer holidays to minimise disruption to learning insofar as is practicable.

Further to the above, prior notification will be made to all receptors within 85m of the works (including tunnelling corridor) to advise when construction noise and vibration may occur. The ESNV identified that significant noise and vibration effects are not expected to occur beyond this distance.

6.3 Mitigation – Project Specific

In addition to the BPM set out above, the following project specific mitigation will be employed.

Table 4: Project Specific Noise Mitigation	
Mitigation measure	Description
Works boundary noise barriers	<p>Temporary noise barriers will be implemented at all works areas to contain construction noise emissions at source (insofar as is practicable), with the exception of section P9 (opencut).</p> <p>For all shaft locations, noise barriers will be implemented in the form of fixed, solid hoarding. The site hoarding will be 2.4m tall for security purposes, encompassing the</p>

Table 4: Project Specific Noise Mitigation	
Mitigation measure	Description
	<p>full perimeter of each shaft area. Hoarding will be formed from a solid and imperforate plywood panelling with a minimum density of 10 kg/m²; where acoustic control is identified as a priority near noise sensitive locations (including but not limited to residential premises, hospitals, schools), the site hoarding will be enhanced to achieve a mass not less than 17 kg/m². The edging and joints between hoarding panels will be sealed to ensure full acoustic integrity.</p> <p>For Section P2 (open cut), temporary noise barriers will be utilised throughout the opencut trench works along the eastern and northern boundaries of the works area; in particular, care will be taken to ensure temporary screening is provided during works near St Thomas More's School and Bidbury School. Noise barriers will be no less than 2.0m tall, formed from proprietary acoustic blankets with a minimum superficial density of 7 kg/m². The extent of the temporary screening will be sufficient such that noise leakage around the edges of the barrier does not contribute to the screening offered by the barrier. To this end, temporary barriers will extend no less than 5m past the active works area in a direction perpendicular to the direction of the surrounding sound sensitive receptors.</p>
Equipment noise barriers	Local acoustic barriers will be erected around fixed noisy plant within the works areas where possible (comprising scaffold frames and suspended acoustic blankets) to remove the line of sight between plant and receptors. These barriers will be installed primarily to the tunnelling centrifuge pumps, screening and separation plant (refer to Appendix C).
Programming	Insofar as is practicable, works on the Section P2 (opencut) will be programmed to occur outside of term-time. This will minimise disruption to the staff and pupils of St. Thomas More's Primary School.

The proposed site hoarding, noise barriers, and construction programme have been accounted for in the prediction of noise and vibration levels presented in Section 8 and in the determination of the proposed noise monitoring thresholds defined in Section 10..

6.4 Noise Insulation & Temporary Rehousing

The requirements for a S61 under CoPA state that powers are only available to control noise emitted from the premises, or noise at any specified point on those premises.

This implies therefore that any determination or review of BPM under the provisions of CoPA cannot take into account the intention or otherwise to offer off-site mitigation in the form of noise insulation or temporary re-housing invoked under separate legislation. However, it may be appropriate for a developer/contractor to provide details regarding off-site mitigation measures and eligibility for information purposes only, and to ensure that the Local Authority are provided with the full details of both on-site and off-site measures (as opposed to being included for the purposes of obtaining consent).

As such, and in line with the ANC guidance, eligibility and applications for off-site mitigation for these works will be managed through the implementation of a Noise Insulation and Temporary Rehousing Policy. This policy is beyond the scope of this S61 application; however, to demonstrate due diligence, information has been presented herein with relation to the trigger thresholds and likely eligibility of noise insulation as a result of the works.

Following the implementation of BPM as set out herein, and in line with Section E.4 of BS 5228-1, W&B will offer noise insulation (or reasonable costs thereof) where applied for by owners or occupiers of the affected dwellings to habitable rooms (bedrooms, living rooms). Dwellings will be considered eligible for noise insulation where construction noise levels¹¹ are measured or predicted to exceed either of the following:

- the threshold levels set out in Table 5¹² for the corresponding time of day; or
- a noise level 5 dB or more above the existing pre-construction ambient noise level for the corresponding time of day (whichever is higher);

and for a period of 10 or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any 6 consecutive months.

W&B will offer temporary re-housing (or reasonable costs thereof) where applied for by owners or occupiers of the affected dwelling where construction noise levels are measured or predicted to exceed either of the following:

- A noise level 10 dB above the threshold levels set out in Table 5 for the corresponding time of day; or
- A noise level 10 dB or more above the existing pre-construction ambient noise level for the corresponding time of day (whichever is higher);

and for a period of 10 or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any 6 consecutive months.

In accordance with BS 5228-1, non-residential buildings (the occupants of which are likely to be particularly sensitive to noise - including commercial and educational establishments, hospitals and clinics) will be subject to individual consideration by W&B, upon application by the affected party.

The number of receptors likely to be eligible for off-site mitigation is presented in Section 9 as part of the construction noise level calculations. These have been provided for completeness of information and to provide confidence that all on-site mitigation measures have been explored for these works in line with the S61 requirements.

¹¹ 'Construction noise' being noise emissions from construction works, plant, and activities, in isolation, without contributions from any pre-existing environmental noise sources.

¹² Eligibility thresholds as per BS 5228-1 Table E.2

Table 5: Time periods and noise levels associated with the determination of eligibility for noise insulation (BS 5228-1 Table E.2)

Time	Relevant Time Period	Averaging time, T	Noise insulation trigger level, dB $L_{Aeq,T}$ ^A
Monday to Friday	07.00 – 08.00	1 h	70
	08.00 – 18.00	10 h	75
	18.00 – 19.00	1 h	70
	19.00 – 22.00	3 h	65
	22.00 – 07.00	1 h	55
Saturday	07.00 – 08.00	1 h	70
	08.00 – 13.00	5 h	75
	13.00 – 14.00	1 h	70
	14.00 – 22.00	3 h	65
	22.00 – 07.00	1 h	55
Sunday and Public Bank Holidays	07.00 – 21.00	1 h	65
	21.00 – 07.00	1 h	55

^A All noise levels are predicted or measured at a point 1m in front of the most exposed of any windows and doors in any façade of any eligible dwelling.

7 Baseline Acoustic Conditions

7.1 Overview

The baseline pre-construction noise levels in the vicinity of Havant Thicket Reservoir and the associated pipeline works have been determined following environmental noise surveys undertaken by AtkinsRéalis as part of the ESNV for the development.

The measurement methodology and results for the pipeline corridor set out in the ESNV are summarised below.

Given that construction vibration is assessed against absolute thresholds, the baseline vibration level at all receptors is considered to be zero and as such no baseline survey works have been undertaken.

7.2 Survey Methodology

The baseline environmental noise climate across the pipeline corridor was determined following attended noise measurements during the daytime hours at four locations. Locations were selected to be representative of the prevailing noise climate in the area. The methodology and measurement positions were reportedly agreed with the Environmental Health Officer (EHO) at HBC prior to the survey taking place.

Night-time noise levels were then determined following a review of the Defra strategic noise maps for England which provide estimated noise levels from major transport (road and rail) sources across the UK.

7.3 Results Summary

The ESNV provides the following summary of noise levels across the proposed scheme extents resulting from the above survey works.

Table 6: Baseline Environmental Noise Levels in the Vicinity of the Scheme [Table 12-14 of ES Chapter 12, AtkinsRéalis]				
Area		Time Period	Data Source	Baseline noise level, dB L _{Aeq}
Pipeline corridor	High Lawn Way	Daytime	AtkinsRéalis baseline noise survey	53
	Purbrook Way			59
	Barncroft Way			52
	Bidbury Preschool			58
	Bedhampton	Night-time	Defra Strategic Noise Map	50-55

8 Predicted Construction Noise Levels

8.1 Overview

Construction noise levels have been predicted at the noise sensitive receptors closest to the works areas in accordance with BS 5228-1, the plant equipment tables in Appendix C and the mitigation measures set out herein. In accordance with the ANC guidance, these predictions have been presented to demonstrate the range of noise levels expected at the identified receptors following the implementation of BPM. This report does not present commentary or discussion of potential noise impacts; reference should instead be made to the ESNV where required.

