FIDDLERS FERRY POWER STATION (FFPS) REDEVELOPMENT

Technical Briefing Note: Noise and Vibration

NOVEMBER 2023

Version Control

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01	17/04/23	Rod Pugh	First Draft
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Abbreviations and Glossary

Abbreviation	Definition
ADS	Acoustic Design Statement.
adverse	A negative effect.
Applicant	Peel NRE
baseline	The conditions against which potential effects arising from the proposed development are identified and evaluated.
beneficial	A positive effect.
DMRB	Design Manual for Roads and Bridges
EHO	Environmental Health Officer
EIA	Environmental Impact Assessment
FFPS	Fiddlers Ferry Power Station
FF Allocation Site	The whole of the proposed Fiddlers Ferry Allocation (as defined by emerging local plan Policy MD3), which comprises the mixed-use redevelopment of the entirety of the former power station site (brownfield land) and land to be removed from the Green Belt for residential development (greenfield land to north of the railway line), which will be developed in multiple phases. The FF Allocation Site also includes land to the south of the railway which is expected to remain within the Green Belt.
FF Employment Land	The employment component of the Fiddlers Ferry Allocation, which comprises brownfield land comprising the former power station
FF Residential Land	The residential component of the Fiddlers Ferry Allocation, which comprises land north of the railway land which is proposed to be removed from the Green Belt through the emerging Local Plan.
HBC	Halton Borough Council
Impact	A change at or to a receptor brought about by the proposed development.
Mitigation	Measures including any process, activity, or design to avoid, reduce, remedy or compensate for negative environmental impact or effects of the proposed development.
NPPF	National Planning Policy Framework
Receptor	Any defined feature that is sensitive to or has the potential to be subject to an impact.
Residual Effect	Environmental effect remaining after mitigation measures have been implemented.
Scoping Opinion	The Local Authority's response to a Scoping Report taking into account comments made by statutory consultees.

Abbreviation	Definition
Scoping Report	A document that is produced to outline the intended scope of the Environmental Impact Assessment produced in accordance with the Town and Country Planning (Environmental Impact Assessment) Regulations 2017
Screening	This is a procedure used to determine whether a proposed project is likely to have significant effects on the environment and whether it requires Environmental Impact Assessment.
WBC	Warrington Borough Council

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1 Introduction

1.1.1 This Technical Note provides information to inform the preparation of the Development Framework for the FF Allocation Site, with respect to Noise and Vibration.

1.1.2 This technical note is intended to provide context and high-level recommendations to inform the Development Framework, using currently available baseline data, as well as interim traffic data. As such the report includes;

- An overview of the site context;
- Recommended assessment methodologies for future application stages covering employment, residential and other land uses;
- Summary of a high-level site suitability assessment for the residential allocation; and,
- Mitigation and design considerations.

1.1.3 Impacts on the employment areas of the FF Allocation Site have not been considered in detail at this stage. Commercial and industrial uses have lower sensitivity to noise and therefore are not considered sensitive receptors in site suitability assessments in the same way as residential use. Nonetheless, as part of detailed design stages, appropriate assessment of employment land deemed 'noise-sensitive' (for example, office space) would be considered in line with the relevant guidance and design criteria. In addition, design principles and mitigation measures for noise and vibration across the FF Allocation Site have been incorporated into the Development Framework as part of its preparation, as set out later in this technical note, and will ensure the suitability of the FF employment land for its proposed use.

1.1.4 Detailed assessments pursuant to each individual phase of development at Fiddlers Ferry will be prepared and submitted as part of the respective individual planning applications.

1.1.5 A summary of relevant legislation, policy and guidance, and a description of the methodologies used to assess the potential effects of the Development Framework is provided. Baseline conditions are set out followed by proportional assessment and a summary of mitigation and design considerations.

1.2 Site Context

1.2.1 The FF Allocation Site comprises the mixed-use redevelopment of the entirety of the former power station site (brownfield land) and the land to be removed from the Green Belt for residential development (greenfield land to north of the railway land). The FF Allocation Site is situated within a broader industrial estate along River Mersey at the eastern edge of Warrington Borough's administrative area. The FF Allocation Site abuts the A562 Widnes Road to its north, which serves as the main point of vehicular access.

1.2.2 The surrounding area comprises industrial premises which occupy a strip of land straddling St Helens Canal and the A562 Widnes Road and a mix of rural housing and agricultural development and private recreation sites to the north of the A562 Widnes Road. Figure 1 below shows the FF Allocation Site.

