

Southampton to London Pipeline Project

Construction Environmental Management Plan
(CEMP)

Appendix E: Noise and Vibration Management Plan

Revision No. 3.0

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Rushmoor Borough Council





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Acronyms and Abbreviations

Acronym	Definition
BPM	Best Practical Means
CEMP	Construction Environmental Management Plan
CoCP	Code of Construction Practice
CoPA	Control of Pollution Act 1974
DCO	Development Consent Order
DMP	Dust Management Plan
ECoW	Environmental Clerk of Works
ES	Environmental Statement
Esso	Esso Petroleum Company, Limited
NVMP	Noise and Vibration Management Plan



1 Introduction

1.1 Overview of the Project

- 1.1.1 Esso Petroleum Company, Limited (Esso) has been granted a Development Consent Order (DCO) by the Secretary of State to replace 90km (56 miles) of an existing pipeline with 97km of new pipeline to transport aviation fuel between Boorley Green in Hampshire and the Esso West London Terminal storage facility in Hounslow. The replacement pipeline is 97km long, taking into account that it cannot follow the line of the existing pipeline along its whole length due to new developments and environmental constraints.
- 1.1.2 Esso has already replaced 10km of pipeline between Hamble and Boorley Green in Hampshire. The replacement pipeline starts near Boorley Green at the end point of the previously replaced pipeline. The route runs generally in a northeast direction via Esso's Pumping Station in Alton. It terminates at the Esso West London Terminal storage facility. The areas of land to be permanently or temporarily used for the project are known as the Order Limits.
- 1.1.3 The project within this local authority area is broken down into five stages. These are based on geographical areas. Rushmoor Borough Council is host to 7.3km of the 97km pipeline route. This Noise and Vibration Management Plan (NVMP) specifically applies to the section of works between (483 316E, 153 573N) and (487 672E, 157 236N), in the Borough of Rushmoor. This is shown on Sheets 8 and 9 in the Stages of the Authorised Development.
- 1.1.4 It is anticipated that works to install the pipeline will start in 2021 and be completed in 2023. The installation of the pipeline is planned to be completed within a two-year construction period. On completion of the installation works the contractor will hydrotest the pipeline and any post-construction monitoring required will be carried out.
- 1.1.5 The development authorised by the DCO must be undertaken in accordance with the Construction Environmental Management Plan (CEMP) pursuant to Requirement 6 of the DCO.

1.2 Purpose of the Noise and Vibration Management Plan

- 1.2.1 This NVMP has been produced as an appendix to the CEMP for Rushmoor Borough Council. This CEMP and appendices have been produced prior to construction and has been submitted to Rushmoor Borough Council for approval. Esso and its supply chain of contractor(s) will adopt the control measures set out in the NVMP when undertaking the construction of the project.

1.3 Aims and Objectives

- 1.3.1 The overarching aim of the NVMP is to reduce noise and vibration impacts at local receptors during the construction of the pipeline and to maintain positive working relationships with the local community and Rushmoor Borough Council.



1.3.2 The objectives of the NVMP are to define:

- the relevant noise and vibration thresholds from the Environmental Statement (ES) that are to be adopted;
- existing good practice measures in relation to noise and vibration; and
- the additional mitigation proposed to reduce significant effects identified as part of the assessment (including plans showing the locations of these areas) in relation to the management of noise and vibration.

1.3.3 The original noise and vibration assessment was reported in ES Appendix 13.3. This was updated at Deadline 2 with a Noise and Vibration Technical Note Addendum (**Application Document [REP2-060](#)**), which included refinements about the working method. It was further updated following representations made during the Issue Specific Hearing on 4 December 2019 and updated at Deadline 4 (**Document Reference 8.14(2)**).

1.3.4 The project has now been granted development consent and is working on the detailed designs and preconstruction preparations. As part of this work, further detail has been made available about the types of equipment required during construction and when this would be used, this has been utilised to further refine the previous noise assessment work and confirming the locations where noise mitigation measures may be required. The findings of which are summarised within this NVMP

1.3.5 This assessment has informed the locations requiring site-specific measures.

1.3.6 The NVMP relates only to the construction of the project, as there are no significant effects during operation.

1.4 Roles and Responsibilities

1.4.1 Overall roles and responsibilities for the project are presented in the CEMP. The main roles and responsibilities specific to the NVMP are set out in Table 1.1 along with the specification for the roles where applicable.

Table 1.1: Roles and Responsibilities

Roles and Specification	Responsibilities
Environmental Manager	The Environmental Manager will be responsible for the maintenance of all environmental plans and registers including monitoring that the environmental measures and mitigations are implemented on site and as recorded within the CEMP. They will be the main point of contact for all environmental matters on the project. They will also develop good working relationships and key external stakeholders such as the Environment Agency, Natural England and the local authorities.
Works Supervisor	Responsible for delivering the site works in accordance with the requirements of the CEMP and implementing good environmental practices required by the Environmental Manager. They are responsible for managing operatives, plant and their areas of work in accordance with the principles of good environmental practice.
Environmental Clerk of Works	The ECoW will monitor that the works proceed in accordance with relevant environmental Development Consent Order requirements and



Roles and Specification	Responsibilities
	adhere to the required mitigation measures. The ECoW will be supported as necessary by appropriate specialists (G3, G41).

1.5 Structure of the Noise and Vibration Management Plan

1.5.1 The NVMP includes:

- Section 2: This contains a summary of the geographical context relevant to Rushmoor Borough Council.
- Section 3: This includes the main body of the NVMP, with the good practice measures, and details about methods that will be employed to reduce noise and vibration during construction including additional mitigation measures.
- Section 4: This outlines the site checks and reporting that will be undertaken in respect of noise and vibration.
- Annex 1 in the NVMP contains the figures showing the location of proposed noise barriers that would be installed during installation.
- Annex 2 contains levels of peak particle velocity associated with ground compaction works and vibratory piling from BS 5228-2:200 (see Section 3 for details).
- Annex 3 provides the representative plant list used to inform the noise assumptions including predicted noise levels generated from each activity.



2 Geographical Context

- 2.1.1 Throughout Rushmoor Borough, the Order Limits pass through rural, suburban and urban environments.
- 2.1.2 The noise assessment considers both residential receptors, such as residential dwellings, and also community receptors such as educational, religious and other noise-sensitive facilities.

3 Noise and Vibration Management Plan

3.1 Good Practice Measures

3.1.1 Esso has committed to a number of good practice measures which would reduce noise and vibration impacts. The commitments are indicated by a reference number, for example (G22). The good practice measures relevant to the NVMP are listed in Table 3.1. The following sections of the NVMP set out further details about how the construction works will be undertaken.

Table 3.1: Project Good Practice Measures Relevant to the NVMP

Commitment Number	Commitment
G22	Plant and vehicles would conform to relevant applicable standards for the vehicle type, would be correctly maintained and operated in accordance with manufacturer's recommendations and in a responsible manner.
G23	All plant and vehicles would be required to switch off their engines when not in use and when it is safe to do so.
G24	In the absence of a mains electricity supply, super silent pack generators would be used as an alternative power supply. A generator shall be considered 'super silent' if it meets the following criteria: <ul style="list-style-type: none"> • has a maximum noise output of 69 dB(A) at 7m; • is fitted with a silencer in the diesel combustion exhaust system; and • includes a layer of barrier material within the casing of the generator to reduce noise breakout.
G25	Any activity carried out or equipment located within a logistics hub or construction compound that may produce a noticeable nuisance from dust, noise, lighting etc would be located away from sensitive receptors such as residential properties or ecological sites where practicable.
G100	The Noise and Vibration Management Plan would include the following details in relation to the project within the relevant local authority area: <ul style="list-style-type: none"> • description of works pursuant to DCO; • scheme of work; • programme; • working hours; • plant noise and vibration data; • receptors at risk of >1.0mm/s peak particle velocity and a protocol for providing prior warning and explanation; • best practicable means (BPM) measures where applicable (as defined in Section 72 of CoPA 1974 for the control of noise and vibration); • predicted noise and vibration levels; and • BPM justification for short term higher noise/vibration levels or out of hours working and community communication details.
G102	Noise and vibration would be managed by processes and measures laid out in the CEMP. This would include to adopt BPM for the control of noise and vibration across the project.
G104	Before works commence, the site workforce would be fully briefed on the need to keep all noise generated to a low level. Shouting and raised voices would not be permitted other than in cases where warnings of danger must be given. No personal radios on site.



