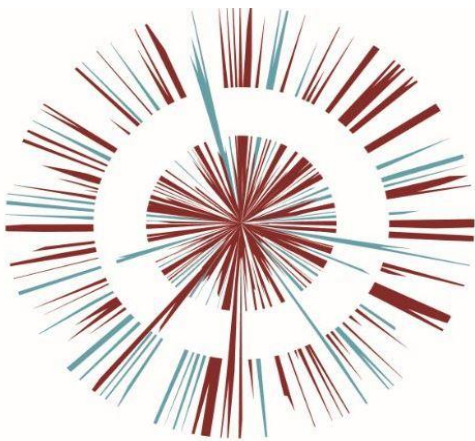




# **OMEGA ZONE 8, ST HELENS**

**Omega St Helens Ltd / T. J. Morris Limited**



**Document Title**  
**ES Vol. 2 Appendix 7 Noise and**  
**Vibration Appendices**  
**Document No. OPP DOC.11.20**

# Appendix 7.1

## **GLOSSARY OF ACOUSTIC TERMINOLOGY**



# GLOSSARY OF ACOUSTIC TERMINOLOGY

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## NOISE

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20Hz (deep bass) to 20,000Hz (high treble) and over the audible range of 0dB (the threshold of perception) to 140dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or  $L_{Aeq}$ ,  $L_{A90}$  etc, according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

## ACOUSTIC TERMINOLOGY

**dB (decibel):** The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ( $2 \times 10^{-5}$ Pa).

**dB(A):** A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

**$L_{Aeq,T}$ :** Defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.

**$L_{Amax}$ :** The maximum A-weighted sound pressure level recorded over a particular period.  $L_{Amax}$  is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall  $L_{Aeq,T}$  noise level, but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response, denoted  $L_{AFmax}$  or  $L_{Amax,F}$ .

**$L_{10}$  and  $L_{90}$ :** If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The  $L_n$  indices are used for this purpose, and the term refers to the level

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exceeded for  $n\%$  of the time. Hence  $L_{10}$  is the level exceeded for 10% of the time, and the  $L_{90}$  is the level exceeded for 90% of the time. Unless described otherwise, they are measured using the 'fast' sound level meter response, denoted  $L_{AF10}$  and  $L_{AF90}$ .

**Free-field Level:** A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally as measured outside and at least 3.5m away from buildings.

**Façade Level:** A sound field determined at a distance of 1 m in front of a large sound reflecting object such as a building façade.

**Ambient Noise Level:** The all-encompassing noise level measured in  $L_{Aeq,T}$ . The Ambient Noise Level incorporates background sounds as well as the industrial source noise under consideration.

**Background Noise Level:** The noise level exceeded for 90% of the time, the  $L_{A90}$  noise index, in the absence of sound of an industrial and/or commercial nature (BS 4142).

**Specific Sound Level,  $L_s = L_{Aeq,T}$ :** The term used in BS 4142 to describe the equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given time period.

**Rating Level,  $L_{Ar,Tr}$ :** The term used in BS 4142 to describe the specific sound level plus any adjustment for the characteristic features of the sound.

## VIBRATION

Vibration is defined as a repetitive oscillatory motion. Vibration can be transmitted to the human body through the supporting surfaces; the feet of a standing person, the buttocks, back and feet of a seated person or the supporting area of a recumbent person. In most situations, entry into the human body will be through the supporting ground or through the supporting floors of a building.

Vibration is often complex, containing many frequencies, occurring in many directions and changing over time. There are many factors that influence human response to vibration. Physical factors include vibration magnitude, vibration frequency, vibration axis, duration, point of entry into the human body and posture of the human body. Other factors include the exposed persons experience, expectation, arousal and activity.

Experience shows that disturbance or annoyance from vibration in residential situations is likely to arise when the magnitude of vibration is only slightly in excess of the threshold of perception.

### Vibration Terminology

**Peak Particle Velocity (PPV):** The maximum instantaneous velocity of a particle at a point during a given time interval, usually stated in mm/s.

**Peak Component Particle Velocity:** The maximum value of any one of three orthogonal component particle velocities measured during a given time interval.

**Vibration Dose Value (VDV):** A cumulative measurement of the frequency weighted vibration level received over a period of time, e.g. a 16-hour daytime or 8-hour night-time, usually stated in terms of  $m/s^{-1.75}$ .

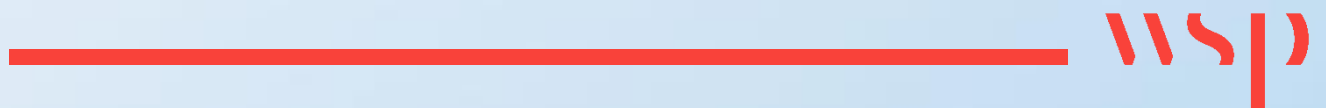
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Mount View  
Standard Way Business Park  
Northallerton  
DL6 2YD

# Appendix 7.2

## **LEGISLATION, POLICY AND GUIDANCE**



# LEGISLATION, POLICY AND GUIDANCE

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## LEGISLATION

### CONTROL OF POLLUTION ACT 1974 [REF. 7.14]

Sections 60 and 61 of the COPA give local authorities special powers for controlling noise arising from construction and demolition works, regardless of whether a statutory nuisance has been caused or is likely to be caused. These powers may be exercised either before works start (Section 61) or after they have started (Section 60). Section 61 is a prior consent process whereby approval is sought for the completion of construction works following prescribed methods, whilst Section 60 affords Local Authorities means of control of construction noise where a Section 61 has not previously been agreed.