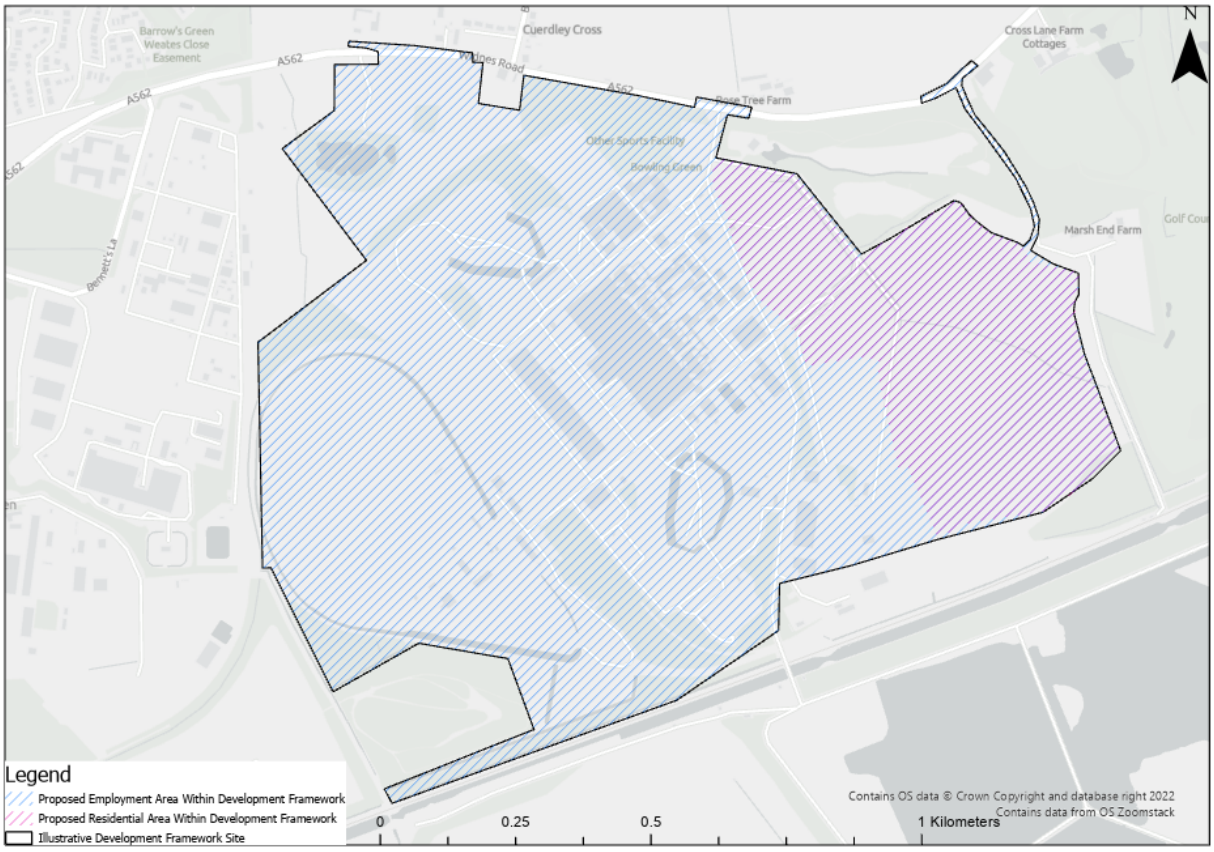


Figure 1 - FF Allocation Site

Baseline Noise Climate

1.2.3 Noise surveys were conducted in the vicinity of the FF Allocation Site in October 2022. A summary of these surveys is provided below.

1.2.4 Additional noise surveys will be undertaken to inform future application stages and the inclusion of the data below is intended for general context of the baseline noise climate around the FF Allocation Site.

1.2.5 A desktop study of commercial mapping and aerial photography indicated that the primary existing noise sources in the area of the FF Allocation Site are anticipated to be associated with:

- Noise from road traffic using the A562 Widnes Road to the north of the FF Allocation Site;
- The Lanxess Chemical Plant manufacturing site located towards the western part of the FF Allocation Site on Bennets Lane is likely to dominate the baseline noise environment within this part of the site.
- In addition to these specifically identified features, there is a general noise environment across the site that is influenced by road traffic on the local road network and general human activities such as agriculture and residential noise sources.

1.2.6 Following the desktop study, and through consultation with the Local Planning Authority EHO, a baseline noise survey regime was derived comprising of 4 monitoring positions on both an unattended longer term and attended short term basis.

1.2.7 The noise monitoring locations for the survey are provided in Figure 2. The noise monitoring locations (NML) and durations were determined in consultation with the Environmental Health Officer (EHO) at Warrington and Halton Borough Councils.

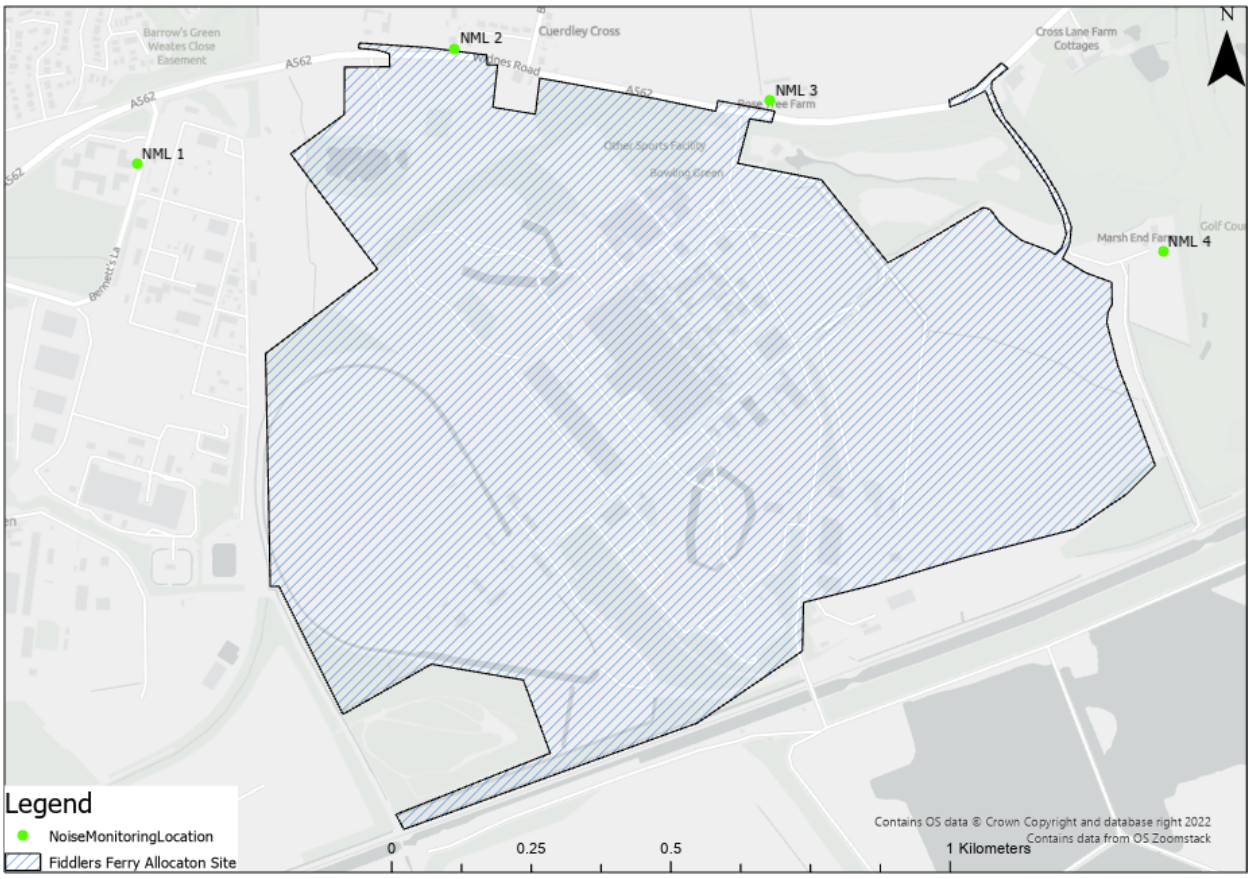


Figure 2 - Noise Monitoring Locations

1.2.8 24-hour measurements were taken at 3 of the 4 monitoring locations. As a result of access restrictions and equipment security the 4th location was monitored using attended measurement consisting of 1-hour periods during the day, evening and night.