8.2 Prediction Methodology and Noise Modelling

The noise levels resulting from construction activities will depend on the type of activity, period of operation, source to receiver distance, ground absorption and reflections.

The predictions of resultant noise levels are based on a percentage on-time for each activity during the assessment period, as provided by W&B. The percentage on-time covers periods when a specified tool, machine or activity is in peak operation.

The predictions have been undertaken using the Datakustik Cadna/A noise modelling software package, which applies the ISO 9613-2¹³ methodology. The sound propagation model allows for the specific sound level to be predicted at each noise sensitive receptor, whilst considering factors such as geometric spreading, the effect of any intervening buildings, walls or ground features. ISO 9613-2 has also been used within the noise model to predict the efficacy of the proposed site hoarding and acoustic barriers described above.

The noise model has been used to predict the level of noise that would be experienced at nearby receptors as a result of the works undertaken and equipment used during the daytime ($L_{Aeq,10hr}$) and night-time ($L_{Aeq,8hr}$) shifts.

8.3 Modelling Stages

Based on the information provided and given that the detailed works programme may change as the works progress, the noise predictions reflect the worst-case noise level expected in each month based on the provided simplified programme, therefore accounting for the possible overlaps between phases which may result in increased noise impacts.

8.4 Noise Sensitive Receptors Considered

In order to review the resultant construction noise levels expected during the works, a notional study area has been derived. This study area considers all noise sensitive receptors (dwellings, schools, etc) that have a direct line of sight to the pipeline corridor (including tunnelling routes), equating to 863 individual noise sensitive receptors including non-residential uses.

¹³ ISO 9613 Part 2: 'Acoustics -- Attenuation of sound during propagation outdoors -- Part 2: General method of calculation', International Organization for Standardization, 2024.

Typically, this equates a radius of 50 – 100m from the works, depending on receptor locations. All other receptors further from the works will be subject to lower noise levels due to increased propagation losses and screening.

Construction noise levels have been calculated at 1m from each façade of these receptors using the noise modelling approach set out above. Building heights within the noise model, for both sensitive receptors and non-sensitive receptors, have been estimated from publicly available mapping of the local area, on the basis of each storey being typically 2.4m, with façade receptors located 1.5m above local floor level.

In order to provide a concise summary of predicted construction noise levels, and given the duration of the works, it is not considered prudent to provide full results for each of the 863 receptors for the full construction period. Instead, Table 7 below identifies the individual worst-affected receptor during each month of the works, the resultant noise level, and the closest works area. This approach is considered to align with the ANC Good Practice Guide.

Full calculation details and results are available upon request.

8.5 Noise Model Validation

Following consultation with HBC in support of this S61 application, a noise model verification process will be undertaken following commencement of the initial works to ensure the accuracy and reliability of the noise calculations presented below. This verification will be completed by comparing the noise modelling results to the results of in-situ noise monitoring undertaken during the first phase of works. Where a variance of $< \pm 3$ dB is found, this is an indication that the noise modelling exercise is robust and within expected tolerances. Where a variance of greater than 3 dB is found, the noise modelling approach will be investigated to identify and evaluate the likely cause of the variance. Where appropriate, revised noise modelling may then be undertaken to reflect the measured scenario. In either instance, HBC will be notified of the validation assessment outcomes and any implications this may have on the S61 application.

Refer to Section 10 for further details on noise monitoring.

8.6 Prediction of Construction Noise Levels

8.6.1 Daytime Works (08:00 – 18:00)

Table 7 presents the calculated worst-case construction noise level in each month of the programme, the receptor at which this level is predicted, the pre-existing ambient noise level, and the closest works activity.

Given that each works area will be surrounded by site hoarding, noise levels have been predicted at first-floor level, as this will be subject to lower levels of screening and therefore exposed to higher construction noise levels.

Table 7: Summary of Construction Noise Levels – Daytime				
Programme Month	Worst-affected receptor address	Existing ambient noise level, dB L _{Aeq,T}	Predicted worst-case construction noise level, dB L _{Aeq,10hr} (Facade)	Closest works area
1	23 Beaufort Road	52 - 59	67	Shaft W2
2	23 Beaufort Road	52 - 59	67	Shaft W2
3	23 Beaufort Road	52 - 59	72	Shaft W2
4	23 Beaufort Road	52 - 59	70	Shaft W2
5	23 Beaufort Road	52 - 59	70	Shaft W2
6	23 Tarrant Gardens	52 - 59	72	Shaft W3
7	43 Corhampton Crescent	52 - 59	78	Shaft ED
8	43 Corhampton Crescent	52 - 59	76	Shaft ED
9	43 Corhampton Crescent	52 - 59	76	Shaft ED
10	9 Ellisfield Road	52 - 59	74	Shaft W5
11	9 Ellisfield Road	52 - 59	74	Shaft W5
12	45 Dunsbury Way	52 - 59	82	Shaft W6
13	45 Dunsbury Way	52 - 59	79	Shaft W6
14	9 Ellisfield Road	52 - 59	77	Shaft W5
15	9 Ellisfield Road	52 - 59	77	Shaft W5
16	9 Ellisfield Road	52 - 59	77	Shaft W5
17	9 Ellisfield Road	52 - 59	77	Shaft W5
18	83 High Lawn Way	52 - 59	79	Shaft W7
19	23 Beaufort Road	52 - 59	72	Shaft W2
20	83 High Lawn Way	52 - 59	79	Shaft W7
21	83 High Lawn Way	52 - 59	79	Shaft W7
22	83 High Lawn Way	52 - 59	79	Shaft W7
23	83 High Lawn Way	52 - 59	79	Shaft W7
24	83 High Lawn Way	52 - 59	79	Shaft W7
25	83 High Lawn Way	52 - 59	79	Shaft W7
26	83 High Lawn Way	52 - 59	79	Shaft W7
27	83 High Lawn Way	52 - 59	79	Shaft W7
28	83 High Lawn Way	52 - 59	79	Shaft W7
29	83 High Lawn Way	52 - 59	79	Shaft W7
30	83 High Lawn Way	52 - 59	79	Shaft W7
31	83 High Lawn Way	52 - 59	75	Shaft W7
32	83 High Lawn Way	52 - 59	75	Shaft W7
33	45 Dunsbury Way	52 - 59	79	Shaft W6
34	45 Dunsbury Way	52 - 59	51	Shaft W6

Table 7: Summary of Construction Noise Levels – Daytime				
Programme Month	Worst-affected receptor address	Existing ambient noise level, dB $L_{Aeq,T}$	Predicted worst-case construction noise level, dB $L_{Aeq,10hr}$ (Facade)	Closest works area
35	83 High Lawn Way	52 - 59	76	Shaft W7
36	83 High Lawn Way	52 - 59	76	Shaft W7

8.6.2 Construction Overrun

Unless specifically stated herein, works will occur during daytime hours only, between 08:00 – 18:00 (08:00 – 13:00 Saturdays). However, in some exceptional circumstances, tunnelling works may be required to continue past the core daytime hours to ensure the site is left in a safe working condition (refer to Section 5).

Given the nature of the works, noise levels from the shafts are expected to be broadly continuous in magnitude and so the levels predicted above are also considered representative of the equivalent continuous noise levels expected during evening overrun hours.

Evening works will be avoided wherever possible through careful programming. As part of this programming, the opportunities for early stoppages (i.e. before 18:00) will be considered/evaluated on a day-to-day basis. Any unavoidable evening overruns will occur rarely in practice and be halted at the earliest safe opportunity.

In cases of evening overruns, an email will be sent to HBC detailing the nature and duration of the overrun for record keeping purposes.