### ENVIRONMENTAL PROTECTION ACT 1990 [REF. 7.13]

Section 79 of the EPA presents a number of matters which may be statutory nuisances, including noise. Under the provisions of the EPA, the Local Authority is required to inspect its area periodically to detect any nuisance and, where a valid complaint of a statutory nuisance is made by a person living within its area, to take such steps as are reasonably practicable to investigate the complaint.

Section 80 of the EPA (Summary proceedings for statutory nuisances) provides Local Authorities with powers to serve an abatement notice requiring the abatement of a nuisance or requiring works to be executed to prevent their occurrence.

## NATIONAL PLANNING POLICY

### NOISE POLICY STATEMENT FOR ENGLAND (NPSE) [REF. 7.9]

The NPSE [Ref. 7.9] was published on 15 March 2010. It sets out the long-term vision for government noise policy, to promote good health and a good quality of life through the management of noise.

The policy ensures that noise issues are considered at the right-time during the development of policy and decision making, and not in isolation. It highlights the underlying principles on noise management already found in existing legislation and guidance. The NPSE [Ref. 7.9] should apply to all forms of noise, including environmental noise. It sets out the long-term vision of Government noise policy as follows:

*"Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development."*

This long-term vision is supported by the following 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."*
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To assist in the understanding of the terms "*significant adverse*" and "*adverse*", the NPSE [Ref. 7.9] acknowledges that there are two concepts being applied to noise impacts, for example, by the World Health Organisation. They are:

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

The NPSE [Ref. 7.9] introduces a third concept:

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

However, the NPSE [Ref. 7.9] goes on to state that:

*"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."*

## **NATIONAL PLANNING POLICY FRAMEWORK (NPPF) [REF. 7.15]**

Last updated in February 2019, the NPPF [Ref. 7.15] sets out the Government's planning policies for England and how these are expected to be applied. The NPPF [Ref.7.15] superseded Planning Policy Guidance Note (PPG) 24: *Planning and noise* [Ref. 7.25] amongst other PPG's and Planning Policy Statements (PPS's). In contrast to PPG 24 [Ref.7.25], reference to noise is scant within the NPPF [Ref. 7.15]. Noise is referenced within the document as follows:

*"170. Planning policies and decisions should contribute to and enhance the natural and local environments by:...[a number of points including]...*

- *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;"*

and

*"180. 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<sup>60</sup>;*

*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;...*”

Reference number 60 of the above quotation points to the Explanatory Note to the Noise Policy Statement for England (NPSE) [Ref. 7.9].

Additional reference is made to noise with respect to mineral extraction Sites but this is not applicable to this assessment.

The NPPF [Ref. 7.15] also includes the following statement:

*“182. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent, of change’) should be required to provide suitable mitigation before the development has been completed.”*

Whilst this paragraph does not explicitly reference noise, being ‘overarching’ in nature, in previous versions of the NPPF [Ref.7.15], similar text was included within the noise related paragraphs of the document.

## **LOCAL PLANNING POLICY**

### **ST. HELENS BOROUGH LOCAL PLAN 2020-2035, SUBMISSION DRAFT JANUARY 2019, A BALANCED PLAN FOR A BETTER FUTURE [REF. 7.16]**

The new Local Plan for St. Helens is yet to be formally adopted. The current status is that this submission draft has been prepared following a previous consultation exercise which took place on the St. Helens Local Plan 2018-2033 Preferred Options document (Dec 2016) [Ref. 7.16].

Section 8 of the submission draft, entitled *Development Management Policies* includes the following policy:

#### ***“Policy LPD01: Ensuring Quality Development***

*All proposals for development will be expected, as appropriate having to their scale, location and nature, to meet or exceed the following requirements:*

1. [a number of points concerned with quality of the built environment]
2. [a number of points concerned with environmental quality, including] ...

*b) Minimise and mitigate to acceptable levels any effects that the development may have on: air quality; light, land and / or water pollution (including contamination of soil, surface water and groundwater resources); and levels of noise, vibration, smells, dust and electromagnetic fields in the area,”*

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## **ST. HELENS LOCAL PLAN CORE STRATEGY (OCTOBER 2012) [REF. 7.17]**

The Core Strategy is the principal document in a framework of planning policy documents, known as the St. Helens Local Plan, that guide how decisions are made on planning applications.

The Core Strategy includes the following policies that are pertinent to noise or vibration and the proposed development:

### ***“Policy CP 1 Ensuring Quality Development in St. Helens***

*All proposals for development within the Borough will be expected, where appropriate, to meet the following standards as a minimum:*

1. [a number of points concerned with quality of the built environment]
2. [a number of points concerned with the protection of the natural and historic environmental quality, including] ...

*i) Minimise and mitigate against the effects of air, light and water pollution (including contamination of soil, surface water and groundwater resources) and noise, vibration, smells, dust and electromagnetic fields caused by the development...”*

### **“Policy CP 2 Creating an Accessible St. Helens**

*In order to provide a realistic choice of travel, including access for people with mobility difficulties, all proposals for development within St. Helens (where appropriate) will be expected to meet the following principles, except where specific locational requirements restrict the opportunity for ensuring a choice of travel:...*

[A number of points including] ...

5. *Reduce the adverse impacts of traffic on the community by: ...*

[Two points including] ...

*ii) Supporting initiatives to reduce congestion, air pollution and noise on key routes.”*

## **SAVED POLICIES OF THE 1998 UNITARY DEVELOPMENT PLAN (UDP) (ST. HELENS BOROUGH COUNCIL) [REF. 7.18]**

Saved Policy ENV 29 of the UDP included account of potential pollution as a result of noise. The Policy has been replaced following the adoption of the Core Strategy as referenced above.