1.2.9 Noise measurements have been completed using BS EN 61672-1 Class 1 compliant sound level analysers and baseline noise surveys have been completed in accordance with BS7455-1: 2003 '*Description and measurement of environmental noise – Part 1: Guide to quantities and procedures*' and BS7455-2: 1991 '*Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use'.*

1.2.10 The following tables summarise the monitoring survey results for the short-term and long-term survey locations, separated into daytime and night-time periods.

1.2.11 Within the presentation of the longer-term data within this technical note, the typical 24hr daytime period has been divided into two discrete periods for assessment purposes, as outlined below:

- 16hr Daytime period: 07:00 to 23:00 hours; and,
- 8 hr Night-time period: 23:00 to 07:00 hours.

1.2.12 Within the information in the following tables the “S” suffix denotes the short-term measurement positions and the “L” suffix long term measurement positions. The location numbers quoted relate directly to those presented in Figure 2.

Table 1-1 – Short-Term Manned Measurement: Summary Levels NML01

Location	Start Date and Time	Time Period	$L_{Aeq,T}$ dB	L_{Amax} dB	$L_{A10,T}$ dB	$L_{A90,T}$ dB
NML01S	17/10/2022 14:15	1 hour	56.3	77.3	58.6	50.2
	17/10/2022 22:20	1 hour	46.9	65.2	48.0	45.1
	18/10/2022 01:30	1 hour	49.7	75.3	49.1	46.6

Table 1-2 – Long-Term measurements: Summary Levels NML1

Location	Date	Time Period	$L_{Aeq,T}$ dB	L_{Amax} dB	$L_{A10,T}$ dB	$L_{A90,T}$ dB
NML2L	17/10/2022	Daytime (13:30 – 23:00)	68.2	95.7	76.2	52.9
	17/10/2022 – 18/10/2022	Night (23:00 – 07:00)	60.0	84.9	70.1	44.0
	18/10/2022	Daytime 07:00 – 13:30)	68.1	94.7	76.4	51.6
NML3L	18/10/2022	Daytime (14:00 – 23:00)	62.3	90.7	64	47.7
	18/10/2022 – 19/10/2022	Night (23:00 – 07:00)	54.2	81.2	52.0	35.0
	19/10/2022	Daytime 07:00 – 14:00)	64.7	89.5	67.4	56.4
NML4L	17/10/2022	Daytime (13:30 – 23:00)	51.6	86.0	50.5	44.1
	17/10/2022 – 18/10/2022	Night (23:00 – 07:00)	38.4	58.0	39.5	35.6
	18/10/2022	Daytime 07:00 – 13:30)	46.6	78.6	45.4	41.7

2 Methodology

2.1 Legislation, Policy and Guidance

2.1.1 Assessment and recommendations for further assessment have been undertaken in accordance with current national legislation, and national, regional and local plans and policies relating to Noise and Vibration in the context of the Development Framework. A summary of the relevant legislation, policies and guidance, the requirements of these policies and the project response is provided below.

Legislation

- The Control of Pollution Act 1974 (Ref.1)
- The Environmental Protection Act 1990 (Ref.2)
- The Noise Insulation Regulations 1975 (Ref.3)
- The Building Regulations 2010 (Ref.4)
- The Environment Act 2021 (Ref.5)

Policy

2.1.2 The planning policy relevant to Noise and Vibration and how this policy has been taken into account is provided in Table 2-1.

Table 2-1 - Relevant Noise and Vibration Policy

Policy Document	Policy/Reference	Description in Relation to Noise
National Planning Policy Framework (NPPF), as amended, 2021 (Ref 6)	*Paragraph 174*	*Planning policies and decisions should contribute to and enhance the natural and local environment by:* *e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;*
	Paragraph 185	*Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:* *a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;* *b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;*

Policy Document	Policy/Reference	Description in Relation to Noise
Noise Policy Statement for England (NPSE) (Ref 7)	*Paragraph 1.6* *Vision statement*	*Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.*
	Paragraph 1.7 *Aims*	*Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:* • *avoid significant adverse impacts on health and quality of life;* • *mitigate and minimise adverse impacts on health and quality of life; and* • *where possible, contribute to the improvement of health and quality of life.*

Technical Guidance

2.1.3 The following is a list of the relevant technical guidance which has been referenced during the consideration of noise and vibration impacts associated with various aspects of the FF Allocation Site.

- Guidelines for Environmental Noise Impact Assessment, Institute of Environmental Management and Assessment (IEMA) 2014 (Ref 8)
- World Health Organisation (WHO): Guidelines for Community Noise 2000; (Ref 9)
- World Health Organisation (WHO) Night Noise Guidelines for Europe 2009; (Ref 10)
- World Health Organisation (WHO) Guidelines for the European Region 2018; (Ref 11)
- BS 7445-1:2003 Description and measurement of environmental noise. Guide to quantities and procedures; (Ref 12)
- BS 7445-2:1991 Description and measurement of environmental noise. Guide to the acquisition of data pertinent to land use; (Ref 13)
- BS 8233:2014: Guidance on sound insulation and noise reduction for buildings; (Ref 14)
- BS 5228-1:2009+A1:2014: Code of practice for noise and vibration control on construction and open sites; Part 1 Noise; (Ref 15)
- BS 5228-1:2009+A1:2014: Code of practice for noise and vibration control on construction and open sites; Part 2 Vibration; (Ref 16)
- Calculation of Road Traffic Noise (CRTN) 1988; (Ref 17)
- Design Manual for Roads and Bridges (DMRB) Sustainability and Environmental Appraisal LA111 Noise and Vibration revision 2, May 2020; (Ref 18)
- BS 7385-2:1993 Evaluation and measurement for vibration in buildings. Guide to damage levels from ground borne vibration; (Ref 19)
- BS 6472-1:2008: Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting; (Ref 20)
- BS 4142:2014+A1 2019 Methods for rating and assessing industrial and commercial sound; (Ref 21)
- Professional Practice Guidance on Planning and Noise – New Residential Development (ProPG) 2017; (Ref 22)
- Transport Research Laboratory (TRL) Supplementary Report 328 ‘Ground vibrations caused by road construction activities (Ref 23)
- Building Bulletin 93: acoustic design of schools - performance standards (Ref 24)