8.6.3 Night-time Works (23:00 – 07:00)

Table 8 presents a summary of the worst-affected receptors, and worst-case calculated construction noise levels during the night-time works at Shaft W2 (resulting from tunnelling) and at each works location as a result of the 24/7 generators required for welfare units and de-watering.

Given that these are localised works, and separate in the programme, these have been described by construction task only.

Table 8: Summary of Construction Noise Levels – Night-time				
Construction Task/Area	Worst-affected receptor address	Existing ambient noise level, dB $L_{Aeq,T}$	Predicted worst-case construction noise level, dB $L_{Aeq,10hr}$	Closest Works Area
Shaft W2 Tunnelling	25 Beaufort Road	50 - 55	66	Shaft W2 Tunneling
Welfare/De-watering Generators (All Areas)	45 Dunsbury Way	50 - 55	49	Shaft ED Generator

8.6.4 Eligibility for Noise Insulation and Temporary Rehousing

Based on the results of the noise modelling exercise and works programme set out herein, some noise sensitive receptors are likely to be eligible for off-site mitigation due to the works (subject to ongoing noise monitoring).

As described above, the implementation of noise insulation eligibility is provided for information only, but is not considered applicable to the determination of S61 consents which rely on the demonstratable implementation of BPM.

On this basis, the quantity of receptors likely to be eligible for off-site mitigation (noise insulation or temporary re-housing) is presented below in Table 9. Eligibility and implementation of off-side mitigation will be managed through a Noise Insulation and Temporary Rehousing Policy, where applied for by owners or occupiers of affected receptors.

Based on the modelling results and works programme, no properties are considered likely to be eligible for noise insulation or temporary rehousing due to night-time construction works. Eligibility for noise insulation is identified for some receptors as a result of daytime works only.

Table 9: Quantity of receptors likely to be eligible for Noise Insulation and/or Temporary Rehousing			
Likely eligible for noise insulation due to daytime works	Likely eligible for temporary re-housing due to daytime works	Likely eligible for noise insulation due to night-time works*	Likely eligible for temporary rehousing due to night-time works*
43	0	0	0
* Night-time works that exceed the off-site mitigation thresholds will occur for durations of 7 days or less in a 3-month period. Therefore the durations are not sufficient to result in eligibility at receptors.			

In all instances, the potential noise insulation eligibility outlined above refers only to windows of occupied rooms (e.g., bedrooms, living rooms) that have a direct line of sight to the works areas. Windows that do not overlook a works area, and that are screened by the building fabric, will experience noise levels typically 10 dB lower than those fronting the works, and as such are not likely to be eligible for noise insulation.

9 Predicted Construction Vibration Levels

9.1 Overview

Construction vibration during the pipeline works will arise from the following primary activities:

- Groundworks including excavation and compaction at the shafts and at the open-trench sections of pipe;
- Sheet piling at Shafts W6; and
- The progression of the tunnel boring machine (TBM) during tunnelling works.

Limited details are available from manufacturers regarding the resultant ground-borne vibration from the above construction activities. As such, the prediction of resultant vibration levels is based on in-situ measurements undertaken of similar equipment, as presented in BS 5228-2 and associated guidance. In accordance with the ANC guidance, these predictions have been presented to demonstrate the range of vibration levels expected at the identified receptors following the implementation of BPM. This report does not present commentary or discussion of potential vibration impacts; reference should instead be made to the ESNV where required.

9.2 Prediction Methodology

9.2.1 Compaction and Sheet Piling

BS 5228-2 presents methods for predicting Peak Particle Velocity (PPV) vibration levels at receptors resulting from compaction (during start-up and steady-state operation) and piling (in this instance, vibratory sheet piling).

Compaction vibration levels have been based on a typical manufacturer's specification (in this case a Cat CB10 Tandem Vibratory Roller, with two drums of 1.7m wide, and a nominal maximum amplitude of vibration of 1.06mm and a minimum of 0.34mm). Modelling has been undertaken on the basis of minimum roller amplitude in line with the BPM.

Sheet piling vibration levels have been calculated on the basis of a 33.3% probability of being exceeded.

9.2.2 Excavation

No prediction method is provided in BS 5228-2 for excavation works, however reference vibration levels for excavation equipment are provided in documentation published by New Zealand Transport Agency research report 485¹⁴ (indicating 1.8mm/s PPV at 10m for a 6t excavator). A generic vibration propagation calculation is presented by the Federal Transit Administration (FTA)¹⁵, which has then been used in this report to derive estimated vibration levels from excavation works.

¹⁴ New Zealand Transport Agency research report 485 Ground vibration from road construction, 2012, NZ Transport Agency

¹⁵ Federal Transit Administration Report No. 0123 Transit Noise and Vibration Impact Manual, 2018, U.S. Department of Transport

9.2.3 Micro-Tunnelling

Whilst Annex E of BS 5228-2 presents a prediction method for vibration resulting from tunnelling activities, this prediction method is derived from TBMs significantly larger than those proposed herein and as such is expected to result in significant overestimations of resultant PPV. As such, guidance has been taken from the Transport Research Laboratory report 429, *Groundborne vibration caused by mechanised construction works* (TRL 429)¹⁶.

TRL 429 presents measured vibration levels at a range of distances from tunnelling activities of a similar size to those proposed for these works. For a 2.44m diameter TBM, surface vibration levels at 10m from the TBM route were measured as $\approx 0.35\text{mm/s}$ PPV for cohesionless soil (cobblestones and sandstone) and $\approx 1.5\text{mm/s}$ PPV at 10m for “*moderately strong mudstone*”.

It is understood that the Havant area geological conditions are broadly similar to the former presented above.

Resultant vibration levels from tunnelling have been estimated using professional judgement and extrapolation of the TRL data.

9.3 Prediction of Construction Vibration Levels

Table 10 presents the distances below which vibration resulting from construction works are likely to be perceptible, and the number of receptors within this radius.

Table 10: Vibration Perceptibility Distances for Construction Activities		
Construction activity type	Distance, m, at which vibration is not likely to be perceptible in residential environments (<0.3mm/s PPV)	Number of receptors where vibration may be perceptible
Excavation	30	23 (P2 open cut) 5 (Shaft 3) 5 (Shaft 5) 11 (Shaft 6) 3 (Shaft 7)
Vibratory compaction	30 (during start up/run down)	23 (P2 open cut) 5 (Shaft 3) 5 (Shaft 5) 11 (Shaft 6) 3 (Shaft 7)
Vibratory Sheet Piling	100	64 (Shaft 6) 33 (Shaft ED)
Tunnelling (TBM)	18	80 (Full pipeline)

Of the receptors identified above, Table 11 identifies the likely worst-affected of these (i.e. closest to the works) and the resulting vibration level during works.

¹⁶ TRL Report 429 *Groundborne vibration caused by mechanised construction works*. Prepared for Quality Services – Civil Engineering, Highways Agency, 2000, Transport Research Laboratory

Notes A and B of Table B.1 of BS 5228-2 state:

“A) The magnitudes of the values presented apply to a measurement position that is representative of the point of entry into the recipient.

B) A transfer function (which relates an external level to an internal level) needs to be applied if only external measurements are available.”

Therefore, as vibration levels have been predicted to external locations, it is considered acceptable in this instance to apply an external to internal transfer function to derive resultant internal vibration levels.

Typical external to internal vibration transfer functions are presented in Table 6-12 of the FTA Noise and Vibration Impact Manual. This documents states that for a 1-2 storey masonry building, a correction of -7 dB may be applied to estimate internal vibration levels. Given that vibration decibels are derived as a $20\log(v/v_{ref})$ function, a 7 dB reduction equates approximately to a 45% PPV magnitude reduction.