## **WARRINGTON BOROUGH COUNCIL PROPOSED SUBMISSION VERSION LOCAL PLAN 2017-2037, MARCH 2019 [REF. 7.19]**

Whilst the Proposed Development is located within the St. Helens area, it is immediately adjacent to the Warrington Borough Council area so their planning policies will provide an indication of their likely requirements for the development

The new Local Plan for Warrington Borough Council is yet to be formally adopted, this being the latest ‘submission’ version which has been prepared drawing upon the results of a previous consultation exercise.

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Section 9.8 of this submission version is entitled: *Environmental and Amenity Protection in Warrington* and includes the following policy:

***“Policy ENV8 - Environmental and Amenity Protection***

*General Principles*

- 1. The Council requires that all development is located and designed so as not to result in a harmful or cumulative impact on the natural and built environment, and/or general levels of amenity.*
- 2. Development proposals, as appropriate to their nature and scale, should demonstrate that environmental risks have been evaluated and appropriate measures have been taken to minimise the risks of adverse impacts to air, land and water quality, whilst assessing vibration, light and noise pollution both during their construction and in their operation...*

[Sections on subjects other than noise and vibration] ...

*Noise Pollution*

- 10. The Council encourages consideration for noise and acoustic mitigation during early stages of design, having regard for layout, siting and internal features.*
- 11. Developments which are noise sensitive end uses near to busy roads or noisy existing businesses will need to demonstrate with any application that appropriate mitigation can be employed and implemented to prevent adverse impacts on health and quality of life for future site users. Such developments need to consider and implement the ‘agent of change’ principle in accordance within the NPPF.*
- 12. New developments should not place unreasonable restrictions on existing businesses or business activities through the restriction of activities, prohibition of works or otherwise.*
- 13. Development proposals generating noise which is likely to create adverse impacts on health and quality of life and which cannot be mitigated and/or controlled through the use of conditions or through pre-existing effective legislative regimes, will not be permitted.*

*General Amenity Protection*

- 14. Where development is considered to be appropriate but may still have impacts on the following environmental considerations, in addition to those detailed above, the Council will consider the use of conditions or planning obligations to ensure any appropriate mitigation or compensatory measures are secured:*

[a number of points including] ...

- c. The need to respect living conditions of existing neighbouring residential occupiers and future occupiers of new housing schemes in relation to overlooking/loss of privacy, outlook, sunlight, daylight, overshadowing, noise, vibration and disturbance.”*
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## **LOCAL PLAN CORE STRATEGY (LPCS) (WARRINGTON BOROUGH COUNCIL) [REF. 7.20]**

Adopted in July 2014, The LPCS is the overarching strategic policy document in the Local Planning Framework for Warrington Borough Council. It sets out the planning framework for guiding the location and level of development in the Warrington Borough area up to 2027.

The LPCS states that it will replace the existing Adopted Unitary Development Plan as a reference document for which all future planning applications will be assessed.

Section 10 of the LPCS is entitled Securing a high quality environment. This section includes the following policy which references noise and is pertinent to the Proposed Development:

### *“Policy QE6*

#### *Environment and Amenity Projection*

*The Council, in consultation with other Agencies, will only support development which would not lead to an adverse impact on the environment or amenity of future occupiers or those currently occupying adjoining or nearby properties, or does not have an unacceptable impact on the surrounding area. The Council will take into consideration the following:*

*...[a number of points including the following two]...*

- Noise and vibration levels and times when such disturbances are likely to occur;*
- The need to respect the living conditions of existing neighbouring residential occupiers and future occupiers of new housing schemes in relation to overlooking/loss of privacy, outlook, sunlight, daylight, overshadowing, noise and disturbance...*

*Proposals may be required to submit detailed assessments in relation to any of the above criteria to the Council for approval.*

*Where development is permitted which may have an impact on such considerations, the Council will consider the use of conditions or planning obligations to ensure any appropriate mitigation or compensatory measures are secured....[text conserved with ground conditions]...*

*Additional guidance to support the implementation of this policy is provided in the Design and Construction and Environmental Protection Supplementary Planning Documents.*

Whilst there was a high court challenge to parts of the LPCS, the ruling of the case does not affect Policy QE6 as detailed above.

Upon adoption of the LCPS, the above policy replaced the previously saved REP10 (Noise) policy of the Unitary Development Plan 2006 (UDP)

## **ENVIRONMENTAL PROTECTION, SUPPLEMENTARY PLANNING DOCUMENT, MAY 2013 (WARRINGTON BOROUGH COUNCIL) [REF. 7.21]**

Whilst this document pre-dates the LCPS, and therefore refers to previous saved policies of the UDP that have now been superseded by the LCPS, it includes a section on noise. This section

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provides a useful source of information to establish the likely expectations of Warrington Borough Council with respect to noise assessment.

In particular section 6.2 confirms that a potential new noisy development which may adversely impact upon existing land uses surrounding the site is a material planning consideration. The use classes that are considered to typically have a greater impact on noise sensitive land uses are listed and include B2/B8 general industrial and warehouse activities.

It is confirmed that an individual noise impact review will be carried out by the Public Protection Service when determining an application to assess the suitability of a Proposed Development and end use. It is also confirmed that the applicant/developer may also carry out a similar review when preparing a development proposal, to identify potential noise impacts and to ascertain whether any protection or mitigation measures are required to counteract the impacts of noise.