Scope of assessment

2.1.4 Table 2-2 provides a summary of the scope of the Noise and Vibration aspects covered within this Technical Note.

Table 2-2 – Scope of the Noise and Vibration Assessment

Scope Item	Justification
Consideration of Noise (External and Internal)	The potential impact of noise needs to be considered on both existing receivers around the site and newly created receptors within the site. Similarly, consideration need to be afforded to the impact of existing noise sources around the site and new noise sources that have the potential to cause adverse impacts. This includes noise from local transport links, utilities, industry and employment areas.
Consideration of Vibration	The impact of vibration needs to be considered on both existing receivers around the site and newly created receptors within the site. The likely sources of vibration that need to be considered will primarily extend to Transport links (road and rail) as well as proposed industrial and employment land uses.
Site Suitability	Within the FF residential land, presented on Figure 1, a basic noise model, based on the methodology and assumptions contained in this Note has been used to assess the areas suitability for residential development. As set out earlier in this Note, based on the above technical guidance, the FF employment land, presented on Figure 1, is suitable for this proposed use, provided the design principles and future consideration of significance criteria set out in this Note are incorporated into detailed design and site layout.
Operation Road Traffic Vibration	Operational vibration has been scoped out of the assessment. Justification of this is provided in Section 3.

2.2 Study Areas

2.2.1 The study areas for Noise and Vibration for the assessments contained in this Technical Note vary according to each assessment and is described as follows:

- For the residential suitability assessment, a draft phasing plan has been used to assume the extent of the residential element of the site. This is subject to change as the Development Framework progresses and more detailed assessment will be required at the appropriate time. This is presented on Figure 1.
- Given the different sensitivity of employment uses, study areas to assess the impacts of new processes associated with the operation of the Development Framework, including employment areas can only be appropriately defined when assessment, based on detailed design and site layout, is being undertaken to inform the relevant planning application.

2.3 Assessment Methodology

Methodology for Assessing Impacts

2.3.1 This section details the recommended methodologies likely to be employed when assessing relevant aspects of the Development Framework. Detailed noise and vibration assessments will be undertaken in line with the phase being brought forward at the time and used to inform design.

Significance Criteria

2.3.2 The NPPF, in line with the NPSE, recognises that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established. That being said, there is a requirement to avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development.

2.3.3 The Development Framework could give rise to the following types of noise, as defined in the NPSE:

- 'Environmental noise' which includes noise from transportation sources; and
- 'Neighbourhood noise' which includes noise arising from within the community such as industrial and entertainment premises, trade and business premises, construction sites and noise in the street.

2.3.4 The explanatory note to the NPSE introduces three concepts relating to the adverse impacts of noise:

- '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 noise.'
- 'LOAEL – Lowest Observed Adverse Effect Level: This is the level above which adverse effects on health and quality of life can be detected.'
- 'SOAEL – Significant Observed Adverse Effect Level: This is the level above which significant adverse effects on health and quality of life occur.'

2.3.5 The NPSE acknowledges that the values for NOEL, LOAEL and SOAEL are likely to vary depending on the noise source and environment; and that at present there are no defined numerical values to allow flexibility within the policy until further evidence and guidance is presented.

2.3.6 The document PPG: Noise summarises the NOEL, LOAEL and SOAEL concepts introduced by means of a noise exposure hierarchy, based on the likely average response to noise, as set out in Table 2-3.

Table 2-3 – Hierarchy of Noise Exposure Responses

Perception	Examples of Outcomes	Effect Level	Action
No Observed Effect Level (NOEL)			
Not noticeable	No Effect	No Observed Effect	No specific measures required

Perception	Examples of Outcomes	Effect Level	Action
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 noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g., regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g., auditory and non-auditory	Unacceptable Adverse Effect	Prevent

2.3.7 None of the aforementioned policy documents go as far as to specify appropriate noise limits/acceptable noise levels for LOAEL and SOAEL for given development types. The NPSE states on this subject that the vision of the Policy seeks to 'Promote good health and good quality of life' with regard to noise, qualifying that the 'use of "promote" and "good" [in said statement] recognises that it is not possible to have single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations'. The Policy advocates a method that specifies 'specific local limits for specific developments'.

2.3.8 Therefore, it is necessary for professional judgement to be made with regard to noise levels/limits that are applicable to any specific development type and situation. Reference is therefore made to the Policy objectives relative to appropriate assessment mechanisms, allowing decisions and conclusions to be made with regard to potential effects and perception of noise, ultimately concluding the impact this would have and the necessity for mitigation.

Construction Noise

1.1.1 Significant effects are deemed to occur if noise generated by demolition and construction operations exceeds the calculated noise limits for the locality based upon the example criteria of BS5228-1 2009 (+A1:2014).

2.3.9 For any future construction noise assessment, an approach adopted from the DMRB LA111 has been recommended with regard to the setting of LOAEL and SOAEL values for construction noise at existing sensitive receptors, this is presented within Table 2-4.

Table 2-4 – Levels of LOAEL and SOAEL Assumed for Construction Noise

Time period	LOAEL $L_{Aeq,T}$ dB	SOAEL $L_{Aeq,T}$ dB
Daytime (07:00 – 19:00 Monday to Friday and Saturdays 07:00 – 13:00)	Baseline noise levels $L_{Aeq,T}$	Threshold level determined as per BS 5228-1 (Ref 15) Section E3.2 and Table E.1 BS 5228-1 (Ref 16)
Night (23:00 – 07:00)	Baseline noise levels $L_{Aeq,T}$	Threshold level determined as per BS 5228-1 (Ref 15) Section E3.2 and Table E.1 BS 5228-1 (Ref 16)
Evening and Weekends Time periods not covered above	Baseline noise levels $L_{Aeq,T}$	Threshold level determined as per BS 5228-1 (Ref 15) Section E3.2 and Table E.1 BS 5228-1 (Ref 16)

2.3.10 Where the existing ambient noise level already exceeds the level specified to represent a SOAEL as stated in the table above, then a significant effect would be derived on the basis that construction noise should not increase the ambient noise climate by more than 3dB. A SOAEL would therefore be taken to be equivalent to the existing ambient noise level.