Construction activity type	Worst-affected receptor address	Distance from works, m	Resulting 'external' vibration level, PPV mm/s	Resulting 'internal' vibration level, PPV mm/s
Excavation	45 Dunsbury Way, PO9 5BB	15	0.98	0.4
Vibratory Compaction	45 Dunsbury Way, PO9 5BB	15	0.6 (steady state) 0.8 (start up)	0.3 (steady state) 0.4 (start up)
Vibratory Sheet Piling	45 Dunsbury Way, PO9 5BB	8	8.4	3.8
Tunneling (TBM)	4 Brunswick Gardens, PO9 3HZ	2	3.9 – 9.8 (based on local soil conditions)	1.8 – 4.4 (based on local soil conditions)

According to BS 5228-2, vibration magnitudes under 1.0mm/s PPV are likely to be tolerable within dwellings provided prior notice is given to occupants. Therefore, Table 11 indicates that the proposed construction methods and BPM will not result in adverse comment due to vibration from compaction or excavation works.

External vibration from vibratory sheet piling is expected to reach a maximum of 8.4mm/s PPV at the nearest receptor, equating approximately to 3.8mm/s PPV internally. This magnitude of vibration is likely to be tolerable given prior notice and when considered in the context of the ESNV (paragraphs 12.59 – 12.60), with the programme indicating a maximum duration of 10 days at Shaft W6. Piling works at Shaft ED will occur for approximately 3 weeks, however receptors are significantly further from Shaft ED ($\approx 30\text{m}$) and so vibration levels will be considerably lower than those predicted for Shaft W6.

In line with the defined BPM, where the ground conditions allow, push-in piling methods will be implemented in place of vibratory piling, resulting in negligible vibration levels.

During tunnelling works, it is expected that an external vibration level of 3.9 - 9.8mm/s PPV may occur at the closest receptors (subject to local ground conditions), equating approximately to 1.8 - 4.4mm/s PPV internally. When considered in the context of the ESNV, adverse comments may therefore arise from these worst-affected occupants. However, given the moving nature of the TBM, this magnitude of vibration is expected to occur for a maximum of one day per section of tunnel; after this the TBM will be sufficiently far from the receptor that vibration will be tolerable given prior notice.

In all cases, the predicted maximum external vibration levels presented in Table 11 are below those at which there is a risk of cosmetic building damage (as per BS 7385-2:1993¹⁷). However, given the proximity of the tunnelling works to noise sensitive receptors, and to demonstrate due diligence, W&B will look to undertake pre-works building condition surveys at the residential premises where the 'amber' alert threshold described in Table 13 is anticipated to be exceeded during TBM pass-bys. These receptors have been identified as: # 4 & 5 Brunswick Gardens, # 1 & 8 North Street, and #83 & 85 Barncroft Way. Condition surveys are subject to access and agreement with the occupiers.

9.3.1 Ground-borne Noise

The nature of the tunnelling works, being a source of vibration with little to no environmental noise emissions (excluding at the shaft locations), the works may result in audible ground-borne noise (GBN) within the building of the receptors.

Whilst BS 5228-2 provides a method for calculating likely GBN from tunnelling activities, this is derived from TBMs with a significantly larger diameter than those proposed here and so it is expected that this method will result in significant over estimation of re-radiated noise levels.

Mitigation for GBN is limited strictly to the source equipment, with options to reduce GBN linked essentially to limiting working hours and ensuring the slowest modes of operation are used. In this instance, the tunnelling plant will be operated during daytime hours only (excluding shaft W2), and at the minimum speed feasible to deliver the works within programme.

Furthermore, as part of the prior notification of works, a comprehensive and informative community relations programme will be formulated by W&B and implemented well in advance of the approaching works.

It is considered therefore that BPM has been demonstrated for this element.

¹⁷ British Standard ('BS') 7385-2:1993 Evaluation and measurement for vibration in buildings – Guide to damage levels from groundborne vibration, 1993, British Standards Institution ('BSI')

10 Noise and Vibration Monitoring

Noise and vibration monitoring will be undertaken across the pipeline corridor using equipment with integrated real-time viewers and alert/notification systems. The monitoring locations, requirements and notification thresholds are presented below. Specific monitoring systems will be determined prior to works commencing.

The remotely accessible monitoring system for each noise and vibration logger will be configured to provide real time viewing and alerts to W&B. As per consultation undertaken with HBC to support this S61 application, a 'viewer only' profile will be configured for representatives at HBC.

Following alerts of 'red' threshold exceedances (as defined below), W&B will produce a written notification for submission to HBC detailing the time and magnitude of the alert and any actions taken. This notification will be provided within 24-hours of each 'red' alert received.

Further to this, a weekly report will be produced and issued to HBC for record keeping purposes presenting the full time-history of each noise and vibration logger for that period, and a summary of any alerts received, and actions taken.

10.1 Noise Monitoring

Noise monitoring will be undertaken during the works at each shaft location and along the boundary of the open cut works at Section P2 and Section P9.

A single monitor will be installed per shaft location at the site boundary closest to a noise sensitive receptor; at least two monitors will be installed at each open cut works area, representative of the closest noise sensitive receptors.

Monitoring will be undertaken at each works area for the full period when that area is active, as below. Furthermore, where programme and logistics allow, monitoring will begin one week prior to commencement of the works in order to quantify an up-to-date baseline condition in the area:

- Launch shafts: baseline, plus continuous monitoring from shaft construction to shaft fit-out/backfill.
- Reception shafts: baseline, plus continuous monitoring during shaft construction and shaft fit-out/backfill, and TBM retrieval. Reception shafts will be largely silent between these periods and so monitoring is not deemed beneficial.
- Open cut works: baseline, plus continuous monitoring from initial works to completion.

It is expected that site hoarding and haul/access roads may need to be installed prior to safe and secure monitoring locations being available. Therefore, these enabling works will be supported by observational monitoring by the site management team to verify that the construction methods, plant and BPM noise mitigation measures are being implemented.

All noise monitoring equipment will conform to Type 1 specification of British Standard 61672-1: *Electroacoustics. Sound level meters*¹⁸. Metrics to be measured will include:

- LAeq,1hour
- LA10,1hour
- LA90,15min
- LAFMax,15min

The results of the monitoring will be used as verification of the noise levels predicted herein for each phase of works and the efficacy of the BPM. The monitoring will also be used to support investigations of complaints and for final determination of eligibility for off-site mitigation (noise insulation and temporary re-housing).

To this end, the monitors will be set up to provide real time alerts to W&B where significant adverse impacts may occur as defined in BS 5228-1 ('amber' thresholds), and where the eligibility threshold for off-site mitigation is exceeded ('red' threshold). Given that monitoring will take place at the works boundary rather than at receptor locations (which are further away and subject to screening losses from the site hoarding), thresholds levels will be configured as follows¹⁹:

¹⁸ British Standard 61672-1: 2003: *Electroacoustics. Sound level meters. Part 1 Specifications*. British Standards Institution (BSI).

¹⁹ The proposed 'Amber' and 'Red' notification thresholds are respectively 5 dB greater than the significant effect threshold and noise insulation eligibility criteria defined in BS 5228-1 and presented herein. This adjustment allows for the minimum 5 dB grazing line of sight screening loss that will be experienced at receptors as a result of the site hoarding. This does not allow for any additional distance propagation losses and so is considered a reasonable worst-case adjustment to reflect the propagation losses between the site boundary and receptor facades.