With regards to new business proposals the following is stated:

*“Consideration for new businesses will typically involve a review of the noise likely to be emitted from the business. This can include plant or equipment associated with that business and its operation, but may also consider transport noise from deliveries or dispatched merchandise as well as possible increased traffic flows from visitors or staff arriving or leaving the site. Certain types of business may also be expected to have similar patterns of operation; for example, public houses and hot food takeaways tend to concentrate on afternoon and evening trade, whereas warehousing is likely to include overnight operation.”*

The document goes on to state the following:

*“All development proposals should consider the ambient noise levels already present in a given area. The LPA is unlikely to grant planning permission to a development that will massively increase existing noise levels in an area, as this may significantly change the character of the local environment. For developments that are likely to have a significant noise impact, then consideration of appropriate acoustic mitigation measures will be necessary to reduce the impact from the development site to an acceptable level.*

*The Public Protection Service may make recommendations for basic mitigation measures to be adopted on smaller scale developments, which will attain the correct acoustic standards within the development. These recommendations will be made in discussion with the Applicant/Developer where possible.*

*Noise emitted by new plant and equipment should not exceed the existing background noise level by more than -10dB(A). Once the background noise level has been established and specific plant or equipment selected, acoustic calculations can be made to determine whether the plant or equipment will meet requirements including the effect of separation distance (i.e. the further away from a noise source, the quieter the noise will become). Quieter equipment is also usually available, which may assist in achieving the required/desired noise levels.*

*In some circumstances, no matter what equipment is selected, it may not be feasible to achieve the desired acoustic levels, meaning additional acoustic shielding may be required or alternatively, the relocation of equipment or plant to achieve the required/desired levels.*

*In rural areas the background noise level may be significantly quieter than that found in urban/built-up areas. It can be technically much more difficult to achieve target noise levels in*

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*these areas. A flexible approach will be considered where it is clear that the applicant/Developer has tried all reasonable methods to reduce noise to an acceptable level.”*

The following guidance is then presented on Construction noise

#### **“Noise During Construction/Demolition Works**

*Noise from construction or demolition works can be intrusive or disruptive to local businesses and/or noise sensitive land uses. For this reason construction or demolition activities should be restricted to daytime periods and have finite start and finish times. It is usually recommended that all noisy works (i.e. those that are audible beyond the site boundary), are restricted before 08:00 hrs and no later than 18:00 hrs on Monday to Friday to minimise disruption. Noisy activities occurring on Saturday should be restricted to 08:30 hrs to 13:30 hrs and no noisy works should take place on Sundays or Public or Bank Holidays. These restrictions apply to anyone working on site or deliveries to the site*

*By utilising set working hours for activities on site as well as deliveries to the site, respite is provided for local residents and businesses/workers near to the development. Noise and disruption to local residents will occur during development works, so it is important to remember that local residents may not necessarily be in favour of the development or all aspects of it. By keeping an open dialogue and attempting to placate any complaints or grievances, the development may be allowed to progress more smoothly.*

*For larger developments or developments that are likely to progress over a long period of time, it may be worth considering a 'Considerate Contractors Scheme'. These schemes suggest guidelines to minimise disruption to local residents and businesses and provide a code of conduct for employees on site so that their work does not unduly upset local residents and/or businesses/workers. These schemes include noise as well as many other elements such as dust suppression, deliveries, working hours, behaviour on site, approved delivery routes, etc.”*

## **GUIDANCE**

### **PLANNING PRACTICE GUIDANCE (PPRACG) [REF. 7.22]**

Last updated on 22 July 2019, this web-based resource was issued for use by the Department for Communities and Local Government (DCLG). The purpose of the guidance is to complement the NPPF [Ref. 7.15] and provide advice on how to deliver its policies

The section on noise was published on 06 March 2014, but was last updated 22 July 2019. The guidance includes a table which summarises “the noise exposure hierarchy based on the likely average response of those affected” and which offers “examples of outcomes” relevant to the NOEL, LOAEL and SOAEL effect levels described in the NPSE. The term Unacceptable Adverse Effect (UAE) level is introduced which equates to noise perceived as “present and very disruptive”. It is stated that UAEs should be prevented.

These outcomes are in descriptive form and there is still no numerical definition of the NOEL, LOAEL and SOAEL (or UAE), or detailed advice regarding methodologies for their determination. There is also no reference to the further research that is identified as necessary in the NPSE. There

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is reference to a number of other information sources, including British Standards, and it is confirmed that ‘Some of these documents contain numerical criteria.’ (albeit not that seek to define to the NOEL, LOAEL or SOAEL), and it is then advised that ‘These values are not to be regarded as fixed thresholds and as outcomes that have to be achieved in every circumstance’

The noise exposure hierarchy table is duplicated below in Table 7.2-1.

**Table 7.2-1 - Noise exposure hierarchy based on the likely average response**

<b>Response</b>	<b>Examples of outcomes</b>	<b>Increasing effect level</b>	<b>Action</b>
<b>No Observed Effect Level</b>			
Not present	No effect	No Observed Effect	No specific measures required
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
<b>Lowest Observed Adverse Effect Level</b>			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, 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 small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
<b>Significant Observed Adverse Effect Level</b>			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological	Significant Observed Adverse Effect	Avoid



	<p>response, 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.</p>		
Present and very disruptive	<p>Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.</p>	Unacceptable Adverse Effect	Prevent

**BS 5228-1:2009+A1:2014: CODE OF PRACTICE FOR NOISE AND VIBRATION CONTROL ON CONSTRUCTION AND OPEN SITES. PART 1: NOISE [REF. 7.1]**

This Standard sets out techniques to predict and assess the likely noise effects from construction works, based on detailed information on the type and number of plant being used, their location, and the length of time they are in operation. The noise prediction method is used to establish likely noise levels in terms of the  $L_{Aeq,T}$  over the core working day. This Standard also documents a database of information, comprising previously measured sound power levels for a variety of different construction plant undertaking various common activities.