Construction Vibration

2.3.11 Significant effects are deemed to occur if Peak Particle Velocity (PPV) levels exceed 1mms-1 as consistent with the moderate adverse effects for the LOAEL defined in Table 2-5.

2.3.12 For any future construction vibration assessment, the following is recommended with regard to the setting of LOAEL and SOAEL values for construction generated vibration at existing sensitive receptors.

Table 2-5 – Construction Vibration Significance Thresholds

Vibration Level (PPV)	Effect	Significance	Observed Adverse Effect Level
Vibration less than 0.3mms^{-1}	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	Neutral	NOEL
Vibration between 0.3 and 1.0mms^{-1}	Vibration might be just perceptible in residential environments	Minor adverse	
Vibration between 1.0 and 10.0mms^{-1}	It is likely that vibration of this level in residential environments will cause complaint	Moderate adverse	LOAEL

	but can be tolerated if prior warning and explanation has been given to residents.		
Vibration greater than 10mms^{-1}	Vibration is likely to be intolerable for any more than a very brief exposure to this level.	Major Adverse	SOAEL

Operational Noise: Commercial, Industrial and Retail

2.3.13 Significant effects are deemed to occur if the mitigated operational 'Rating Levels' described in BS4142:2014+A1 2019 Methods for rating and assessing industrial and commercial sound, exceeds the measured background noise level (LA90) by more than +5dB.

2.3.14 For any operational noise assessment associated with the noise generating aspects of the Development Framework, the following has been considered with regard to the setting of NOEL, LOAEL and SOAEL values at noise sensitive receptors. These can be applied at the future phase assessment stages once layouts have been produced for the proposed development and the proximity of sensitive receptors can be determined.

Table 2-6 – Operational Noise Significance Thresholds (Noise Generating Aspects)

BS4142:2014 Assessment	Example Outcome	Noise Policy Statement England	Actions
Greater than L_{A90} – 10dB	No effect – not noticeable	NOEL	No specific measures required
Rating level of between L_{A90} -10dB and L_{A90} +/- 0dB	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.		
Rating level of between L_{A90} +/- 0dB and L_{A90} + 5dB	Noise can be heard and causes small changes in behaviour and/or attitude. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	LOAEL	Mitigate and reduce to a minimum
Rating Level of between L_{A90} + 5dB and L_{A90} + 10dB	The noise causes a material change in behaviour and/or attitude. Quality of life diminished due to change in the acoustic character of the area.		
Rating level of greater than L_{A90} + 10dB	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects.	SOAEL	Mitigate and reduce to a minimum

2.4 Consideration of Site Suitability

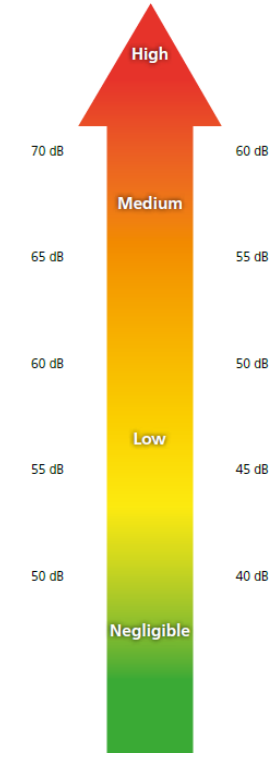
2.4.1 Significant effects are deemed to have occurred if the noise levels within the land parcels identified for residential end use exceed the following criteria based upon the NPPF, NPSE, ProPG, BS8233 and the World Health Organisation's Guidelines for Community Noise as set out in the following paragraphs.

Operational Noise: Residential Site Suitability

2.4.2 With regards to the suitability of the site for residential development the table below presents a matrix assigning noise levels to Policy derived impacts. These levels can then be used for the assessment and consideration of residential suitability.

2.4.3 Significant effects are defined as occurring at the levels defined below for the day and night-time periods corresponding to the SOAELs.

Table 2-7 – Significance Criteria – Residential Suitability

Noise Policy Statement England	Planning Practice Guidance - Noise	Assigned Noise Levels/Limits		Mitigation Strategy
		External Noise	Internal Noise	
SOAEL	Noticeable and very disruptive		Increasing scale of negative impact with increase in noise levels above the BS8233 internal design criteria values	Significant mitigation required. Mitigate to a minimum
LOAEL	Noticeable and intrusive			Detailed mitigation required. Mitigate to a minimum
	Noticeable and disruptive			
NOEL	Not noticeable		BS8233/WHO internal design criteria met	None required

2.4.4 Significant vibration effects are deemed to have occurred where vibration levels within residential portions of the FF Allocation Site are above the threshold values for a SOAEL for day and night-time periods as set-out in Table 2-8.

Table 2-8 – BS6472 Vibration dose value thresholds

Building Type	Period	Threshold ($mm/s^{-1.75}$)	BS6472 Guidance	Significance of Effect
Residential Building	Daytime	≤ 0.2	Below threshold of low probability of Adverse Comment	NOEL
Residential Building	Night-time	≤ 0.1		
Residential Building	Daytime	0.2 to 0.4	Low probability of Adverse Comment	LOAEL
Residential Building	Night-time	0.1 to 0.2		
Residential Building	Daytime	0.4 to 0.8	Adverse Comment Possible	SOAEL
Residential Building	Night-time	0.2 to 0.4		
Residential Building	Daytime	0.8 to 1.6	Adverse Comment Probable	
Residential Building	Night-time	0.4 to 0.8		

Operational Noise: Public Open Spaces

2.4.5 Levels of LOAEL and SOAEL should only be defined at residential receptors and therefore no such values have been defined for Public Open Spaces.

2.4.6 Assessment and consideration of noise associated with areas of public open space would be considered in accordance with the external noise level guidance of both the WHO *Guidelines for Community Noise* and BS8233:2014. Within BS8233 a level of between 50dB $L_{Aeq,\,T}$ and 55dB $L_{Aeq,T}$ is considered to be acceptable for external amenity depending on the local noise environment.

Operational Ground Borne Vibration

2.4.7 The Development Framework does not propose any items that would be expected to generate significant operational vibration; therefore, consideration of operational vibration has been scoped out of this assessment and is not discussed further.

Assumptions

2.4.8 The assumptions applicable to the noise and vibration related aspects of the development proposed by the Development Framework are presented and discussed below.