Table 12: Noise Monitoring Thresholds & Alert Actions				
Period, T	Amber threshold*	W&B action on Amber alert	Red threshold*	W&B action on Red alert
Daytime (07:00 – 19:00, 07:00 – 13:00 Saturdays)	70 dB L _{Aeq,1hour}	W&B to review local environment to confirm that the alert is due to site activity. W&B to review construction activities with regard to plant, methods, and locations and confirm that all BPM is in place.	80 dB L _{Aeq,1hour}	W&B to undertake amber threshold review. Where BPM is already in place, W&B to review the nearby noise sensitive receptors with regard to NITR eligibility.
Evening (19:00 – 23:00, 13:00 – 23:00 Saturdays, 07:00 – 23:00 Sundays and Bank Holidays)	60 dB L _{Aeq,1hour}	Where it is found that BPM is not being observed, works will be paused until BPM has been implemented.	70 dB L _{Aeq,1hour}	If NITR has already been allocated, no further action to be taken. Where NITR has not been allocated, W&B will review the works programme and task durations to identify if additional receptors are eligible for NITR. NITR to be actioned as set out in the relevant Policy.
Night (23:00 - 07:00)	50 dB L _{Aeq,1hour}		60 dB L _{Aeq,1hour}	
* Measured at the site boundary above the site hoarding.				

A 1-hour integration period is proposed in all instances as this allows W&B an opportunity to immediately investigate and, where possible mitigate, noise emissions in the context that they are occurring.

10.2 Vibration Monitoring

Vibration monitoring will be undertaken during the construction and fit-out of each shaft, during the open cut trench works, and throughout the tunnelling periods.

Vibration monitoring will be undertaken as follows:

- Shafts: vibration monitors will be installed at all shafts during the construction and fit-out/completion works. The monitor will be installed at the works area boundary closest to the nearest receptor (this may be the same location at the noise monitoring set out above). Monitoring is not considered necessary at the shafts during the tunnelling works except for the initial/final periods (as below).
- Open cut/trench works: vibration monitors will be installed at the open cut/trench works areas for the full duration of this phase of works. The monitor will be installed at the works area boundary closest to the nearest receptor.
- Tunnelling: Due to the moving nature of the tunnelling works, fixed monitoring positions are not expected to be beneficial or practicable. Instead, short-term attended vibration monitoring will be undertaken on a regular basis at positions representative of receptors closest to the TBM location. Monitoring will be

undertaken for a period of no less than 1-hour per week to verify that the TBM is progressing as expected and that vibration emissions align with those predicted herein. Additional short-term vibration monitoring will be undertaken on receipt of a complaint or where the tunnelling equipment indicates a change in soil conditions.

As with the noise monitoring, it is expected that site hoarding and haul/access roads may need to be installed prior to safe and secure monitoring locations being available. Therefore, these enabling works will be supported by observational monitoring by the site management team to verify that the construction methods, plant and BPM vibration mitigation measures are being implemented.

The results of the monitoring will be used primarily as verification of the vibration levels predicted herein for each phase of works, and the efficacy of the BPM. The monitoring will also be used to support investigations of complaints and to determine risk of building damage.

To this end, the fixed monitors will be set up to provide real time alerts to W&B; attended measurements of TBM vibration will present immediate notification to the surveyor. Given that monitoring will take place at locations representative of receptors, thresholds levels will be configured as follows²⁰:

Table 13: Vibration Monitoring Thresholds & Alert Actions				
Period, T	Amber threshold	W&B action on Amber alert	Red threshold	W&B action on Red alert
All periods	6 mm/s PPV	<p>W&B to review local environment to confirm that the alert is due to site activity.</p> <p>W&B to review construction activities with regard to plant, methods, and locations and confirm that all BPM is in place.</p> <p>Where it is found that BPM is not being observed, works will be paused until BPM has been implemented.</p>	12.5 mm/s PPV	<p>Where the alert is associated with shaft or open trench locations, W&B to undertake amber threshold review. Where the alert is expected to occur repeatedly due to a specific construction task, W&B to notify local residents (via the agreed community engagement) detailing the specific works causing the alert, the nature of the potential disturbance, and the expected duration.</p> <p>Where the alert is a result of tunnelling operations at the TBM monitoring location, and an amber review has been undertaken, post-construction surveys will be carried out at affected receptors when adjacent</p>

²⁰ 'Amber' thresholds are set at the level at which complaints may be expected from occupants of nearby dwellings, following prior notification of the works; allowing for typical ground to foundation transfer losses, this is equivalent to $\approx 3\text{mm/s}$ PPV within dwellings. 'Red' thresholds are set at the level above which the risk of cosmetic damage is no longer zero.

				<p>tunnelling works are complete, to assess impact and to undertake appropriate and reasonable remediation as necessary.</p> <p>Comparison with existing pre-construction surveys (refer to Section 9.3) can be completed to determine impacts of tunnelling works (if any).</p>
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11 Community Liaison

Table 14 presents the key personnel involved in the construction of the pipeline, as provided by W&B.

Table 14: Key Personnel			
Position	Name	Phone Number	Email Address
Client	Portsmouth Water	-	-
Principal Contractor	Ward and Burke	-	-
Principal Designer	Ward and Burke	-	-
Project Director	Joe Dobey	07738 415509	Joe.Dobey@wardandburke.com
Project Manager	Brien Curran	07739 324048	Brien.Curran@wardandburke.com
Assistant Project Manager	Thomas Foster	07784 231394	Thomas.Foster@wardandburke.com
SHEQ Manager	James Batchelor	-	James.Batchelor@wardandburke.com
Environmental Clerk of Works	Elliot Murray	-	Elliot.Murray@wardandburke.com

12 Conclusion

Sweco UK have been commissioned by W&B to predict and assess the likely levels of construction noise and vibration arising from the Havant Thicket Reservoir pipeline construction works.

This report has been prepared to support a Section 61 application with respect to the full pipeline works programme.

In accordance with industry best practice and British Standard code of practice guidance, this report presents a summary of the baseline conditions along the pipeline corridor, details of the works methods and plant/equipment to be used, details of the mitigation measures proposed including best practicable means, the prediction of construction noise and vibration levels at a representative sample of receptors, and guidance on noise and vibration monitoring include trigger thresholds.

Whilst not strictly forming part of the S61 consent process, consideration has also been given to the likelihood of eligibility for off-site mitigation (noise insulation and temporary re-housing) for information and to demonstrate that both on-site and off-site mitigation measures are being considered. As such, the quantities of receptors likely to be eligible have been summarised herein. The application and implementation of off-site mitigation will be undertaken in accordance with a Noise Insulation and Temporary Rehousing Policy, which is beyond the scope of this document.

The construction vibration predictions find that dwellings closer than 30m to the works may experience perceivable vibration as a result of the construction activities. However, vibration levels are likely to be acceptable given the works durations and on the basis that prior notification will be given.

Based on the above, it is concluded that construction noise and vibration impacts have been appropriately assessed, with adequate mitigation measures and a programme of monitoring recommended, to satisfy a successful S61 application for the proposed works.