Three example methods are presented for determining the significance of construction noise impacts. In summary, these methods adopt either a series of fixed noise level limits, are concerned with ambient noise level changes as a result of the construction operations or a combination of the two.

With respect to absolute fixed noise limits, BS 5228-1 discusses those included within Committee on the problem of noise – Final Report [Ref. 7.26]. These limits are presented according to the nature of the surrounding environment, for a 12-hour working day. The presented limits are:

- 70dB(A)  $L_{eq}$  in rural, suburban and urban areas away from main road traffic and industrial noise; and
- 75dB(A)  $L_{eq}$  in urban areas near main roads and heavy industrial areas.

The above noise level limits are applicable at the façade of the receptor in question (i.e. not free-field).

The Standard goes on to provide methods for determining the significance of construction noise levels by considering the change in the ambient noise level that would arise as a result of the construction operations. Two example assessment methods are presented, these are the ‘ABC method’ as summarised within Table 7.2-2 and the ‘5dB(A) change’ method under that table.

**Table 7.2-2 - Example threshold of potential significance effect at dwellings - ABC method**

Assessment category and threshold value period	Threshold value, in decibels $L_{Aeq,T}$ (dB)		
	Category (A) <sup>A)</sup>	Category (B) <sup>B)</sup>	Category (C) <sup>C)</sup>
Night-time (23:00 – 07:00)	45	50	55
Evenings and weekends <sup>D)</sup>	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75

NOTE 1: A potential significant effect is indicated if the  $L_{Aeq,T}$  noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.

NOTE 2: If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total  $L_{Aeq,T}$  noise level for the period increases by more than 3dB due to site noise.

NOTE 3: Applied to residential receptors only.

A) Category A: threshold values to use when ambient levels (when rounded to the nearest 5dB) are less than these values.

B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.

C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.

D) 19.00-23.00 weekdays, 13.00-23.00 Saturdays and 07.00-23.00 Sundays

With respect to the ‘5dB(A) change’ method, the guidance states:

*“Noise levels generated by site activities are deemed to be potentially significant if the total noise (pre-construction ambient plus site noise) exceeds the pre-construction ambient noise by 5dB or more, subject to lower cut-off values of 65dB, 55dB and 45dB  $L_{Aeq,T}$ , from site noise alone, for the daytime, evening and night-time periods, respectively; and a duration of one month or more, unless works of a shorter duration are likely to result in significant effect.”*

## BS 5228-2:2009+A1:2014: CODE OF PRACTICE FOR NOISE AND VIBRATION CONTROL ON CONSTRUCTION AND OPEN SITES. PART 2: VIBRATION [REF. 7.3]

This Standard provides recommendations for basic methods of vibration control relating to construction and open sites. The legislative background to vibration control is described and guidance is provided concerning methods of measuring vibration and assessing its effects on the environment.

Guidance criteria are suggested for the assessment of the significance of vibration effects; such criteria are provided in terms of Peak Particle Velocities (PPV) and are concerned with both human and structural responses to vibration. Those applicable to human perception and disturbance are presented within Table 7.2-3.

**Table 7.2-3 - Guidance criteria for the assessment of significance of vibration for human perception and disturbance (from BS 5228-2:2009+A1:2014)**

Vibration level <sup>A), B), C)</sup> (PPV)	Effect
0.14 mms <sup>-1</sup>	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mms <sup>-1</sup>	Vibration might be just perceptible in residential environments.
1.0 mms <sup>-1</sup>	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10 mms <sup>-1</sup>	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.

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

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

<sup>C)</sup> Single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. The values are provided to give an initial indication of potential effects, and where these values are routinely measured or expected then an assessment in accordance with BS6472-1 or BS6472-2, and/or other available guidance, might be appropriate to determine whether the time varying exposure is likely to give rise to any degree of adverse comment.

The Standard goes on to present guidance criteria applicable to the vibration response limits of buildings in terms of the component PPV. These are presented within **Table 7.2-4**. It should be noted that the values presented within **Table 7.2-4** are applicable to cosmetic damage only. It is stated within BS 5228-2 that minor damage is possible at vibration magnitudes which are greater than twice those given in the table.

**Table 7.2-4 - Guidance criteria for the assessment of significance of transient vibration for cosmetic building damage (from BS 5228-2:2009+A1:2014)**

Type of Building	Peak component particle velocity in frequency range of predominant pulse	
	4Hz to 16Hz	15Hz and above
Reinforced or framed structures. Industrial and heavy commercial buildings.	50mm/s at Hz and above	50mm/s at Hz and above
Unreinforced or light framed structures. Residential or light commercial buildings.	15mm/s at 4Hz increasing to 20mm/s at 15Hz	20mm/s at 15Hz increasing to 50mm/s at 40Hz and above

NOTE 1: Values referred to are at the base of the building.

NOTE 2: At frequencies below 4Hz, a maximum displacement of 0.6mm (zero to peak) is not to be exceeded.

### **BS 4142:2014+A1:2019: METHODS FOR RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND [REF. 7.5]**

BS 4142 describes methods for assessing sound of an industrial and/or commercial nature, including sound from fixed installations (such as mechanical and electrical plant).

It provides a method of determining the 'rating level' for sources of industrial or commercial sound for the purposes of investigating noise impact, assessing sound from new, modified, or additional sources of sound, and assessing sound affecting new residential premises.