Commitment Number	Commitment
G108	Audible vehicle reversing sirens would be set to as low a setting as is compatible with safety requirements where possible.
G109	Noise implications would be considered when planning activities such as deliveries of pipe and bulk materials.

3.2 Construction Programme

- 3.2.1 We anticipate that works to install the pipeline will start in 2021 and be completed in 2023. Within the Borough of Rushmoor, the programme is anticipated to follow the outline schedule in the Stages of the Authorised Development.
- 3.2.2 With regards to noise and vibration, the key activities that have the potential to produce noise are the installation of the pipeline in the highway sections of the work, and the installation of trenchless crossings.
- 3.2.3 Working hours will be in accordance with the approved DCO Schedule 2 Part 1, section 14:

'(1) Subject to sub-paragraphs (2), (3) and (4), construction works must only take place between 0800 and 1800 on weekdays (except Public and Bank Holidays) and Saturdays, except in the event of an emergency.

(2) In the event of an emergency, notification of that emergency must be given to the relevant planning authority and the relevant highway authority as soon as reasonably practicable.

(3) The following operations may where necessary continue or take place on an exceptional basis outside the working hours referred to in sub-paragraph (1)— (a) trenchless construction techniques which cannot be interrupted; (b) filling, testing, dewatering and drying; (c) works required to mitigate delays to the construction of the authorised development due to extreme weather conditions; and (d) commissioning of the pipeline works.

(4) Nothing in sub-paragraph (1) precludes— (a) the receipt of oversize deliveries to site and the undertaking of non-intrusive activities; (b) start-up and shut-down activities up to an hour either side of the core working hours and undertaken in compliance with the CEMP; and (c) works on a traffic sensitive street where so directed by the relevant highway authority pursuant to a permit granted under the permit schemes and following consultation by the relevant highway authority with the relevant planning authority under the terms of such scheme.

(5) In this Requirement— (a) “emergency” means a situation where, if the relevant action is not taken, there will be adverse health, safety, security or environmental consequences that in the reasonable opinion of the undertaker would outweigh the adverse effects to the public (whether individuals, classes or generally as the case may be) of taking that action; and

(b) “non-intrusive activities” means activities which would not create any discernible light, noise or vibration outside the Order limits.'



3.2.4 In certain circumstances, activities may need to be undertaken outside of core working hours. Further details are provided in paragraph 3.4.1.

3.3 Description of Works

3.3.1 A project description is set out within the Code of Construction Practice (CoCP). This describes the main works that would be undertaken before, during and after installation.

3.3.2 The works to be carried out can be broadly separated into three main situations. Namely, the open cut installation of the pipe in existing carriageways and streets (urban), open cut installation of the pipeline in soft landscaping areas (Rural e.g. parkland, verges, farmland) and the installation of the trenchless crossings. In addition, there will be compound and logistic hub locations that require mobilising immediately prior to commencing works and operating during construction.

3.3.3 The indicative types of plant, which are to be utilised during these activities and associated noise levels are summarised within Annex 3. These specific items of plant may vary or be replaced with alternative item of plant with an equal or lower sound power level.

3.3.4 For the open cut installation of pipe within the carriageway, the following tasks will be carried out which have the potential to create noise and vibration:

- saw cut and break out the existing carriageway;
- excavation of material;
- installation of trench support;
- welding and coating of pipe;
- placement and compaction of backfill material; and
- reinstatement of the road surface.

3.3.5 For the open cut installation of the pipe in soft landscaping areas, the following activities have the potential to cause noise and vibration:

- fencing and vegetation removal (where required);
- topsoil stripping and haul road preparation;
- pipe stringing, welding and coating;
- excavation of material;
- installation of trench support;
- laying of pipe;
- placement and compaction of backfill material;
- reinstatement including removal of haul road and fencing; and
- reinstatement of topsoil and landscaping.



3.3.6 Compound and logistic hub locations:

- mobilisation, involving vegetation removal, installation of fencing, ground preparation; and
- operation of compounds, including use of generators for welfare and offices, vehicle movements associated with material deliveries, movement of materials using excavators, telehandlers and dumpers.

3.3.7 Within the Borough of Rushmoor, trenchless crossings will take place at the following locations:

- TC013 - Basingstoke Canal SSSI and A323;
- TC014 - Ively Road;
- TC014a - Cove Brook Flood Storage Area;
- TC015 - South Western Main railway line;
- TC016 - Cove Brook;
- TC017 - North side of railway embankment;
- TC018 - Parallel to West Heath adjacent Railway Embankment Northside;
- TC019 - A325 Farnborough Road; and
- TC020 - Blackwater Valley.

3.3.8 For the installation of the trenchless crossings, the activities that have the potential to give rise to noise and vibration are:

- installation of the excavation supports;
- excavation of material within launch / receptor pit;
- welding of pipe sections; and
- operation of drilling equipment, including generators, pumps and mud separation units.

3.3.9 For all cases, vegetation clearance may need to be carried out. If this is the case, the following short-term activities have the potential to create noise:

- cutting down of branches / trees using chainsaws and excavators;
- hedge trimming and vegetation strimming by hand or attached to tractor/excavator; and
- wood chipping.

3.4 Updated Assessment

3.4.1 The NVMP summarises the findings following refinement of previous noise assessments. It takes into account further detail which has been made available about the types of equipment required during construction and when this would be used. The representative plant list and construction activities provided within Annex 3 form the basis of this refined assessment. It assumes the core working hours set out in paragraph 3.2.3. It also includes the assumption for night working at a number

of limited trenchless crossing sites, where operations cannot be interrupted due to interfaces with existing infrastructure or poor ground conditions. Within the Borough of Rushmoor, these crossings comprise:

- TC013 – Basingstoke Canal SSSI and A323;
- TC015 – South Western Main Railway Line; and
- TC020 – Blackwater Valley, (North Downs and Ascot to Guildford railway lines, A331 and the River Blackwater).

3.4.2 The assessment uses the adopted site noise and vibration levels which are as set out in Table 3.2.

3.4.3 At the properties along the A325 in Farnborough, there is robust evidence from the strategic noise map data published by Defra, that existing levels of traffic noise would reduce the impact of site noise at the affected facades. As such, a numerical limit has been adopted using the approach set out in Appendix E.3.2 of BS 5228-1:2009+A1:2014 (also known as the ‘ABC method’) and set out in Table 3.2.

Table 3.2: Noise and Vibration Assessment Criteria

Receptor	Limit	Relevant Location	Reference
Residential receptors (day)	A monthly average (see definition below) of 70 dB $L_{Aeq,T}$.	‘Free field’ location 1m from the façade of any residential receptor	BS 5228-1:2009+A1:2014 Annex E.2
Residential receptors (night)	45 dB $L_{Aeq,8h}$.	‘Free field’ location 1m from the façade of any residential receptor	Category A defined in BS 5228-1:2009+A1:2014 Annex E.3
A325 Residential receptors (night)	50dB $L_{Aeq,8h}$	‘Free field’ location 1m from the façade of any residential receptor	Category B defined in BS 5228-1:2009+A1:2014 Annex E.3
Educational, religious, health and other noise sensitive community facilities	A monthly average (see definition below) of 65 dB $L_{Aeq,T}$.	‘Free field’ location 1m from the façade of any community receptor	Lower daytime threshold from example method presented in BS 5228-1:2009+A1:2014 Annex E.3.3
Any building outside the works area	1.0mm/s peak particle velocity in any axis	At any building outside the works area, at measurement location defined in BS ISO 4866:2010.	BS 5228-2:2009+A1:2014

3.4.4 The monthly average noise levels set out within this section of the NVMP are defined as the logarithmic average of the $L_{Aeq,T}$ values averaged over each working day during the four-week period with the highest levels of construction activity, calculated using BS 5228-1:2009+A1:2014.

3.5 Management of Change

3.5.1 Where works may be required to be undertaken outside of the core hours, for the reasons set out in paragraph 3.2.3, Rushmoor Borough Council will be notified in advance along with any neighbouring receptors. Where a change of plant is required that is expected to produce a higher noise level than that assessed in Annex 3 and



cannot be replaced for an alternative, or more items of plant are required than anticipated, then Rushmoor Borough Council will be notified of the change.