Appendix A – Glossary of Acoustic Terminology

Table A1: Definitions of Acoustic Terminology and Parameters	
Wording	Description
Ambient sound level	The total sound pressure level in a given position from all surrounding sources of noise, both near and far. Normally expressed as an equivalent continuous A-weighted sound pressure level, dB $L_{Aeq,T}$.
A-weighting	The process of weighting the observed sound pressure level at each frequency band, to approximate the sensitivity of the human ear to sounds of different frequencies. A-weighted sound pressure levels are expressed as dB(A) or dB L_{Ap} .
Decibel	A logarithmic value quantifying the sound pressure at a specified position or sound power, relative to a reference sound pressure or sound power (20 μ Pa for sound pressure, 10-12 W for sound power).
Façade	A sound monitoring position is a “façade” position when it includes a strong reflection from an adjacent building or structure. This corresponds with a position that is between 1 and 2 metres away from a reflecting building or structure.
Free-field	A sound monitoring position is a “free-field” position when it is not affected by sound reflections from surrounding buildings and structures. This corresponds with a position at least 3.5 metres away from reflecting buildings or structures.
Frequency	The number of oscillations per second of a vibrating particle in a medium, measured in Hertz (Hz) or cycles per second.
$L_{A10,18hr}$	The A-weighted sound pressure level exceeded during 10% of the 18-hour time interval between 06:00 and 24:00. This is the UK Road Traffic Noise Index, as defined in the Calculation of Road Traffic Noise (CRTN, HMSO, 1988).
$L_{A90,T}$	The A-weighted sound pressure level exceeded during 90% of the time interval, T. Typically used to quantify the background sound level at a specified position.
$L_{Aeq,T}$	The equivalent continuous A-weighted sound pressure level over a time interval, T. This is an energy-average sound pressure level over the specified time period.
$L_{AFmax,T}$	The maximum A-weight sound pressure level during a specified time interval, T. Measured with “fast” time-weighting (which approximates the time-response of the human ear).
Noise	Unwanted or undesirable sounds observed by a listener.
Octave band	A frequency band used in acoustical measurements. An octave is a frequency interval between two sounds where the frequency of the lower sound is half the frequency of the upper sound. The human hearing range is divided into ten logarithmically equal frequency divisions called octave bands, with centre-band frequencies as follows: (16 Hz, 32 Hz,) 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz, 16000 Hz.
Rating level, $L_{Ar,Tr}$	The specific sound level plus a correction accounting for acoustic features such as impulses, tones, intermittent features, or any other characteristics that draw more attention to the sound source.
Residual sound level	The equivalent continuous A-weighted sound pressure level of the ambient sound remaining at a specified position when the specific sound source (the sound source being assessed) does not contribute to the ambient sound.
Reverberation	The reflection of sound from room surfaces, resulting in the prolongation or persistence of a sound in a room.
Reverberation time	Time, in seconds, required for the sound pressure level in a room to decrease by 60 dB after a sound source has stopped. Long reverberation times are present in large empty rooms with hard surfaces (e.g. a cathedral); short reverberation times are present in smaller rooms with soft furnishing (e.g. typical living room, a recording studio).

Table A1: Definitions of Acoustic Terminology and Parameters	
Wording	Description
R_w	The weighted sound reduction index of an architectural element. A single-figure rating of the sound insulation provided by the architectural element in idealised conditions over a range of frequencies. Measured in a laboratory in accordance with BS EN ISO 140-3 (or BS EN ISO 10140-2), with single figure rating determined in accordance with BS EN ISO 717-1.
Sound	The vibration, or oscillation, of particles in a medium, such as air, which may be detected by the human ear.
Sound insulation	The ability of architectural elements or structures to reduce the transmission of sound, predominantly due to the reflection of sound incident on the element or structure. Typically measured as the difference in sound pressure levels between a “source” room containing a loudspeaker and an adjacent “receiving” room.
Sound power level	A logarithmic measurement that quantifies the total sound power of a source emitted in all directions relative to a reference sound power ($W_{ref} = 1 \text{ pW}$ or 10^{-12} W). Equal to $10 \log_{10} (W / W_{ref})$ and expressed in decibels.
Sound pressure level (SPL)	A logarithmic measurement that quantifies the sound pressure at a specified position relative to a reference sound pressure ($p_{ref} = 20 \text{ } \mu\text{Pa}$). Equal to $20 \log_{10} (p / p_{ref})$ and expressed in decibels.
Specific sound level	The equivalent continuous A-weighted sound pressure level at a specified position due to the specific sound source (the sound source being assessed).
Third-octave band	A higher-resolution frequency band used in acoustical measurements. A third-octave band is equal to one of three logarithmically equal parts of the corresponding octave frequency band. The upper band edge frequency is equal to the lower band-edge frequency multiplied by $2^{1/3}$.

Appendix B – Policy, Standards and Guidelines

Legislation

Control of Pollution Act 1974

Section 60

Section 60 of CoPA provides powers to a Local Authority to impose controls on construction noise emanating from a site, before or after works have started. Under Section 60, a local authority can serve a notice on those responsible for the works and impose requirements as to the way in which the works are to be carried out. The notice may:

- a) specify the plant or machinery which is, or is not, to be used;
- b) specify the hours during which the works may be carried out;
- c) specify the level of noise which may be emitted from the premises in question or at any specified point on those premises or which may be so emitted during specified hours; and
- d) provide for any change of circumstances.

Section 61

As an alternative to risking the imposition of unexpected or undesirable controls under Section 60, the contractor may pursue a proactive approach and seek “prior consent” for the works under Section 61 of CoPA. An application for prior consent under Section 61 should cover the specifications as set out in Section 60 (including plant and machinery, hours of work and noise levels expected to be emitted) and should also demonstrate that BPM will be employed to minimise noise.

If the local authority considers that the application contains sufficient information for the purpose and that, if the works are carried out in accordance with the application, it would not serve a notice under Section 60 in respect of those works, the local authority shall give its consent to the application

Compliance with a Section 61 consent does not, however, mean that nuisance action cannot be taken under Environmental Protection Act 1990²¹ (EPA) Section 80 or 82.

National Planning Policy

National Planning Policy Framework, 2024

The latest revision to the National Planning Policy Framework (NPPF) was published in December 2024. The NPPF sets out the Government’s planning policies for England and how

²¹ Environmental Protection Act 1990 (legislation.gov.uk). Accessed September 2024.

these should be applied. It provides a framework within which local plans for housing and other development can be produced.

This document makes reference to mitigating and reducing potential adverse impacts resulting from noise to a minimum but it does not set absolute criteria. In this instance the most relevant National and International standards are referred to within this assessment, which provide definitive guidance on noise impacts.

Noise Policy Statement for England, 2010

The underlying principles and aims of existing noise policy documents, legislation and guidance are clarified in the Noise Policy Statement for England (NPSE). The NPSE sets out the 'Long Term Vision' of Government noise policy as follows: *“Promote good health and good quality of life through the effective management of noise within the context of Government policy on sustainable development”*.

The NPSE outlines the following three aims for the effective management and control of environmental, neighbour and neighbourhood noise:

- *“Avoid significant adverse impacts on health and quality of life*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life”*.

The guidance defines three established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation (WHO):

- “NOEL (No observed Effect Level) – This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise”
- “LOAEL (Lowest Observed Adverse Effect Level) – This is the level above which adverse effects on health and quality of life can be detected”; and
- “SOAEL (Significant Observed Adverse Effect Level) – This is the level above which significant adverse effects on health and quality of life occur”.

The guidance also states that 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 and that not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.

National Planning Practice Guidance, England

Further guidance in relation to the National Planning Policy Framework and the Noise Policy Statement for England has been published in the National Planning Practice Guidance in England: Noise (NPPG-Noise), which summarises the noise exposure hierarchy, based on the likely average response.

The National Planning Practice Guidance (NPPG) has been revised and updated to be easily accessible and available online.

The Noise Guidance advises on how planning can manage potential noise impacts in new development. It sets out when noise is relevant to planning and outlines the following Observed Effect Levels to determine the noise impact:

- Significant observed adverse effect level: This is the level of noise exposure above which significant adverse effects on health and quality of life occur
- Lowest observed adverse effect level: this is the level of noise exposure above which adverse effects on health and quality of life can be detected
- No observed effect level: this is the level of noise exposure below which no effect at all on health or quality of life can be detected.

The document recognises the subjective relationship between noise levels and the impact on those affected and advises on factors which may influence on whether noise could be a concern.

The significance criteria from NPPG-Noise are reproduced in Table B1 below.

Table B1: Significance Criteria from NPPG In England: Noise			
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 is 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 is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a 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 is no alternative ventilation, having to keep windows closed most of the time because of the	Significant Observed Adverse Effect	Avoid

Table B1: Significance Criteria from NPPG In England: Noise			
Perception	Examples of Outcomes	Increasing Effect Level	Action
	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.		
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Local Planning Policy

Havant Borough Core Strategy Local Development Framework 2011

The Core Strategy sets out the planning framework for communities until 2026, addressing local needs for housing and economic development whilst maintaining the natural and built environment. Of particular relevance to this development are policies CS16 'High Quality Design' and DM10 'Pollution'.