2.4.9 The baseline surveys were completed around the site between 17 October 2022 and 19 October 2022. Whilst agreed with Local Planning Authority (WBC) prior to undertaking and utilising both short and longer term (up to 24 hour) surveys the noise levels quantified can only ever represent a 'snapshot' in time of the noise climate during the specific periods monitored. However, it is considered the industry norm to assess and consider noise in this way for the purposes of assessment; and as comprehensive as possible baseline survey has been undertaken at the site to represent the noise climate as robustly as possible. As the purpose of this Technical Note is to present recommendations to inform the Development Framework, it may therefore be necessary to revisit the site and collect

additional noise data to inform the detailed assessments to be undertaken as part of future application stages.

2.4.10 The assessment and recommendations in this document are based upon the current Development Framework, while land use zones are fixed, specifics relating to discrete items of plant and process are not yet finalised. The screening effects of the proposed building structures shown within the Development Framework itself cannot yet be robustly represented for future stages. This assessment therefore considers the absolute worst-case scenario of uninhibited noise propagation across all aspects of the site.

2.4.11 With regard to the proposed employment areas of the Development Framework the current constraints of the study are presented below:

- At this stage of the development process, the use classes proposed (such as Class E Commercial and Service, Class B Business that supply people, and Class F Local Community Uses) cover a variety of potential users and as such noise generation profiles of end users cannot be assumed or concluded but will be considered further as part of the future phase assessments once further information of end users and internal layouts are available.
- Areas have been identified from the Development Framework plan. No specific layouts proposed within these areas are available as this would depend upon user interest, requirements and uptake which cannot be determined at this time.

2.4.12 This Technical Note is intended to provide identification and recommendations of relevant design criteria based upon acoustic guidance. As part of future application stages, detailed acoustic assessments, including mitigation recommendations will be undertaken to inform the detailed design process. This would ensure that noise (and vibration) is considered as a key issue of the detailed design of these future phases once end users become identified and subsequent phases built out.

3 Consideration of Noise and Vibration

3.1 Operational Road Traffic Vibration

3.1.1 Any new or upgraded road surface would be constructed in accordance with the Manual of Contract Documents for Highway Works, Volume 1, *Specification for Highway Works, Series 700 Road Pavements – General*, which would ensure any surface irregularities would not be permitted, resulting in a smooth road surface.

3.1.2 TRL RR 246 *Traffic induced vibrations in buildings* provides a methodology for the prediction of peak particle velocity (PPV), accounting for surface irregularity, speed and a ground scaling factor to account for geology. The following formulae calculates the maximum PPV at a building foundation:

$$PPV = 0.028 \times A \times (V/48) \times T \times P \times (R/6)x$$

Where:

A is the maximum height or depth of the surface defect in mm

V is the maximum expected speed of HGVS in km/h

T is the ground scaling factor.

P where the surface defect occurs in one wheel path = 0.75, otherwise p =1

R is the distance of the foundation from the defect in metres

X is the power factor for the most appropriate soil type.

3.1.3 As a result of compliance with Series 700 for road pavement construction the proposed development will not present any surface irregularities and therefore factor 'A' would be 0 (zero)mm. This would mean that the calculation undertaken to predict road traffic induced ground-borne vibration would result in a value of $0mms^{-1}$.

3.1.4 Therefore, ground-borne vibration impacts from road traffic movements associated with the FF Allocation Site would have a negligible magnitude of impact, resulting in effects that are not significant.

3.1.5 In 2018 Highways England commissioned a report entitled '*Effects of vibration from Road Traffic*', it is noted that the scope of the report was to consider if the assertion that there are no impacts from operational vibration is valid and to provide assurance that the issue can be scoped out of assessments, as advised under DMRB LA 111.

3.1.6 The study concluded that the *"measurement results from the location adjacent to the carriageway [10m from the A20 southbound carriageway] were well below perceptible levels, supporting the conclusions of the literature review in the first part of this task, that under "normal conditions" ground-borne vibration may be scoped out of assessment."*

3.2 Control of Noise from the FF Allocation Site

3.2.1 A secondary issue will be to ensure that noise from any new commercial/ light industrial classed as either E(g),B2 or B8 uses is controlled relating to impacts on new and existing proposed dwellings around the FF Allocation Site. This would include noise from sources such as unit activities, service yards, HGV and vehicle activities, car parking and building services plant.

3.2.2 Currently only land uses are fixed, specifics about discrete items of plant, processes and associated vehicular movements cannot be characterized so noise associated with these aspects would need to be designed/controlled sufficiently so as not to adversely impact on residential receptors at the detailed design stage. By definition in The Town and Country Planning (Use Classes) (Amendment) (England) Regulations 2020, business uses within what was Use Class B1(a) and is now Class E(g) are those *'being a use, which can be carried out in any residential area without detriment to the amenity of that area by reason of noise, vibration. smell, fumes, smoke, soot, ash, dust or grit.'*

3.2.3 Impacts associated with employment areas of the Development Framework, including the retained ash processing plant, are required to be considered in line with the methodology of BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*. Assessment in accordance with BS4142 would require detailed information regarding the location, hours of operation and noise emission levels of the activities in question. This level of detail is not available at present and therefore assessment would need to be completed as part of future planning applications when more specifics are available relating to end users and internal building layouts.

3.2.4 Noise associated with any commercial/ light industrial development of Classes E(g), B2 or B8 uses on the site would need to be controlled as far as practically possible to a cumulative level which is no higher than the existing background noise climate (L_{A90} +/-0dB) at the nearest noise sensitive receptors without the source under consideration (subject to agreement with the Local Planning Authority).

3.2.5 Good planning relating to the layout of the site will be imperative to controlling the noise impact of industrial land uses on nearby residential receptors. Noise limits will need to be imposed on new commercial uses to control the noise impacts on new sensitive receptors. Appropriate noise limits would need to be determined as part of the future assessment, in consultation with the Local Planning Authority, but would usually require noise to be controlled to a level no higher than that of the existing background level (L_{A90} +/-0dB).

3.2.6 Specific noise studies will be undertaken as part of future stage planning applications, once end uses are identified for a given plot, to ensure that noise does not result in adverse impacts at sensitive receptors.

3.2.7 Accordance with limits of this nature would provide a commensurate level of protection for future residents of further phases of the Development Framework and ensure that noise is fully controlled within the interaction of non-residential elements of the Development and sensitive residential aspects. As such adherence to this limit would ensure residual impacts would be acceptable.