3.6 Noise and Vibration Management

3.6.1 The NVMP has been developed by the Principal Contractor and will be provided to sub-contractors for information so that they have regard to the operational hours and the Best Practicable Means (BPM) that will be used to reduce noise and vibration during installation, in line with commitment G99 which states *'the contractor would be required to produce a Noise and Vibration Management Plan for the approval of the relevant planning authority. The Noise and Vibration Management Plan would, having regard to the approved operational hours, set out, where applicable, the best practicable means (BPM) that would be used to reduce noise and vibration during installation'*.

3.6.2 In developing the noise control measures to be used, the following hierarchy will be followed in accordance with commitment G98:

- control at source – for example the selection of quieter equipment;
- the choice of location for equipment on site;
- control of working hours; and
- the provision of acoustic enclosures around equipment or barriers around work sites.

3.6.3 As per the hierarchy above, the first source of control for noise pollution is to control at the source. To this end, where reasonably practicable, efforts will be made to use equipment that reduces the noise produced where located in close proximity to sensitive receptors, in particular those listed in Annex 1.

3.6.4 In Rushmoor Borough there are four work compounds (CO) located as listed below. As per commitment (G24), super silent generators will be used to keep down noise levels. As per commitment G25, any equipment that has potential to cause nuisance will be positioned so to be away from sensitive receptors where practicable. Deliveries will be restricted to within the working hours, where reasonably practicable.

- CO-4AB Ively Road;
- CO-4AC Southwood Country Park;
- CO-4AD West Heath Road; and
- CO-4AE Queen Elizabeth Park.

Training for Construction Staff

3.6.5 Training and toolbox talks for the project would be in accordance with commitment G28, *'Construction workers would undergo training to increase their awareness of environmental issues. Topics would include... noise reduction measures'*, and commitment G104, *'Before works commence, the site workforce would be fully briefed on the need to keep all noise generated to a low level. Shouting and raised*



voices would not be permitted other than in cases where warnings of danger must be given. No personal radios on site'.

- 3.6.6 All operatives will receive a general site induction before being put to work on the scheme. This general induction will give an overview as to the expected measures workers will have to adhere to with regards to overall noise and vibration. Before commencing any works there will be a more specific pre-start briefing relating to the area that the operatives will be working in, detailing the specific sensitive receptors and area specific measures in place to combat excess noise and vibration.

Best Practical Means

- 3.6.7 This section sets out measures that represent BPM measures (as defined in Section 72 of the Control and Pollution Act (CoPA) 1974 for the control of noise and vibration) that will be adopted by the contractor. This addresses the requirements of commitment G102. These comprise the following measures:
- Fitting compressors, percussion tools and vehicles with effective silencers of a type recommended by the manufacturers of the compressors, tools or vehicles and at least to the requirements of BS 5228-1:2009+A1:2014.
 - Setting audible vehicle reversing sirens on as low a setting as is compatible with safety requirements in accordance with commitment G108.
 - Only using plant that conforms with or better than relevant national or international standards, directives or recommendations on noise or vibration emissions, including The Noise Emission in the Environment by Equipment for Use Outdoors Regulations 2001.
 - Wherever practicable, deliveries to site will be conducted during normal working hours.
 - Plant will be inspected on arrival to site.
 - Where necessary, letter drops, informing stakeholders of works likely to generate elevated levels of noise and/ or vibration will be implemented.
 - Machines in intermittent use will be shut down in intervening periods of non-use when it is safe to do so, in accordance with commitment G23.
 - All acoustic plant enclosures will be kept closed when the plant is in use.
 - Methods of construction and associated plant will be selected so as to minimise noise and vibration in the first instance, thus reducing the need for the use of percussive and vibratory equipment, particularly for night-time working.
 - Static plant will be located so as to optimise screening and/or distance attenuation in relation to occupied residential properties, and fitted with suitable acoustic surrounds if required.
 - Good practice guides will be provided to all operatives through the provision of toolbox talks and an appropriate induction routine. The induction will inform operatives, amongst other issues, of good practice to be employed outside normal working hours including ways of limiting unnecessary noise during the night-time working.



- Review of works method statements will be undertaken to ensure BPM are adopted.
- Compound layouts will be designed to ensure that the noisiest operations are located as far a possible from residential properties and temporary screening provided between the noise source a receptor where necessary, in accordance with G25.
- Work sites will be planned and designed to limit reserving of vehicles and the noise associated with reversing beacons.
- In the absence of a mains electricity supply, super silent pack generators would be used as an alternative power supply, in accordance with commitment G24.
- Before works commence, the site workforce would be fully briefed on the need to keep all noise generated to a low level. Shouting and raised voices would not be permitted other than in cases where warnings of danger must be given. No personal radios on site. This is an accordance with commitment G104.
- Noise implications would be considered when planning activities such as deliveries of pipe and bulk materials, in accordance with commitment G109.

3.7 Additional Mitigation Measures

3.7.1 The updated noise assessment identified the following locations which will require additional mitigation to avoid significant effects. Annex 1 contains figures showing the locations where noise mitigation is proposed. At these locations temporary noise screening would be put in place to screen receptors from installation activity. The screening would comprise a solid hoarding or acoustic barrier material (such as Echo Barrier™ or similar) fitted to site fencing.

3.7.2 Mitigation will be implemented at the locations in line with Annex 1 to prevent significant noise effects at receptors in the following locations:

- Ively Road;
- West Heath Road;
- Nash Close;
- Newton Road;
- Cove Road;
- Faraday Road;
- Fleming Close;
- Sheffield Close;
- Queen Victoria Court;
- Ship Lane;
- Woodland Crescent;
- Ringwood Road;
- Ship Alley;



- Mariners Drive;
- Baird Road;
- Bell Close; and
- Farnborough Gate Sports Pavillion.

3.7.3 Levels of noise associated with these works will not meet the example thresholds used to determine eligibility for noise insulation and temporary rehousing set out in Annex E of BS5228-1:2009+A1:2014 for receptors.

3.8 Vibration Assessment

3.8.1 ES Appendix 13.3 (**Application Document [APP-121](#)**) identified that the works are not anticipated to exceed vibration levels at receptors that would cause cosmetic damage, as set out in BS 5228-2:2009.

3.8.2 The assessment also identified that the works could create levels of vibration where peak particle velocity values could exceed 1.0mm/s. Vibration of this level in residential environments could cause complaint but can be tolerated if given prior warning.

3.8.3 As per the assessment attached in Annex 2, when ground compaction is carried out, vibration in excess of 1mm/s could be experienced by adjacent properties. This will predominantly affect the locations that have been highlighted in Section 3.7 and Annex 1 of this NVMP. Advance notice of any works happening where vibration is expected to exceed 1mm/s will be given to local residents and other receptors, in line with the Community Engagement Plan.



4 Site Checks and Reporting

4.1 Site Checks

4.1.1 The contractor(s) will be responsible for record keeping and site checks during the construction period. Site checks and inspections will be undertaken regularly throughout the construction period as set out below, to monitor compliance with the requirements of the NVMP. This will be in addition to the regular environmental inspections undertaken as identified in Table 3.2 of the CEMP.

4.1.2 Table 4.1 sets out the site checks that would be undertaken during construction.

Table 4.1: Site Checks

Action	Responsibility	Frequency
Noise barriers: Checks for damage that could reduce effectiveness, security and safety, wind throw and loading issues	Works Supervisor	Daily
Noise and vibration monitoring	ECoW	During noisy or vibratory work activities at the locations requiring mitigation listed in Section 3.7 / Annex 1
Plant checks	Works Supervisor	Daily

4.2 Complaints Procedure

4.2.1 The complaints procedure would follow the process set out within the CEMP. A record would be made of the complaint or incident for audit purposes.



Annex 1: Figures showing the location of proposed noise barriers



Annex 2: Levels of peak particle velocity associated with ground (trench) compaction works and vibratory piling from BS 5228-2:2009

Ground (Trench) Compaction Works

Distance from Ground (Trench) Compaction Works (m)	Peak Particle Velocity due to Ground (Trench) Compaction Works (mm/s)		
	95% Confidence Level	67% Confidence Level	50% Confidence Level
20	9.3	4.8	2.5
40	3.4	1.8	0.9
60	1.9	1.0	0.5
90	1.0	0.5	0.3

Vibratory Piling Works

Distance from Piling Works (m)	Peak Particle Velocity due to Vibratory Piling Works (mm/s)		
	95% Confidence Level	67% Confidence Level	50% Confidence Level
20	5.4	2.6	1.2
40	2.2	1.0	0.5
60	1.3	0.6	0.3
90	0.8	0.4	0.2

Auger Bore and Horizontal Directional Drilling Works

As identified in ES Appendix 13.3: Noise and Vibration Technical Note, auger bore and horizontal directional drilling works are considered likely to generate similar levels of vibration to rotary bored piling due to the similar mechanisms involved. Empirical data presented in Table D.6 of BS 5228-2:2009+A1:2014 suggest that vibration from rotary bored piling activities would fall to below 1.0mm/s at a distance of approximately 10m to 15m.