BS 4142 uses several terms to define the various parameters / indicators used in assessments, including:

- Specific sound – the commercial / industrial noise source under consideration;
- Residual sound – the sound level at the noise-sensitive receivers in the absence of the specific sound;
- Ambient sound – the sound level at the noise-sensitive receivers in the presence of the specific sound (i.e. ambient = residual + specific);
- Background sound level – the sound pressure level which is exceeded by the residual sound for 90% of the measurement period; and,
- Rating level – the specific sound, corrected for acoustically distinguishing characteristics.

BS 4142 states it is normally possible to carry out a subjective assessment of characteristics, based on the following correction guidelines:

- Tonality: +2dB for a 'just perceptible' tone, +4dB for a 'clearly perceptible' tone, and rising to +6 dB for a 'highly perceptible' tones;
- Impulsivity (rapidity of change and overall change in level): +3dB for 'just perceptible' impulsivity, +6dB for 'clearly perceptible' impulsivity, rising to +9dB for 'highly perceptible' impulsivity; and,

- Intermittency: if the on/off-time of the specific sound is readily distinctive at the noise-sensitive receivers, +3dB.

Typically, the greater the difference between the background and rating level, the greater the magnitude of impact, although BS 4142 emphasises that this is highly context-specific.

BS 4142 states that an initial estimate of the impact can be obtained by subtracting the background sound level from the rating level, and that:

- Typically, the greater the difference the greater the magnitude of the impact;
- A difference of around +10dB or more is likely to be indicative of significant adverse impact, depending on context;
- A difference of around +5dB or more is likely to be indicative of adverse impact, depending on context;
- The lower the rating level relative to the background sound level, the less likely it is that the specific sound will have an adverse impact, depending on context. Where the rating level does not exceed the background sound level, this is an indication that the specific sound will have a low impact, depending on context.

This initial estimate of impact can then be modified to take account of context, including reference to factors such as:

- The absolute level of the sound;
- The character and level of the residual sound compared to the character and level of the specific sound;
- The sensitivity of the receptor and whether dwellings or other premises used for residuals purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:
  - Façade insulation on treatment;
  - Ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and
  - Acoustic screening.

## **ACOUSTICS OF SCHOOLS: A DESIGN GUIDE (AOS) [REF. 7.6]**

AoS provides supporting guidance and recommendations on the acoustic design of new and refurbished schools. In section 2.2 of AoS includes the following recommendations for outdoor teaching spaces:

*“Noise levels in unoccupied playgrounds, playing fields and other outdoor areas should not exceed 55dB  $L_{Aeq,30min}$  and there should be at least one area suitable for outdoor teaching activities where noise levels are below 50dB  $L_{Aeq,30min}$ . If this is not possible, due to lack of suitably quiet sites, acoustic screening should be used to reduce noise levels in these areas as much as practicable, and an assessment of noise levels and options for reducing these should be carried out. Noise levels can be reduced by up to 10dBA at positions near an acoustic screen.”*

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## DESIGN MANUAL FOR ROADS AND BRIDGES (DMRB): LA 111, 'NOISE AND VIBRATION [REF. 7.2]

This document sets out procedures for undertaking the environmental assessment of new road schemes, including the assessment of noise impacts from road traffic. In undertaking a DMRB assessment, the calculation of traffic noise levels uses the methodology contained within the CRTN [Ref. 7.4] document as described below.

Although the DMRB strictly applies to new road schemes, the principles can also be applied to the assessment of noise from road traffic in general. The Proposed Development has the potential to affect road traffic noise levels along existing roads, hence the need for this assessment.

The DMRB categorises operational road traffic noise into magnitude of change bands. The short and long term classification scales are provided in the tables below.

**Table 7.2-5 - Magnitude of change – short term**

Short term magnitude	Short term noise change (dB $L_{A10,18h}$ or $L_{night}$ )
Major (Large)*	Greater than or equal to 5.0
Moderate (Medium)	3.0 to 4.9
Minor (Small)	1.0 to 2.9
Negligible (Negligible)	Less than 1.0

\* Semantic scale in brackets is the terminology used in this assessment, as defined in paragraph 5.5.26.

**Table 7.2-6 - Magnitude of changes – long term**

Long term magnitude	Long term noise change (dB $L_{A10,18h}$ or $L_{night}$ )
Major (Large)	Greater than or equal to 10.0
Moderate (Medium)	5.0 to 9.9
Minor (Small)	3.0 to 4.9
Negligible (Negligible)	Less than 3.0

\* Semantic scale in brackets is the terminology used in this assessment, as defined in paragraph 5.5.26.

The significance of effect depends upon a number of factors, including the magnitude of change, the sensitivity of the receptor, the absolute noise level and the acoustic context.

## CALCULATION OF ROAD TRAFFIC NOISE (CRTN) MEMORANDUM 1988 [REF. 7.4]

Published by the Department of Transport and the Welsh Office in 1988, CRTN sets out standard procedures for calculating noise levels from road traffic. The calculation methods use a number of input variables, including traffic flow volume, average vehicle speed, percentage of heavy duty



vehicles (HDVs), type of road surface, site geometry and the presence of noise barriers or acoustically absorbent ground. CRTN predicts the  $L_{A10,18hr}$  or  $L_{A10,1hr}$  noise level for any receptor point at a given distance, up to 300m, from the road.