3.3 Site Suitability

3.3.1 This section summarises the results of the high-level daytime Stage 1 ProPG residential suitability assessment described in Section 2.4.

3.3.2 This assessment is based on traffic flow data provided from the Project Traffic Engineers. The data provided contains provision for traffic movements associated with the retained ash processing plant.

3.3.3 This assessment is intended to provide an early indication of suitability for residential development. This assessment would be refined to inform the relevant planning application, upon which the robustness of the model would be improved to include but not limited to;

- Screening from intervening buildings based on the masterplan at the time;
- Assessment of the night time period;

- Inclusion of local terrain to more accurately predict ground absorption;
- Consideration of external $L_{Amax,F}$ levels associated with known noise sources around the site;
- Consideration operational noise and vibration from other phases of the development, where necessary implementing the methodology of BS4142: 2014 +A1 2019;
- Commentary on potential internal levels with reference to relevant standards and guidance; and,
- Recommendations for mitigation to be included in an Acoustic Design Statement (ADS) if necessary.

3.3.4 As set out earlier in this Note, it is not appropriate to appraise the suitability of the FF Allocation Site for employment use in the same way as residential. The application of design principles and significance criteria at detailed design will ensure the suitability of the FF employment land for commercial, industrial and office uses.

3.3.5 Figure 3 below presents the predicted daytime (07:00 - 23:00hrs) noise across the proposed residential allocation of the Development Framework. This has been calculated to assume a 'worst case' scenario and reflects predicted traffic flows on the local road network in the year 2026, as well as additional employment traffic entering the FF Allocation Site via the proposed access points from the A562.

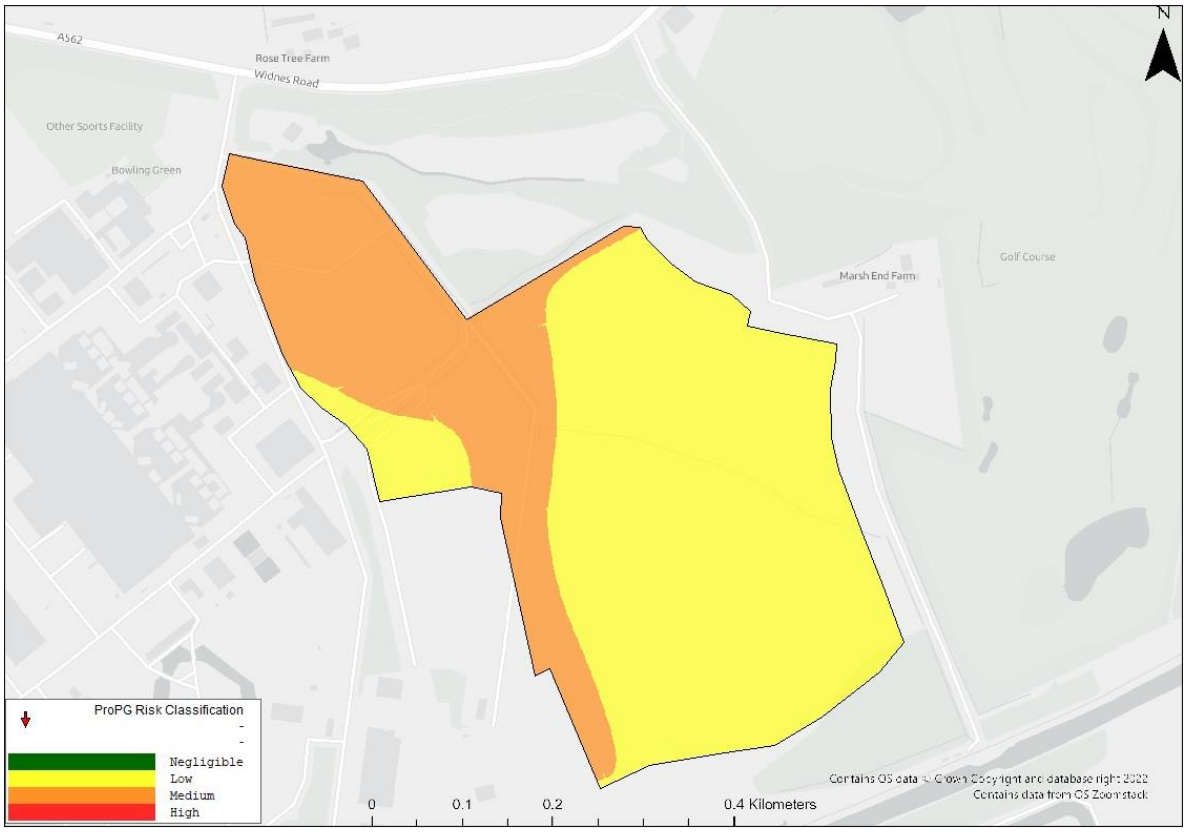


Figure 3 - ProPG Residential Risk Noise Contour

3.3.6 It has not been considered representative of the entire allocation to use the measured baseline levels presented in Tables 1-2 for a comparison of the prediction in Figure 3, measurements were taken much closer to the A562 and would be much more dominated by road noise. As part of a more detailed assessment to inform the relevant planning application additional data would be collected to represent the entire allocation more robustly.

3.3.7 From the daytime ProPG risk contour presented in Figure 3, it can be concluded that the residential allocation of the site almost entirely falls within the Medium Risk category as per table 2-7. This indicative assessment would suggest that the allocation would likely be considered in the LOAEL category described in the NPSE.

3.3.8 Medium risk below the SOAEL level would imply that detailed mitigation prescribed through a proportionate ADS would be required to inform decision makers about how potential noise impacts would be addressed.

4 Design and Mitigation

4.1 Introduction

4.1.1 This section presents the design consideration of the Development Framework, including consideration of potential mitigation measures and good practice identified in relation to Noise and Vibration.