Annex 3: Plant List and predicted noise levels

Table 1.1: Calculation of Average Daily Activity Noise Levels (Typical Rural Open Cut Sections)

Activity	Equipment					Activity LAeq @ 10m
	Project Plant Description	BS 5228 Ref. for Closest Available Substitute Plant	L _{WA} , dB	% On-time	Adjusted L _{Aeq} at 10m, dB	
Fencing and Vegetation Removal*	Tractor	C4.75	107	80	47	75
	Post Rammer	-	113	1	57	
	Nail Gun	-	120	1	64	
	Tracked excavator 25t	C2.19	105	80	68	
	Wood Chipper	C4.72	107	80	70	
	Chainsaw	C4.72	107	50	68	
	Tractor	C4.75	107	80	47	
	Strimmer	-	108	50	69	
Road sweeping	Road sweeper	C4.90	104	50	42	42
Fencing	Tractor	C4.75	107	80	47	65
	Post Rammer	-	113	1	57	
	Nail Gun	-	120	1	64	
Topsoil Strip	Tracked excavator 25t	C2.19	105	100	72	74
	Dumper	C4.3	104	80	70	
Haul Road Preparation	Angle Dozer (CAT D6 or equivalent)	C2.11	107	80	73	74
	Tracked excavator 21t	C2.21	99	80	65	

**Southampton to London Pipeline Project
Noise and Vibration Management Plan - Rushmoor Borough Council**



Activity	Equipment					Activity LAeq @ 10m
	Project Plant Description	BS 5228 Ref. for Closest Available Substitute Plant	L _{WA} , dB	% On-time	Adjusted L _{Aeq} at 10m, dB	
	Vibratory Roller 4t	C2.39	102	50	66	
Pipe Stringing	Tractor	C4.75	107	80	70	75
	Lorry	C2.34	108	80	71	
	Tracked excavator 25t	C2.19	105	80	68	
	Vacuum lifter	C2.19	105	80	68	
Pipe Welding	Welder	C3.31	101	50	62	65
	Welding generator	C3.33	85	100	49	
	Pipe facing machine	C4.93	108	10	62	
Pipe Coating	Compressor	D7.9	102	10	56	61
	Sand Blaster	C4.93	108	5	59	
	Generator and Pump	C11.2	99	10	53	
Excavation	Tracked excavator 21t	C4.65	99	80	65	65
	Dewatering Pump	C8.23	90	50	44	
Pipe Laying	Tracked excavator 21t	C2.21	99	80	62	69
	Tracked Sideboom 40t	C2.35	99	80	62	
	Pipe Pusher	-	125	5	66	
Backfill	Tracked excavator 21t	C2.21	99	80	68	68
Compaction	Vibratory roller	C2.40	101	50	68	68
Reinstatement	Tracked excavator 121t	C2.21	99	80	62	71

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Activity	Equipment					Activity LAeq @ 10m
	Project Plant Description	BS 5228 Ref. for Closest Available Substitute Plant	L _{WA} , dB	% On-time	Adjusted L _{Aeq} at 10m, dB	
	Angle Dozer (CAT D6 or equivalent)	C2.11	107	80	70	
	Dumper	C4.3	104	80	44	
	Tractor	C4.75	107	80	47	

* Activity only included at locations where sustained woodland clearance would require use of power tools

**Southampton to London Pipeline Project
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Table 1.2: Calculation of Average Daily Activity Noise Levels (Typical Urban Open Cut Sections)

Activity	Equipment					Activity LAeq @ 10m
	Project Plant Description	BS 5228 Ref. for Closest Available Substitute Plant	LWA, dB	% On-time	Adjusted LAeq at 10m, dB	
Main laying	Saw	C4.73	112	25	80	87
	Hydraulic breaker	C5.1	116	10	80	
	Wheeled Excavator	C2.25	97	80	70	
	Tracked Excavator 13t	C4.65	99	80	72	
	Tracked Excavator 6t	C4.68	93	80	66	
	Road Sweeper	C4.90	104	50	49	
	Vacuum Excavator	-	108	30	77	
	Vibro Hammer (sheet pile installation)	C3.8	116	10	80	
	Vacuum Lifter	C2.19	105	80	78	
	Dewatering Pump	C8.23	90	80	63	
	Dumper (removal)	C4.3	104	80	50	
	Dumper (bedding)	C4.3	104	80	50	
	Pipe delivery lorry	C2.34	108	80	48	
	Grab Wagon	C2.26	107	20	41	
Pipe Pusher	-	125	5	76		
Pipe Welding	Welder	C3.31	101	50	72	76
	Welding generator	C3.33	85	100	59	
	Pipe facing machine	C4.93	108	10	72	

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Activity	Equipment					Activity LAeq @ 10m
	Project Plant Description	BS 5228 Ref. for Closest Available Substitute Plant	LWA, dB	% On-time	Adjusted LAeq at 10m, dB	
Pipe Coating	Compressor	D7.9	102	10	66	72
	Sand Blaster	C4.93	108	5	69	
	Generator and Pump	C11.2	99	10	63	
Backfill	Dumper	C4.3	104	80	50	79
	Vibratory roller	C2.40	101	80	77	
	Wheeled Excavator 23t	C2.25	97	80	73	
Reinstatement	Dumper	C4.3	104	100	51	78
	Vibratory roller	C2.40	101	100	78	
	Tarmac Wagon (40t)	C6.21	108	100	52	



Table 1.3: Calculation of Average Daily Activity Noise Levels (Typical Construction Compounds and Logistics Hubs)

Activity	Equipment					Activity L _{Aeq} at 10m, dB
	Project Plant Description	BS 5228 Ref. for Closest Available Substitute Plant	L _{WA} , dB	% On-time	Adjusted L _{Aeq} at 10m, dB	
Vegetation Removal	25t tracked excavator	C2.19	105	80	76	82
	Chainsaw	C4.72	107	50	76	
	Strimmer	-	108	50	77	
	Wood Chipper	C4.72	107	50	76	
Construction compound / Logistics Hub installation	Tracked excavator 25t	C2.19	105	100	77	80
	Delivery lorry for geotextile material	C2.34	108	10	70	
	Rolling and compaction	C5.22	109	25	75	
Construction compound / Logistics Hub usage	Generator for site cabins	C4.78	94	100	66	78
	Lorry for delivery of materials	C2.34	108	10	70	
	Dumper for movement of materials	C4.3	104	25	70	
	Excavator for movement of materials	C2.19	105	25	71	
	Telehandler for movement of materials	C4.39	105	60	75	

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Table 1.4: Calculation of Average Daily Activity Noise Levels (Typical Trenchless Crossing Locations)

Trenchless Crossing type	Equipment							Corrected sound pressure level at 10m (day), dB	Corrected sound pressure level at 10m (night), dB
	Project plant description	BS5228 Ref. for closest available substitute plant	Sound pressure level at 10m, dB	% On-time (day)	% On-time (night)	Screening due to location in pit	No. Plant items		
HDD	Generator for site cabins	C4.78	66	100	50		1	66	63
	Tracked excavator 22t	C2.21	71	40	40		1	67	67
	HDD Rig	C4.96	77	100	100		1	77*	77*
	Crane 50t	C4.46	67	40	40		1	63	63
	Mud Separation Plant	-	79	100	100		1	79*	79*
	Bentonite Mixing Unit	-	69	100	100		1	69*	69*
	High Pressure Pump	-	68	100	100		1	68*	68*
Auger Bore	Generator for site cabins	C4.78	66	100	50		1	66	63
	Dumper for movement of materials	C4.3	76	10	0		1	66*	-
	Tracked excavator 22t	C2.21	71	60	60		1	69	69
	Auger Bore Equipment	C4.96	77	100	100		1	77*	77*
Micro tunnelling	Generator for site cabins	C4.78	66	100	50		1	66	63
	Tracked excavator 22t	C2.21	71	50	50		1	68	68*
	Crane 50t	C4.46	67	50	50		1	64	64*
	Mud Separation Plant	-	65	100	100		1	65	65*
Pipe Pushing	Generator for site cabins	C4.78	66	100	0		1	66	-
	Tracked Excavator 25t	C2.19	77	80	0		1	76	-
	Pipe Pusher	-	97	50	0	10	1	84	-
E-Power	Generator for site cabins	C4.78	66	100	50		1	66	63
	Tracked excavator 22t	C2.21	71	50	50		1	68	68*