CRTN also documents procedures for the measurement of road traffic noise. Three methods of road traffic noise measurement are described, the first entitled 'The Measurement Method', for direct measurement of the  $L_{A10,18hr}$  noise level, the second entitled the 'Shortened Measurement Procedure', for measurement of the  $L_{A10,3hr}$  noise level from which the  $L_{A10,18hr}$  level can be derived and the third entitled 'Comparative Measurements' which is a procedure to establish noise levels from a single road traffic route at various points, provided that the route remains the dominant source. CRTN states that if the Shortened Measurement Procedure is followed, a correction of -1dB can be applied to the determined  $L_{A10,3hr}$  noise level to approximate the  $L_{A10,18hr}$  noise level.

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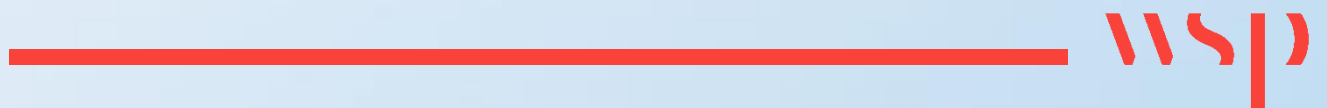




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# Appendix 7.3

## MEASUREMENT DATA ANALYSIS



# BACKGROUND SOUND LEVEL DATA ANALYSIS

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Figure 7.3-1 - ML-1 Daytime (07:00 - 23:00)  $L_{A90,1hr}$  histogram