Policy DS16 states: *"Planning permission will be granted for development that is designed to a high standard, which helps to create places where people want to live, work and relax. All development should demonstrate that its design: [...] The development does not cause unacceptable harm to the amenity of neighbours through smell, the loss of privacy, outlook, noise and overlooking."*

Policy DM10 states: *"Development that may cause pollution of water, air or soil or pollution through noise, smell, smoke, fumes, gases, steam, dust, vibration, light, heat, electromagnetic radiation and other pollutants will only be permitted where all of the following relevant criteria can be met:*

- 1. The health and safety of existing and future users of the site, or nearby occupiers and residents is not put at risk.*
- 2. National air quality standards or objectives would not be breached.*
- 3. The water environment would not be detrimentally affected.*
- 4. It would not lead to an unacceptable deterioration in the quality or potential yield of coastal, surface and ground water resources.*

5. External lighting is of the minimum level of illumination and duration required for security and operational purposes.

6. External lighting would not interfere with safe navigation in either Chichester or Langstone Harbours and other coastal locations.”

Havant Borough Council Draft Building a Better Future Plan, 2025

The Draft Building a Better Future Plan is Havant Borough Council's emerging Local Plan, aiming to replace the Local Development Framework. The policies within the emerging local plan that are relevant to this development are Policy 12 'High Quality Design' and Policy 43 'Amenity and Pollution'.

Policy 12 states: *“Development will be supported which: [...] Is designed at a scale so as not to be overbearing and not to cause unacceptable harm to the amenity of neighbours through overshadowing, overlooking, loss of daylight, loss of privacy, loss of outlook, and/or through odour, noise, light pollution or other disturbance”.*

Policy 43 states: *“Development will be permitted where:*

a) Projected levels of noise, odour, vibration, light, water or air pollution from the development do not have a likely significant negative effect on the amenity of existing and future users of the site, nearby occupiers or the wider environment; or

b) Measures are provided which are suitable for the purposes intended and will ensure that any likely significant negative effect of pollution on receptors is mitigated to an acceptable level”

Standards and Guidelines

British Standard (BS) 5228-1:2009+A1:2014

BS 5228-1 presents an assessment methodology to predict and assess noise emission levels from a construction site. BS 5228 also sets out tables of Sound Pressure Level and Sound Power Levels generated by a wide variety of construction plant to facilitate such predictions.

BS 5228-1 gives several examples of acceptable limits for construction noise. The most simplistic is based upon the exceedance of fixed noise limits, with Annex E.2 stating that: *“Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut.”*

Further detail on limiting thresholds is provided in paragraph E.3.2 of BS 5228 in the form of Example Method 1 (the ABC Method).

Example Method 1 (ABC Method)

This assessment method considers the existing ambient (L_{Aeq}) noise environment at the neighbouring sensitive receptors and identifies levels that would be considered to result in an adverse impact if exceeded. This method is noted to apply to residential receptors only and is generally used where works last for up to one calendar month.

Table E.1 of BS 5228 sets out threshold values at receptors. The process for determining an appropriate threshold value requires determination of the pre-construction ambient noise level at the relevant receptor (rounded to the nearest 5 dB), which is then compared to the predicted construction noise level at the same location. If the predicted construction noise level exceeds the appropriate category value, then the impact is deemed to be significant. The relevant statistics from Table E.1 are set out in Table B2 below. Compliance with these guidance levels would indicate that no significant adverse effects are experienced at the receptor locations.

Table B2: Threshold of Potential Significant Effect at Dwellings			
Period	Threshold Value L_{eq} dBA		
	Category A ^{A)}	Category B ^{B)}	Category C ^{C)}
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
Evenings and Weekends ^{D)}	55	60	65
Night-time	45	50	55
<p><i>NOTE 1: A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.</i></p> <p><i>NOTE 2: If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise.</i></p> <p><i>NOTE 3: Applied to residential receptors only.</i></p>			
<p>A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.</p> <p>B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.</p> <p>C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.</p> <p>D) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.</p>			

British Standard (BS) 5228-2:2009+A1:2014

BS 5228-2 provides recommendations for vibration control in relation to construction and open sites where work activities generate significant vibration levels. This Standard provides recommendations for procedures to establish effective liaison between developers, site operators and local authorities.

Vibration may be impulsive (such as that due to hammer-driven piling), transient (such as that due to vehicle movements along a railway), or continuous (such as that due to vibratory driven piling).

The primary cause of community concern in relation to vibration generally relates to building damage from both construction and operational sources of vibration, although, the human body can perceive vibration at levels which are substantially lower than those required to cause building damage.

Damage to buildings associated solely with ground-borne vibration is not common and although vibration may be noticeable, there is little evidence to suggest that they produce cosmetic damage such as a crack in plaster unless the magnitude of the vibration is excessively high.

The most likely impact, where elevated levels of vibration do occur during the demolition and construction phases, is associated with perceptibility.

There are currently no British Standards that provide a methodology to predict levels of vibration from construction activities, other than the guidance contained within BS 5228-2, which relates to piling and compaction activities only. As such, to control the impact of vibration from any other construction activities, limits relating to the perceptibility of vibration are typically set.

Annex B of BS 5228-2 'Significance of vibration effects' describes methods to identify the likely significance of vibration levels from construction and demolition activities. Table B3 below presents guidance on effects of vibration levels from BS 5228.

Table B3: Guidance on Effects of Vibration Levels	
Vibration level ^{A), B), C)}	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mm/s	Vibration might be just perceptible in residential environments.
1.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.
<p>A) The magnitudes of the values presented apply to a measurement position that is representative of the point of entry into the recipient.</p> <p>B) A transfer function (which relates an external level to an internal level) needs to be applied if only external measurements are available.</p> <p>C) Single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. The values are provided to give an initial indication of potential effects, and where these values are routinely measured or expected then an assessment in accordance with BS 6472-1 or -2, and/or other available guidance, might be appropriate to determine whether the time varying exposure is likely to give rise to any degree of adverse comment.</p>	

The purpose of the target construction vibration criteria is to control the impact of construction vibration insofar as is reasonably practicable and is entirely based on the likelihood of the vibration being perceptible rather than causing damage to properties. Hence, although vibration levels in excess of 1mm/s PPV would be considered indicative of significant adverse impacts in respect of the likelihood of perceptibility, they would not be considered significant in terms of the potential for building damage, which would typically require levels of at least 15mm/s PPV to result in minor cosmetic damage in light/unreinforced buildings.

Association of Noise Consultants (ANC) Construction Noise Good Practice Guide V1.0, 2021

The ANC Construction Noise Good Practice Guide presents practical guidance to assist practitioners in adopting a consistent approach when applying for prior consent under Section 61 of the Control of Pollution Act 1974, and to demonstrate suitable levels of rigour and professionalism in preparing information for that purpose.

The guidance sets out the legislative background relevant to the control of construction noise and vibration, including the implementation of Best Practicable Means, and presents the scope and application strategy for obtaining prior consent.

The guidance advises that any applications for prior consent should include the following information:

1. Address or location of proposed works
2. Name and address of main contractor
3. Particulars of the works to be carried out
4. Working hours
5. Methods to be used in each stage of the development
6. Number, type and size of equipment and machinery stating Sound Power Levels.
7. Proposed steps to minimise noise and vibration
8. Predicted noise and vibration levels
9. Noise and vibration monitoring
10. Approximate duration of works
11. Community liaison
12. Other information – e.g. contact names and contact details, telephone numbers and e-mail addresses. This section may also make reference, for information only, to off-site noise mitigation measures that the project has implemented.
13. List of Appendices – A list of all attached plans and documents

The Good Practice Guide has been adopted as a key framework and basis for the presentation of information in this document.