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Trenchless Crossing type	Equipment							Corrected sound pressure level at 10m (day), dB	Corrected sound pressure level at 10m (night), dB
	Project plant description	BS5228 Ref. for closest available substitute plant	Sound pressure level at 10m, dB	% On-time (day)	% On-time (night)	Screening due to location in pit	No. Plant items		
	Crane 50t	C4.46	67	50	50		1	64	64*
	Mud Separation Plant	-	79	80	80		1	78	78*
	Bentonite Mixing Unit	-	69	80	80		1	68	68*
	High Pressure Pump	-	68	80	80		1	67	67*
Sheet Piling	Vibratory piling rig	D4.12	65	40	0		1	61	-
	Crane 30t	C4.43	70	40	0		1	66	-
	Tracked excavator 50t	C2.14	79	60	0		1	77	-

* Denotes activity present at drive sites, but not receiver site



Annex 4: Noise and Vibration Technical Note



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1 Noise and Vibration Technical Note

1.1 Introduction

- 1.1.1 Appendix 13.3 Noise and Vibration Technical Note to the Environmental Statement (ES) (**Application Document APP-121**) provided an assessment of potential noise effects during the installation of the Southampton to London Pipeline Project ('the project'). This document was submitted to the Planning Inspectorate in May 2019. Addendums were submitted at both Deadline 2 (November 2019) and Deadline 4 (February 2020) providing updates to the assessment.
- 1.1.2 The project has now been granted development consent and is working on the detailed designs and preconstruction preparations. As part of this work, further detail has been made available about the types of equipment required during construction and when this would be used. The project has undertaken a review of the previous noise assessment work, identifying the locations where noise mitigation measures may be required as part of the Noise and Vibration Management Plan (NVMP), that will be issued to the Relevant Planning Authorities for discharge under DCO Schedule 2 Requirement 6. This document provides the results of the review work and informs the mitigation measures set out in the NVMP.

1.2 Refinement of Modelling Assumptions

- 1.2.1 The review has included assumptions that have been refined as part of the current design work and reflect the current understanding of how the project would be implemented.

Working hours

- 1.2.2 Requirement 14 of the Development Consent Order sets out the construction hours. This states that '*construction works must only take place between 0800 and 1800 on weekdays (except Public and Bank Holidays) and Saturdays, except in the event of an emergency.*' Requirement 14 also lists operations where it may be necessary to continue outside of the standard working hours. This includes '*trenchless construction techniques which cannot be interrupted*'.
- 1.2.3 This Technical Note includes the assumption for night working at a limited number of trenchless locations where operations cannot be interrupted.

Location of the Pipeline Route and Associated Works

- 1.2.4 This noise assessment has used the indicative pipeline alignment as a 'line source' to calculate distance to receptors. The locations of trenchless crossings are represented by 'point sources' at the proposed location of the crossings. Similarly, compounds and logistics hubs are represented by 'area sources' at the proposed sites.



Selection of Representative Plant

1.2.5 Work has been undertaken to further understand the types of equipment likely to be used and the selection of representative plant has been refined based on this information. Noise levels have been drawn from BS 5228-1:2009+A1:2014 (BSI, 2014). Where a comparable item of plant was not available in BS 5228-1:2009+A1:2014 (BSI, 2014), noise data has been taken from manufacturers' specifications of models judged to represent the industry standard.

1.2.6 Examples of refined plant choice include:

- Smaller and quieter tracked excavator assumed for excavation, pipe laying and backfill – the original assessment assumed a 30t tracked excavator when it is more likely that a smaller (approximately 14t) tracked excavator would be used for this type of installation.
- Commitment G24 states that 'In the absence of a mains electricity supply, super silent pack generators would be used as an alternative power supply. A generator shall be considered 'super silent' if it meets the following criteria:
 - *has a maximum noise output of 69 dB(A) at 7m;*
 - *is fitted with a silencer in the diesel combustion exhaust system; and*
 - *includes a layer of barrier material within the casing of the generator to reduce noise breakout.'*

The updated modelling therefore reflects the use of super silent generators.

- Sheet piling is included at locations identified in commitment W13. These locations are where it has been identified that sheet piles may be required to control groundwater ingress. For these works the most likely method would be to push sheets in with the arm of an excavator. The areas where this method would be required are areas with high groundwater and therefore with soft ground. The data in BS 5228-1:2009+A1:2014 for hydraulic piling in clay has therefore been adopted.

1.2.7 The assessed plant items are documented in Tables 1.1 – 1.4.



Table 1.1: Calculation of Average Daily Activity Noise Levels (Typical Rural Open Cut Sections)

Activity	Equipment										Activity LAeq @ 10m
	Project Plant Description	BS 5228 Ref. for Closest Available Substitute Plant	L _{WA} , dB	% On-time	Corrected L _{WA} , dB	Number of Passages per day	Progress (m / day)	Number of Passages per hour	Speed (km/h)	Adjusted L _{Aeq} at 10m, dB	
Fencing and Vegetation Removal*	Tractor	C4.75	107	80	106	1	200	0.125	5	47	75
	Post Rammer	-	113	1	93	1	200	0.125	0.025	57	
	Nail Gun	-	120	1	100	1	200	0.125	0.025	64	
	Tracked excavator 25t	C2.19	105	80	104	1	200	0.125	0.025	68	
	Wood Chipper	C4.72	107	80	106	1	200	0.125	0.025	70	
	Chainsaw	C4.72	107	50	104	1	200	0.125	0.025	68	
	Tractor	C4.75	107	80	106	1	200	0.125	5	47	
Strimmer	-	108	50	105	1	200	0.125	0.025	69		
Road sweeping	Road sweeper	C4.90	104	50	101	1	200	0.125	5	42	42
Fencing	Tractor	C4.75	107	80	106	1	200	0.125	5	47	65
	Post Rammer	-	113	1	93	1	200	0.125	0.025	57	
	Nail Gun	-	120	1	100	1	200	0.125	0.025	64	
Topsoil Strip	Tracked excavator 25t	C2.19	105	100	105	1	100	0.125	0.0125	72	74
	Dumper	C4.3	104	80	103	1	100	0.125	0.0125	70	
Haul Road Preparation	Angle Dozer (CAT D6 or equivalent)	C2.11	107	80	106	1	100	0.125	0.0125	73	74
	Tracked excavator 21t	C2.21	99	80	98	1	100	0.125	0.0125	65	

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Activity	Equipment										Activity LAeq @ 10m
	Project Plant Description	BS 5228 Ref. for Closest Available Substitute Plant	L _{WA} , dB	% On-time	Corrected L _{WA} , dB	Number of Passages per day	Progress (m / day)	Number of Passages per hour	Speed (km/h)	Adjusted L _{Aeq} at 10m, dB	
	Vibratory Roller 4t	C2.39	102	50	99	1	100	0.125	0.0125	66	
Pipe Stringing	Tractor	C4.75	107	80	106	1	200	0.125	0.025	70	75
	Lorry	C2.34	108	80	107	1	200	0.125	0.025	71	
	Tracked excavator 25t	C2.19	105	80	104	1	200	0.125	0.025	68	
	Vacuum lifter	C2.19	105	80	104	1	200	0.125	0.025	68	
Pipe Welding	Welder	C3.31	101	50	98	1	200	0.125	0.025	62	65
	Welding generator	C3.33	85	100	85	1	200	0.125	0.025	49	
	Pipe facing machine	C4.93	108	10	98	1	200	0.125	0.025	62	
Pipe Coating	Compressor	D7.9	102	10	92	1	200	0.125	0.025	56	61
	Sand Blaster	C4.93	108	5	95	1	200	0.125	0.025	59	
	Generator and Pump	C11.2	99	10	89	1	200	0.125	0.025	53	
Excavation	Tracked excavator 21t	C4.65	99	80	98	1	100	0.125	0.0125	65	65
	Dewatering Pump	C8.23	90	50	87	1	100	0.125	0.0125	44	
Pipe Laying	Tracked excavator 21t	C2.21	99	80	98	1	200	0.125	0.025	62	69
	Tracked Sideboom 40t	C2.35	99	80	98	1	200	0.125	0.025	62	
	Pipe Rammer	-	125	5	112	1	200	0.125	0.025	66	
Backfill	Tracked excavator 21t	C2.21	99	80	98	2	100	0.25	0.0125	68	68