4.2 Mitigation Considerations

4.2.1 Noise associated with the retail/commercial/industrial activities proposed within the FF Allocation Site has the potential to result in adverse effects on sensitive receptors in the vicinity, either proposed or existing. While the Development Framework already contains provision for sensible acoustic design further measures will be considered at the detailed design phase to control noise, these would include but are not limited to:

- The use of layout provision. Building massing, orientation and positioning will be used as effective screening for noise generating uses. Residential properties will be located as far as possible from other on-site operations; this could be through the sensible placement of the industrial units on their allocated land plots. Likewise, parkland or greenspace will be used as a buffer zone between residential dwellings and noise-generating activities.
- External fixed plant will, as far as possible, be located on façades facing away from sensitive residential receptors (existing or proposed) and would require acoustic treatment where necessary to control noise emissions. Where possible mechanical plant will be located so there is no direct line of sight to the residential properties.
- Noise generating activities will be screened by suitably robust and detailed acoustic fencing provision where deemed necessary. Fences, especially closed board or other solid fences will provide acoustic screening, these could be jointly used as security fences around the perimeter of the industrial/ residential border. Planting trees, shrubs, and bushes will not provide much reduction in physical noise level but will break the line of sight and likely reduce the perception of any noise encroaching on the site.
- Appropriate acoustic specification of external building elements for noise sensitive/noise generating buildings will be employed such that noise break-in/break-out is controlled to appropriate levels.
- Consideration will be given to the location of access routes and the proximity of these to sensitive receptors, both proposed and existing.
- Consideration will be afforded to the location of service yards, timings of deliveries, along with the use classifications/activities permissible in proximity to existing or proposed sensitive receptors.
- Good acoustic design principles will be implemented generally across the site. For example, placing opening facades, docks or noise-generating processes facing other commercial premises rather than the residential area will mean the building provides screening from these processes and drastically reduces their impacts. When considering the residential design, placing less noise-sensitive rooms on the facades facing the industrial areas could alleviate any adverse impacts or possible disturbance. Using suitable construction materials for both the industrial units and residential properties will reduce noise egress and ingress into the residential properties, this applies very much to window and door design, especially on adjacent boundaries.

4.2.2 From review of the Development Framework plan, it is evident that consideration has been afforded to potential noise and vibration impacts through the sensible placement of the different land uses and their relation to local transport links.

4.2.3 Where applicable detailed noise and vibration assessments will be undertaken as part of future phase planning applications to predict and control any associated impacts. Suitable noise limits based upon the prevailing noise climate should be specified within any appropriately worded planning permission to control noise.

4.2.4 Any such planning condition could be specified as such to require a specific noise study be undertaken once an end user is identified for a given premises to ensure that noise does not result in adverse impacts at either proposed or existing sensitive receptors. Any such condition would be expected to reference the assessment methodology of *BS4142: 2014 +A1 2019.*

4.2.5 A new sub-station, comprising of two 132kV transformers, to facilitate the on-site development has been proposed as part of the Development Framework, currently this is shown adjacent to the existing substation at the intersection between phase 3 employment, education and residential land use zones at approximately X:354,786 Y:386,112.

4.2.6 Placement near the existing substation demonstrates sensible acoustic design. Additionally, placing this adjacent to employment land use reduces the potential area of adverse impact given it's reduced sensitivity. The sub-station borders the education use zone but the proposed school buildings occupy the opposite side in this allocation demonstrating sensible acoustic design. Similarly, the border of the residential allocation is separated by open space promoting ground attenuation and reducing noise egress onto the allocation.

4.2.7 The combined sound power level of the new 132kV transformers is 89dB(A), *BS8233* suggests in spaces used for amenity, such as the public open space directly adjacent to the sub-station, the noise level should not exceed an upper guideline value of 55dB$_{LAeq,T}$, to achieve this across the entirety of the public open space it's anticipated that some acoustic treatment or additional screening may be require, though this could be alleviated through good acoustic design.

4.2.8 While the current placement is deemed suitable and using good acoustic design the substation would not likely cause a significant impact. Once a final masterplan has been devised, detailed assessment, including consideration of spectral characteristics of the substation, and its impact on nearby sensitive receptors in accordance with *BS4142: 2014 +A1 2019* will be needed to ascertain any requirement for specialist acoustic mitigation. During the detailed design of the proposed primary school, reference would be made to the acoustic performance standards of BB93 to ensure that the new and existing sub-stations, amongst other sources will not cause adverse impacts on learning spaces. These detailed assessments would from part of a planning application for the proposed residential/educational phase of the Development Framework.

5 References

Reference	Title
Ref 1	Crown, (1974), The Control of Pollution Act
Ref 2	Crown, (1990), The Environmental Protection Act
Ref 3	Crown, (1975), The Noise Insulation Regulations
Ref 4	The Building Regulations, (2010)
Ref 5	Crown, (2021), The Environment Act
Ref 6	Crown, (2021), National Planning Policy Framework
Ref 7	Crown, (2010), Noise Policy Statement for England
Ref 8	Institute of Environmental Management and Assessment (IEMA), (2010) Guideline for Environmental Noise Impact Assessment
Ref 9	World Health Organisation (WHO), (2000) Guidelines for Community Noise
Ref 10	World Health Organisation (WHO), (2009), Night Noise Guidelines for Europe 2009
Ref 11	World Health Organisation (WHO), (2018), Guidelines for the European Region
Ref 12	BS 7445-1, (2003) Description and measurement of environmental noise. Guide to quantities and procedures
Ref 13	BS 7445-2, (1991) Description and measurement of environmental noise. Guide to the acquisition of data pertinent to land use
Ref 14	BS 8233, (2014), Guidance on sound insulation and noise reduction for buildings
Ref 15	BS 5228-1, (2009+A1:2014), Code of practice for noise and vibration control on construction and open sites; Part 1 Noise
Ref 16	BS 5228-2, (2009+A1:2014), Code of practice for noise and vibration control on construction and open sites; Part 2 Vibration
Ref 17	Department of Transport, (1988), Calculation of Road Traffic Noise (CRTN)
Ref 18	Highways England, (2020), Design Manual for Roads and Bridges (DMRB) Sustainability and Environmental Appraisal LA111 Noise and Vibration revision 2, May 2020
Ref 19	BS 7385-2, (1993), Evaluation and measurement for vibration in buildings. Guide to damage levels from ground borne vibration
Ref 20	BS 6472-1, (2008) Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting
Ref 21	BS 4142, (2014+A1 2019), Methods for rating and assessing industrial and commercial sound

Reference	Title
Ref 22	(2017), Professional Practice Guidance on Planning and Noise – New Residential Development (ProPG),
Ref 23	TRL Supplementary Report 328 ‘Ground vibrations caused by road construction activities’ (TRL Limited, 1997)
Ref 24	Building Bulletin 93: Acoustic design of schools – performance standards. Education Funding Agency (2003)

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