Appendix C – Construction Equipment Schedule

Table C.1: Pipeline Construction Equipment List [Taken from ES Chapter 12 Appendix A12.4 Table 1-4, AtkinsRéalis]								
Construction Location	Activity	Plant	BS 5228 Reference (or other)	Noise level @10m L _{Aeq} , dB for 1 item	Quantity	% On Time	Total dB L _{Aeq} @ 10m	Activity Noise Level @ 10m dB L _{Aeq}
Site Compound	Works Access	6t Dumper	C.4.6	79	2	40	78	81.0
		Delivery lorry	C.11.14	79	2	10	72	
		360 degree excavator	C.2.15	76	2	60	76.8	
	Haul road/ reinstatement	Excavator	C.2.2	77	2	40	76	82.4
		6t Dumper	C.4.6	79	1	40	75	
		Wheeled loader	C.2.26	79	2	40	78	
		Diesel generator	C.4.76	61	2	70	62.5	
		Electric water pump	C.5.40	68	2	70	69.5	
		Delivery lorry	C.11.14	79	1	30	73.8	
		Ride on roller	C.2.38	73	1	30	67.8	
Shaft - (Site Compound Operation)	Reception / Launch Shaft	Excavator	C.2.2	77	2	40	76.0	83.8
		Crawler Crane	D.4.106a	82	1	40	78.0	
		Silenced generator	C.4.76	61	2	70	62.5	
		Concrete pump	C.4.26	79	1	30	73.8	
		Poker vibrator	C.4.34	69	3	35	69.2	
		Grout pump	D.6.13	80	1	30	74.8	
		6t Dumper	C.4.6	79	1	40	75.0	
		Electric water pump	C.5.40	68	2	70	69.5	
		Delivery lorry	C.11.14	79	1	40	75.0	

Table C.1: Pipeline Construction Equipment List [Taken from ES Chapter 12 Appendix A12.4 Table 1-4, AtkinsRéalisis]

Construction Location	Activity	Plant	BS 5228 Reference (or other)	Noise level @10m L _{Aeq} , dB for 1 item	Quantity	% On Time	Total dB L _{Aeq} @ 10m	Activity Noise Level @ 10m dB L _{Aeq}
	Dewatering/Welfare Power	Quiet generator	C.4.81	56	1	100	56	56.0
Shaft W6	Sheet Piling	Vibratory piling rig	C.3.8	88	1	30	82.8	82.8
Tunnelling	Material Storage	Delivery Lorry	C.11.14	79.0	1.0	30.0	73.8	78.2
		Excavator	C.2.2	72	1	70	70.5	
		6t Dumper	C.4.6	79	1	40	75.0	
	Tunnelling	Micro Tunnelling	C.6.35	71	1	90	70.5	80.9
		Silenced generators	C.4.76	61	1	100	61.0	
		Electric water pump	C.5.40	68	2	80	70.0	
		Excavator	C.2.2	72	1	70	70.5	
		Crawler Crane	D.4.106a	82	1	25	76.0	
		Grout pump	D.6.13	80	1	25	74.0	
		Silenced generator	C.4.76	61	1	100	61.0	
		Concrete pump	C4.26	79	1	30	73.8	
	Tunnelling Centrifuge	2x pumps	Hsp500 2	59	2	90	61.1	76.5
		3x screening	Hsp500 2	60	3	90	64.3	
		Separation Plant	ZR15046 20FT Container	67	1	90	66.5	
		Water pump	C.5.40	68	2	80	70.0	
		Compressors	C.5.5	65	1	50	62	
		Diesel generator for submersible pump	C8.23	62	1	50	59	

Table C.1: Pipeline Construction Equipment List [Taken from ES Chapter 12 Appendix A12.4 Table 1-4, AtkinsRéalis]

Construction Location	Activity	Plant	BS 5228 Reference (or other)	Noise level @10m L _{Aeq} , dB for 1 item	Quantity	% On Time	Total dB L _{Aeq} @ 10m	Activity Noise Level @ 10m dB L _{Aeq}
		Delivery lorry	C.11.14	79	1	30	73.8	
	Tunnelling Bentonite Plant	Lubrication Plant (Bentonite)	Contractor	71	1	90	70.5	70.5
	Tunnelling pipe installation	Silenced generators	C.4.76	61	2	100	64.0	82.6
		Water pump	C.5.40	68	2	80	70.0	
		Excavator	C.2.2	77	2	40	76.0	
		Concrete pump + concrete mixer truck (idling)	C.4.28	75	1	35	70.4	
		Poker vibrator	C.4.34	69	3	35	69.2	
		Crawler Crane	D.4.106a	82	1	40	78.0	
		Delivery Lorry	C.11.14	79	2	30	76.8	
Open Cut Trench / Above Ground Works	Topsoil strip	Floor Saw	C5.36	87	1	10	77.0	82.1
		Excavator	C.2.2	77	2	40	76.0	
		6t Dumper	C.4.6	79	2	40	78.0	
		360 degree excavator	C.2.21	71	1	60	68.8	
	Deliveries	Excavator	C.2.2	77	2	40	76.0	78.9
		Hiab	C.4.53	77	1	30	71.8	
		Delivery lorry	C.11.14	79	2	10	72.0	
		360 degree excavator	C.2.21	71	1	60	68.8	
	Watercourse/ sewer	Electric water pump	C.5.40	68	1	80	67.0	67.5

Table C.1: Pipeline Construction Equipment List [Taken from ES Chapter 12 Appendix A12.4 Table 1-4, AtkinsRéalis]

Construction Location	Activity	Plant	BS 5228 Reference (or other)	Noise level @10m L _{Aeq} , dB for 1 item	Quantity	% On Time	Total dB L _{Aeq} @ 10m	Activity Noise Level @ 10m dB L _{Aeq}
	Pipelaying	Silenced generators	C.4.76	61	1	50	58.0	82.0
		Excavator	C.2.2	77	2	40	76.0	
		Water pump	C.5.40	68	2	80	70.0	
		Hiab	C.4.53	77	1	30	71.8	
		Concrete mixer truck	C.4.20	80	1	40	76.0	
		Poker vibrator	C.4.34	69	3	35	69.2	
		6t Dumper	C.4.6	79	1	40	75.0	
		Delivery lorry	C.11.14	79	1	10	69.0	
		360 degree excavator	C.2.21	71	1	60	68.8	
	Reinstatement	Excavator	C.2.2	77	1	40	73.0	80.6
		Excavator mounted trench compactor	C.2.42	78	1	10	68.0	
		Concrete mixer truck	C.4.20	80	1	40	76.0	
		Poker vibrator	C.4.34	69	3	35	69.2	
		6t Dumper	C.4.6	79	1	40	75.0	
		360 degree excavator	C.2.21	71	1	60	68.8	
Discharge Chamber construction - Excavation and installation (Inc Concrete)	Discharge Chamber construction - Excavation and installation (Inc Concrete)	Crawler Crane	D.4.106a	82	1	40	78.0	85.1
		Concrete pump + concrete mixer truck (idling)	C.4.28	75	1	35	70.4	
		Poker vibrator	C.4.34	69	3	35	69.2	

Table C.1: Pipeline Construction Equipment List [Taken from ES Chapter 12 Appendix A12.4 Table 1-4, AtkinsRéalisis]

Construction Location	Activity	Plant	BS 5228 Reference (or other)	Noise level @10m L _{Aeq} , dB for 1 item	Quantity	% On Time	Total dB L _{Aeq} @ 10m	Activity Noise Level @ 10m dB L _{Aeq}
		Concrete mixer truck	C.4.20	80	1	35	75.4	
		Tracked excavator (13t)	C.2.7	70	1	40	66.0	
		Excavator	C.2.2	77	2	40	76.0	
		6t Dumper	C.4.6	79	2	40	78.0	
		Compressor	C.5.5	65	1	35	60.4	
		Poker vibrator	C.4.34	69	3	35	69.2	
		Petrol Driven Chain Saw	D.2.14	86	1	20	79.0	
		Electric water pump	C.5.40	68	2	70	69.5	