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Activity	Equipment										Activity LAeq @ 10m
	Project Plant Description	BS 5228 Ref. for Closest Available Substitute Plant	L _{WA} , dB	% On-time	Corrected L _{WA} , dB	Number of Passages per day	Progress (m / day)	Number of Passages per hour	Speed (km/h)	Adjusted L _{Aeq} at 10m, dB	
Compaction	Vibratory roller	C2.40	101	50	98	2	100	0.25	0.0125	68	68
Reinstatement	Tracked excavator 121t	C2.21	99	80	98	1	200	0.125	0.025	62	71
	Angle Dozer (CAT D6 or equivalent)	C2.11	107	80	106	1	200	0.125	0.025	70	
	Dumper	C4.3	104	80	103	1	200	0.125	5	44	
	Tractor	C4.75	107	80	106	1	200	0.125	5	47	

* Activity only included at locations where sustained woodland clearance would require use of power tools



Table 1.2: Calculation of Average Daily Activity Noise Levels (Typical Urban Open Cut Sections)

Activity	Equipment										Activity LAeq @ 10m
	Project Plant Description	BS 5228 Ref. for Closest Available Substitute Plant	L _{WA} , dB	% On-time	Corrected L _{WA} , dB	Number of Passages per day	Progress (m / day)	Number of Passages per hour	Speed (km/h)	Adjusted L _{Aeq} at 10m, dB	
Main laying	Saw	C4.73	112	25	106	1	18	0.125	0.00225	80	87
	Hydraulic breaker	C5.1	116	10	106	1	18	0.125	0.00225	80	
	Wheeled Excavator	C2.25	97	80	96	1	18	0.125	0.00225	70	
	Tracked Excavator 13t	C4.65	99	80	98	1	18	0.125	0.00225	72	
	Tracked Excavator 6t	C4.68	93	80	92	1	18	0.125	0.00225	66	
	Road Sweeper	C4.90	104	50	101	5	18	0.625	5	49	
	Vacuum Excavator	-	108	30	103	1	18	0.125	0.00225	77	
	Vibro Hammer (sheet pile installation)	C3.8	116	10	106	1	18	0.125	0.00225	80	
	Vacuum Lifter	C2.19	105	80	104	1	18	0.125	0.00225	78	
	Dewatering Pump	C8.23	90	80	89	1	18	0.125	0.00225	63	
	Dumper (removal)	C4.3	104	80	103	4	18	0.5	5	50	
	Dumper (bedding)	C4.3	104	80	103	4	18	0.5	5	50	
	Pipe delivery lorry	C2.34	108	80	107	1	18	0.125	5	48	
	Grab Wagon	C2.26	107	20	100	1	18	0.125	5	41	
	Pipe Rammer	-	125	5	112	1	18	0.125	0.00225	76	
Pipe Welding	Welder	C3.31	101	50	98	1	18	0.125	0.00225	72	76
	Welding generator	C3.33	85	100	85	1	18	0.125	0.00225	59	
	Pipe facing machine	C4.93	108	10	98	1	18	0.125	0.00225	72	

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Activity	Equipment										Activity LAeq @ 10m
	Project Plant Description	BS 5228 Ref. for Closest Available Substitute Plant	L _{WA} , dB	% On-time	Corrected L _{WA} , dB	Number of Passages per day	Progress (m / day)	Number of Passages per hour	Speed (km/h)	Adjusted L _{Aeq} at 10m, dB	
Pipe Coating	Compressor	D7.9	102	10	92	1	18	0.125	0.00225	66	72
	Sand Blaster	C4.93	108	5	95	1	18	0.125	0.00225	69	
	Generator and Pump	C11.2	99	10	89	1	18	0.125	0.00225	63	
Backfill	Dumper	C4.3	104	80	103	4	18	0.5	5	50	79
	Vibratory roller	C2.40	101	80	100	2	18	0.25	0.00225	77	
	Wheeled Excavator 23t	C2.25	97	80	96	2	18	0.25	0.00225	73	
Reinstatement	Dumper	C4.3	104	100	104	4	18	0.5	5	51	78
	Vibratory roller	C2.40	101	100	101	2	18	0.25	0.00225	78	
	Tarmac Wagon (40t)	C6.21	108	100	108	2	18	0.25	5	52	



Table 1.3: Calculation of Average Daily Activity Noise Levels (Typical Construction Compounds and Logistics Hubs)

Activity	Equipment							Activity L _{Aeq} at 10m, dB
	Project Plant Description	BS 5228 Ref. for Closest Available Substitute Plant	L _{WA} , dB	% On-time	Corrected L _{WA} , dB	No. Plant Items	Adjusted L _{Aeq} at 10m, dB	
Vegetation Removal	25t tracked excavator	C2.19	105	80	104	1	76	82
	Chainsaw	C4.72	107	50	104	1	76	
	Strimmer	-	108	50	105	1	77	
	Wood Chipper	C4.72	107	50	104	1	76	
Construction compound / Logistics Hub installation	Tracked excavator 25t	C2.19	105	100	105	1	77	80
	Delivery lorry for geotextile material	C2.34	108	10	98	1	70	
	Rolling and compaction	C5.22	109	25	103	1	75	
Construction compound / Logistics Hub usage	Generator for site cabins	C4.78	94	100	94	1	66	78
	Lorry for delivery of materials	C2.34	108	10	98	1	70	
	Dumper for movement of materials	C4.3	104	25	98	1	70	
	Excavator for movement of materials	C2.19	105	25	99	1	71	
	Telehandler for movement of materials	C4.39	105	60	103	1	75	



Table 1.4: Calculation of Average Daily Activity Noise Levels (Typical Trenchless Crossing Locations)

Trenchless Crossing type	Equipment							Corrected L _{WA} (day), dB	Corrected L _{WA} (night), dB
	Project plant description	BS5228 Ref. for closest available substitute plant	L _{WA} , dB	% On-time (day)	% On-time (night)	Screening due to location in pit	No. Plant items		
HDD	Generator for site cabins	C4.78	94	100	50		1	94	91
	Tracked excavator 22t	C2.21	99	40	40		1	95	95
	HDD Rig	C4.96	105	100	100		1	105*	105*
	Crane 50t	C4.46	95	40	40		1	91	91
	Mud Separation Plant	-	107	100	100		1	107*	107*
	Bentonite Mixing Unit	-	97	100	100		1	97*	97*
	High Pressure Pump	-	96	100	100		1	96*	96*
Auger Bore	Generator for site cabins	C4.78	94	100	50		1	94	91
	Dumper for movement of materials	C4.3	104	10	0		1	94*	-
	Tracked excavator 22t	C2.21	99	60	60		1	97	97
	Auger Bore Equipment	C4.96	105	100	100		1	105*	105*
Micro tunnelling	Generator for site cabins	C4.78	94	100	50		1	94	91
	Tracked excavator 22t	C2.21	99	50	50		1	96	96*
	Crane 50t	C4.46	95	50	50		1	92	92*
	Mud Separation Plant	-	93	100	100		1	93	93*
Pipe Ramming	Generator for site cabins	C4.78	94	100	0		1	94	-
	Tracked Excavator 25t	C2.19	105	80	0		1	104	-
	Pipe Rammer	-	125	50	0	10	1	112	-
E-Power	Generator for site cabins	C4.78	94	100	50		1	94	91
	Tracked excavator 22t	C2.21	99	50	50		1	96	96*
	Crane 50t	C4.46	95	50	50		1	92	92*

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Trenchless Crossing type	Equipment							Corrected L _{WA} (day), dB	Corrected L _{WA} (night), dB
	Project plant description	BS5228 Ref. for closest available substitute plant	L _{WA} , dB	% On-time (day)	% On-time (night)	Screening due to location in pit	No. Plant items		
	Mud Separation Plant	-	107	80	80		1	106	106*
	Bentonite Mixing Unit	-	97	80	80		1	96	96*
	High Pressure Pump	-	96	80	80		1	95	95*
Sheet Piling	Vibratory piling rig	D4.12	93	40	0		1	89	-
	Crane 30t	C4.43	98	40	0		1	94	-
	Tracked excavator 50t	C2.14	107	60	0		1	105	-

* Denotes activity present at drive sites, but not receiver sites

1.3 Adopted significance threshold

- 1.3.1 A precautionary threshold of significance for daytime noise during installation of 70 dB(A) has been used, based on 'rural, suburban and urban areas away from main road traffic and industrial noise', as set out in advisory leaflet AL72 'Noise control on building sites' (Department of Environment, 1976). A daytime site noise level of 70 dB(A) has been adopted as the significance threshold for all residential receptors.
- 1.3.2 A night-time site noise significance threshold of 45 dB(A) has generally been adopted, based on the lowest (i.e. most conservative night thresholds) in BS 5228-1:2009+A1:2014. At certain discrete locations where there is robust evidence from the strategic noise map data published by Defra¹ that existing levels of traffic noise would reduce the impact of site noise at the affected facades, a numerical limit has been adopted using the approach set out in Appendix E.3.2 of BS 5228-1:2009+A1:2014 (also known as the 'ABC method'). This approach has been adopted at the following receptors:
- properties along the A325 in Farnborough, Rushmoor;
 - properties near the M25 and A320 in Addlestone and Chertsey, Runnymede; and
 - properties near the M3 in Shepperton and the A30 in Ashford, Spelthorne.

1.4 Results of the Assessment

Changes to the noise environment associated with the proposed development

- 1.4.1 The noise environment in the vicinity of certain installation activities would be influenced by the activities being undertaken. The type of noise associated with installation activities depends on the type of equipment and task:
- For heavy plant such as excavators, bulldozers, dump trucks and lorries the main source of noise is the operation of a diesel engine. Diesel engine noise is typically dominated by their exhaust systems, often described as having a 'clattering' sound.
 - For petrol-driven equipment such as chainsaws and strimmers the main source of noise is the petrol engine itself. Petrol engines emit a more tonal, higher-pitched noise compared to diesel engines, due to their higher rotational speed.
 - For activities such as angle grinding and breaking road surfaces, noise will principally be caused by the repetitive interaction of different surfaces. Instantaneous noise levels from these types of activity have the potential to be relatively high, when compared to other types of activity.
 - For trenchless operations, noise will principally be caused by a combination of diesel power generators, pumps and motors.

¹ <https://www.gov.uk/government/publications/strategic-noise-mapping-2019>

1.4.2 As the activities would steadily progress along the pipeline route, the noise from each activity would only be experienced for a relatively short period of time.

Assessment of effects at sensitive receptors

1.4.3 The assessment presents the approximate number of receptors expected to experience noise effects during installation for the scenario without noise-reducing measures (Table 1.5). It then goes on to estimate the number of receptors likely to experience effects with reductions of 5dB(A) and 10dB(A), which are respectively described as ‘moderate’ and ‘good’ standards of noise reduction (Tables 1.6 – 1.7).

1.4.4 Although the results below are presented separately for urban and rural receptors for consistency with previous revisions, the same significance threshold has been adopted for both groups.

Table 1.5: Potential Noise Effects on Receptors (Without Noise-reducing Measures)

Receptor Group	Period	Magnitude of Change	Potential Significance of Effect	Approximate Number of Receptors Expected to Experience Effect	
				Residential	Other Community Receptors
Urban	Day	Large	Major, significant	88	5
		Medium	Moderate, significant	381	2
		Small	Minor, not significant	295	12
Urban	Night	Large	Major, significant	95	2
		Medium	Moderate, significant	391	3
		Small	Minor, not significant	2,118	32
Rural	Day	Large	Major, significant	0	1
		Medium	Moderate, significant	15	0
		Small	Minor, not significant	50	1
Rural	Night	Large	Major, significant	2	0
		Medium	Moderate, significant	6	0
		Small	Minor, not significant	29	1

Table 1.6: Estimated Number of Properties Experiencing Noise Effects During Installation (Assuming Noise-reducing Measures Achieve a ‘Moderate’ Reduction of 5dB)

Receptor Group	Period	Magnitude of Change	Potential Significance of Effect	Approximate Number of Receptors Expected to Experience Effect	
				Residential	Other Community Receptors
Urban	Day	Large	Major, significant	0	1
		Medium	Moderate, significant	88	4
		Small	Minor, not significant	381	2
Urban	Night	Large	Major, significant	13	1
		Medium	Moderate, significant	82	1
		Small	Minor, not significant	391	3
Rural	Day	Large	Major, significant	0	0

Receptor Group	Period	Magnitude of Change	Potential Significance of Effect	Approximate Number of Receptors Expected to Experience Effect	
				Residential	Other Community Receptors
Rural	Night	Medium	Moderate, significant	0	1
		Small	Minor, not significant	15	0
		Large	Major, significant	0	0
		Medium	Moderate, significant	2	0
		Small	Minor, not significant	6	0

Table 1.7: Estimated Number of Properties Experiencing Noise Effects During Installation (Assuming Noise-reducing Measures Achieve a ‘Good’ Reduction of 10dB)

Receptor Group	Period	Magnitude of Change	Potential Significance of Effect	Approximate Number of Receptors Expected to Experience Effect	
				Residential	Other Community Receptors
Urban	Day	Large	Major, significant	0	0
		Medium	Moderate, significant	0	1
		Small	Minor, not significant	88	4
Urban	Night	Large	Major, significant	0	1
		Medium	Moderate, significant	13	0
		Small	Minor, not significant	82	1
Rural	Day	Large	Major, significant	0	0
		Medium	Moderate, significant	0	0
		Small	Minor, not significant	0	1
Rural	Night	Large	Major, significant	0	0
		Medium	Moderate, significant	0	0
		Small	Minor, not significant	2	0

1.4.5 A summary of the number of properties with the potential to experience significant (i.e. moderate or major) noise and vibration effects during pipeline installation is presented in Table 1.8.

Table 1.8: Summary of Potential Significant Noise and Vibration Effects during Pipeline Installation

Receptor Group	No noise-reducing measures		‘Moderate’ noise reduction of 5dB		‘Good’ noise reduction of 10dB	
	Residential	Other Community Receptors	Residential	Other Community Receptors	Residential	Other Community Receptors
Urban	877	9	169	6	13	2
Rural	23	1	2	1	0	0

1.4.6 The results of the assessment presented in Tables 1.5 – 1.8 demonstrate that there are a relatively small number of properties that are assessed as having the potential to experience significant short-term effects during installation.

1.4.7 Table 1.9 presents a summary of the receptor groups for which mitigation will be provided.

1.4.8 Provided that a 'good' degree of noise mitigation is achieved, then residual significant adverse effects during installation would be expected at 13 residential receptors. Mitigation will need to achieve a reduction of greater than 10 dB at these locations in order to avoid a significant effect (see Section 1.5).

Table 1.9: Location for which mitigation will be provided

District	Road	Number of Properties	
		Residential	Other Community Receptors
Rushmoor, Farnborough	Baird Road	29	0
	Bell Close	6	0
	Cove Road	28	0
	Faraday Road	9	0
	Fleming Close	2	0
	Ively Road	1	0
	Mariners Drive	3	0
	Nash Close	34	0
	Newton Road	21	0
	Queen Victoria Court	2	0
	Ringwood Road	27	1
	Sheffield Close	3	0
	Ship Alley	6	0
	Ship Lane	42	0
	West Heath Road	15	0
Woodland Crescent	1	0	
Surrey Heath, Frimley	Balmoral Drive	0	2
	Beaumaris Parade	3	0
	Berkeley Crescent	7	0
	Bowling Green Court	26	0
	Braemar Close	4	0
	Buckingham Way	4	0
	Carisbrooke	4	0
	Danebury Walk	3	0
	Frimley Green Road	13	0
	Henley Drive	58	0
	Hollytree Gardens	27	0
	Oldbury Close	2	0
	Penshurst Rise	12	0
	Pevensey Way	2	0
	Sandringham Way	5	0
Sheridan Road	5	0	



District	Road	Number of Properties	
		Residential	Other Community Receptors
	Trafford Road	13	0
	Worsley Road	4	0
Surrey Heath, Lightwater	Blackthorn Drive	7	0
	Burdock Close	8	0
	The Folly	3	0
	Quetta Park	0	1
	Hawkwell	1	0
Runnymede, Addlestone	Canford Drive	33	0
	Chertsey Road	3	0
	Roakes Avenue	2	0
Runnymede, Chertsey	Accommodation Road	1	0
	Greenlands	42	0
	Guildford Road	105	2
	Hanworth Lane	9	0
	Hardwick Lane	1	0
	Holloway Hill	1	0
	Longcross Road	13	0
	Lyne Lane	8	0
	Stonehill Road	9	0
Spelthorne, Ashford	Chesterfield Road	1	0
	Clarendon Road	2	0
	Knapp Road	0	1
	Stanwell Road	2	1
	Station Approach	3	0
	Station Road	13	0
	The Wickets	5	0
	Woodthorpe Road	127	2
Spelthorne, Shepperton	Chertsey Road	1	0
	Old Littleton Lane	4	0
Spelthorne, Staines	Ashford Road	74	0
	Greenway Drive	1	0

1.4.9 Table 1.10 summarises the ten community receptors for which mitigation will be provided.

Table 1.10: Community receptors for which mitigation will be provided

District	Address
Rushmoor, Farnborough	Farnborough Gate Sports Pavilion, Ringwood Road, Farnborough, Hampshire, GU14 8BL
Surrey Heath, Frimley	Community Centre, Community Centre, Balmoral Drive, Camberley, Surrey, GU16 9AR
	Frimley Baptist Church, Frimley Baptist Church, Balmoral Drive, Camberley, Surrey, GU16 9AR
Hart, Crookham	Quetta Park Community Centre, The Community Centre, Quetta Park, Fleet, Hampshire, GU52 8TL
Runnymede, Addlestone	Chertsey High School, The Hub, Chertsey Road, Addlestone, Surrey, KT15 2EP
	Equippers Church, The Hub, Chertsey Road, Addlestone, Surrey, KT15 2EP
Spelthorne, Ashford	Clarendon Primary School, Clarendon County Primary School, Knapp Road, Ashford, Surrey, TW15 2HZ
	Salvation Army Citadel, Woodthorpe Road, Ashford, Surrey, TW15 3JY
	St Hilda's Church, Stanwell Road, Ashford, Surrey, TW15 3QL
	Fordbridge Park, Kingston Road, Ashford, Surrey, TW15 3S

Assessment of Noise during Pipeline Installation using National Policy Descriptors

1.4.10 The assessment of noise using National Policy Descriptors presented in paragraphs 6.1.11 – 6.1.19 of ES Appendix 13.3 Noise and Vibration Technical Note is not affected by the changes detailed in this document. Therefore, the project is not expected to cause significant adverse effects on health and quality of life, and the effects are not considered significant in terms of government policy.

1.5 Good Practice Measures and Additional Mitigation

1.5.1 The project has made the following commitments which are set out within the NVMP (Appendix E of the Construction Environmental Management Plan). These commitments will help to reduce the effects of noise on receptors:

- Commitment G22: 'Plant and vehicles would conform to relevant applicable standards for the vehicle type, would be correctly maintained and operated in accordance with manufacturers' recommendations and in a responsible manner';
- Commitment G23: 'All plant and vehicles would be required to switch off their engines when not in use and when it is safe to do so';
- Commitment G24: 'In the absence of a mains electricity supply, super silent pack generators would be used as an alternative power supply. A generator shall be considered 'super silent' if it meets the following criteria:
 - *has a maximum noise output of 69 dB(A) at 7m;*
 - *is fitted with a silencer in the diesel combustion exhaust system; and*
 - *includes a layer of barrier material within the casing of the generator to reduce noise breakout';*



- Commitment G25: 'Any activity carried out or equipment located within a logistics hub or construction compound that may produce a noticeable nuisance from dust, noise, lighting etc would be located away from sensitive receptors such as residential properties or ecological sites where practicable';
- Commitment G104: 'Before works commence, the site workforce would be fully briefed on the need to keep all noise generated to a low level. Shouting and raised voices would not be permitted other than in cases where warnings of danger must be given. No personal radios on site';
- Commitment G108: 'Audible vehicle reversing sirens, would be set to as low a setting as is compatible with safety requirements where possible'; and
- Commitment G109: 'Noise implications would be considered when planning activities such as deliveries of pipe and bulk materials'.

- 1.5.2 The key good practice commitment is Commitment G99 which states that *'The contractor would be required to produce a Noise and Vibration Management Plan for the approval of the relevant planning authority. The Noise and Vibration Management Plan would, having regard to the approved operational hours, set out where applicable, the best practicable means that would be used to reduce noise and vibration during installation.'*
- 1.5.3 An Outline NVMP was submitted during examination and became a certified DCO document. The project will be submitting the final NVMP to the Relevant Planning Authorities for approval under DCO Schedule 2 Requirement 6.
- 1.5.4 For most activities at construction sites, the use of acoustic barrier matting attached to temporary site fencing is considered to represent a best practice noise reduction technique. In relation to noise barriers BS 5228-1:2009+A1:2014 (BSI, 2014) suggests as a generalisation to *'assume an approximate attenuation of 5 dB when the top of the plant is just visible to the receiver over the noise barrier, and of 10 dB when the noise screen completely hides the sources from the receiver.'* This indicates that the proposed type of mitigation will be able to provide a 'good' degree of mitigation (i.e. 10dB of noise reduction).
- 1.5.5 Commitment G107 states *'Temporary noise screening would be put in place to screen receptors at the following locations from installation activity, unless a detailed assessment is undertaken which demonstrates that no significant noise impacts would occur without screening. Any additional locations at which screening would be installed would be identified in the Noise and Vibration Management Plan. The screening would comprise acoustic barrier material (such as Echo Barrier™ or similar) fitted to site fencing.'*
- 1.5.6 Where relevant, Annex 1 of the NVMP shows the locations where noise screening will be installed following the update to the noise assessment presented in this Technical Note.
- 1.5.7 Commercially available acoustic barriers such as Echo Barrier™ comprise a mass layer which attenuates the direct transmission of sound by 10-20 dB. They also typically include an acoustic absorbent layer that prevents the reflection of sound back towards the source. The height of the noise barriers on the project is expected

to be 2m and this is expected to completely screen all sources from receivers at a height of 2m or less.

- 1.5.8 For typical residential houses, the ground floor is considered sensitive during the proposed working hours. The proposed noise barriers would be expected to screen all sources at ground floor windows, and would achieve a 'good' degree of mitigation (i.e. 10dB of noise reduction).
- 1.5.9 Table 1.9 includes flats at Woodthorpe Road, Station Approach and Station Road, Ashford and five community buildings, which have windows above the ground floor level and that could have line of sight to the works over the noise barriers. The noise associated with the works in these urban open cut locations would be dominated by the breaking out of the existing paving, the noise from which is generated at ground level. Noise barriers would be located close to these activities due to the small working width required for in-road working locations. These factors mean that the barriers are likely to screen the dominant noise sources from the windows of nearby flats and community receptors, and provide a 'good' degree of mitigation. It is therefore concluded that significant effects could be avoided at all flats and community receptors.
- 1.5.10 As Table 1.8 demonstrates, there are 13 residential and two community receptors where a reduction of 10 dB or greater is required to avoid significant adverse effects during installation. These receptors are at the following locations:
- Longcross Road, Chertsey (residential);
 - Stonehill Road, Chertsey (residential);
 - Ringwood Road, Farnborough (residential);
 - Ship Lane, Farnborough (residential);
 - Farnborough Gate Sports Pavilion, Ringwood Road, Farnborough (community); and
 - St Hilda's Church, Stanwell Road, Ashford (community).
- 1.5.11 At the receptors mentioned in 1.5.10, mitigation will need to achieve a reduction of greater than 10 dB. The details of the mitigation will be confirmed in the relevant final NVMP.

1.6 Conclusions

- 1.6.1 This Technical Note summarises the results of an updated construction noise assessment using the current plant list, working methods and project assumptions.
- 1.6.2 The revised locations for which noise mitigation will be provided are presented in Annex 1 in the NVMP where relevant.



References

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

Esso (2018). Southampton to London Pipeline Project: 6.4 Environmental Statement - Appendix 13.3 - Noise and Vibration Technical Note. May 2019.

Esso (2018). Southampton to London Pipeline Project: 6.4 Environmental Statement - Appendix 16.1 - Code of Construction Practice. May 2019.

Defra (2019). Strategic noise mapping (2017), updated 2 July 2019.
<https://www.gov.uk/government/publications/strategic-noise-mapping-2019>.
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