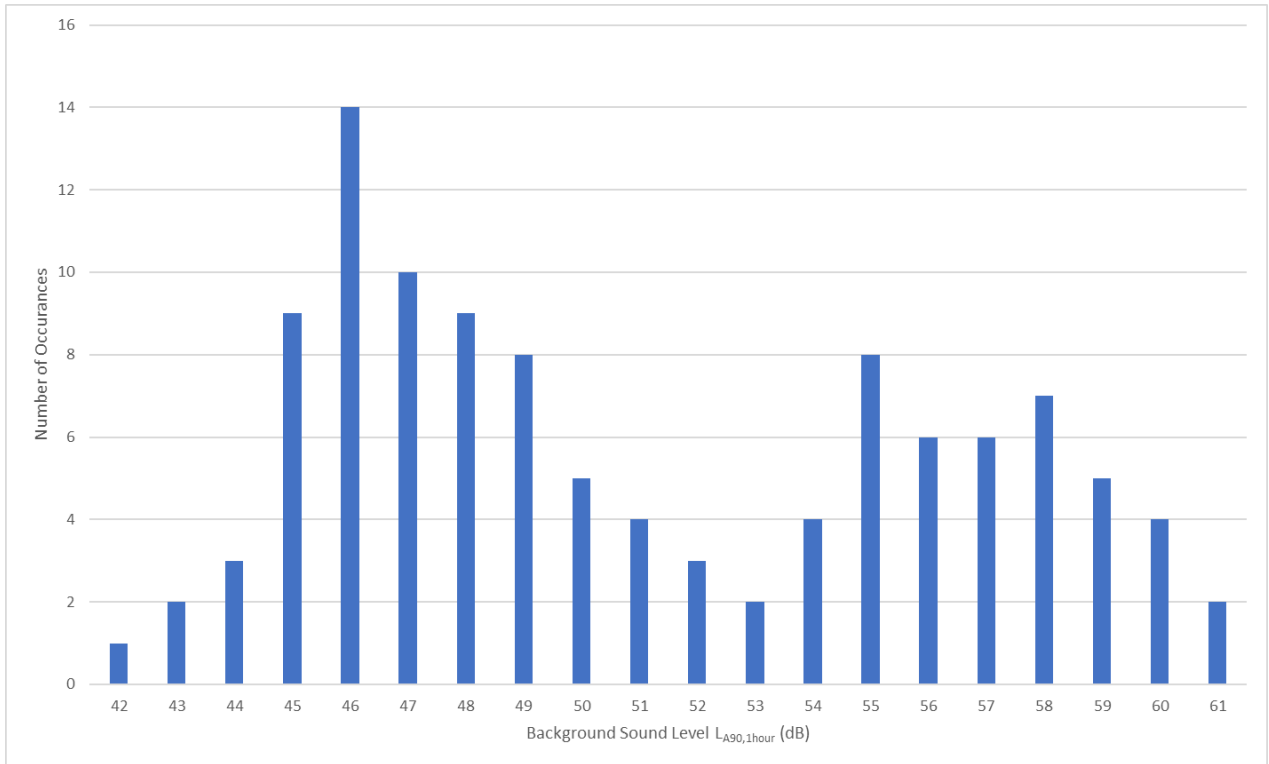
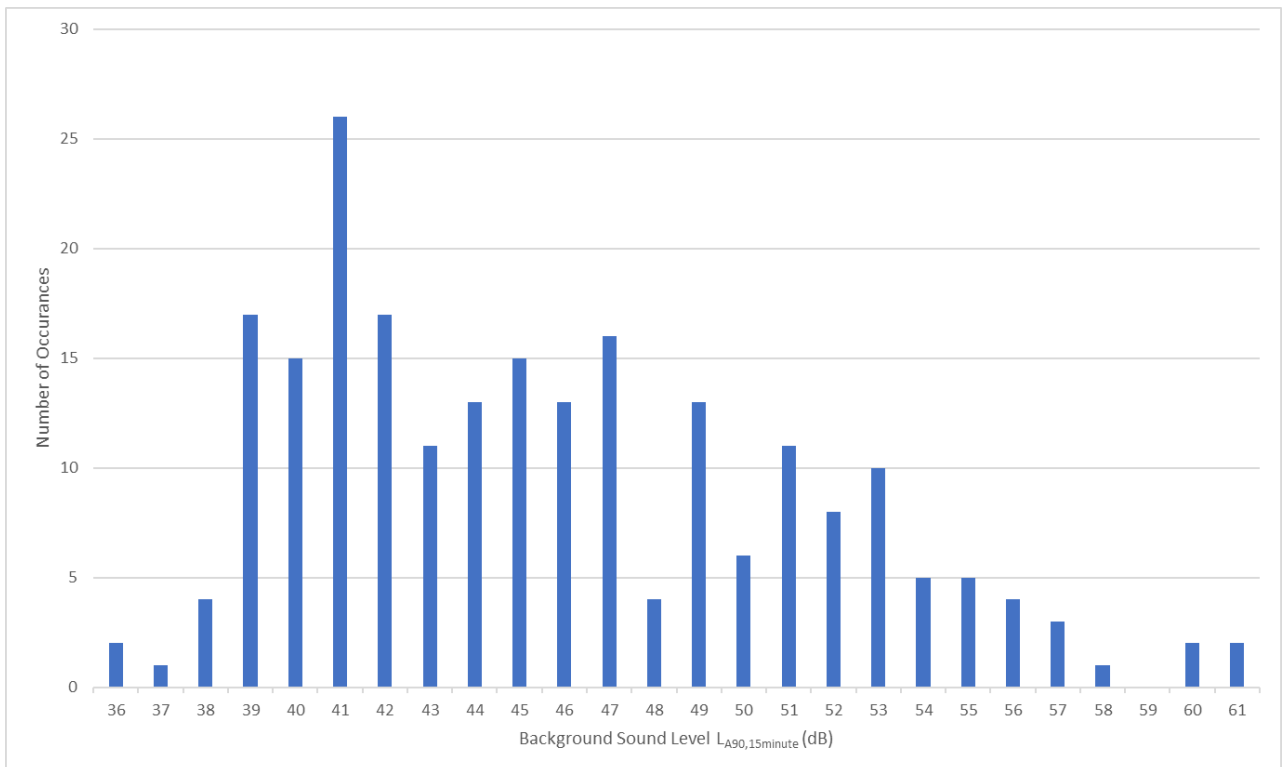
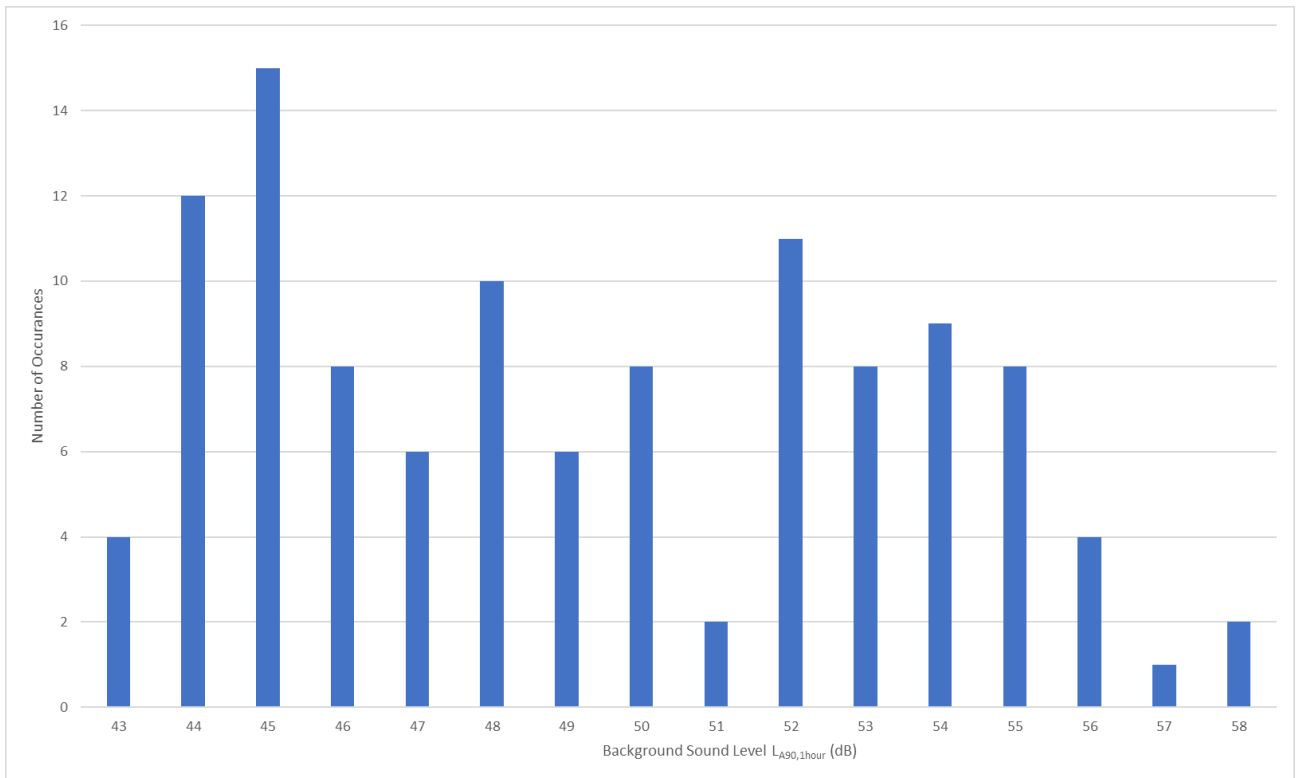


Figure 7.3-2 - ML-1 Night-time (23:00 - 07:00)  $L_{A90,15mins}$  histogram

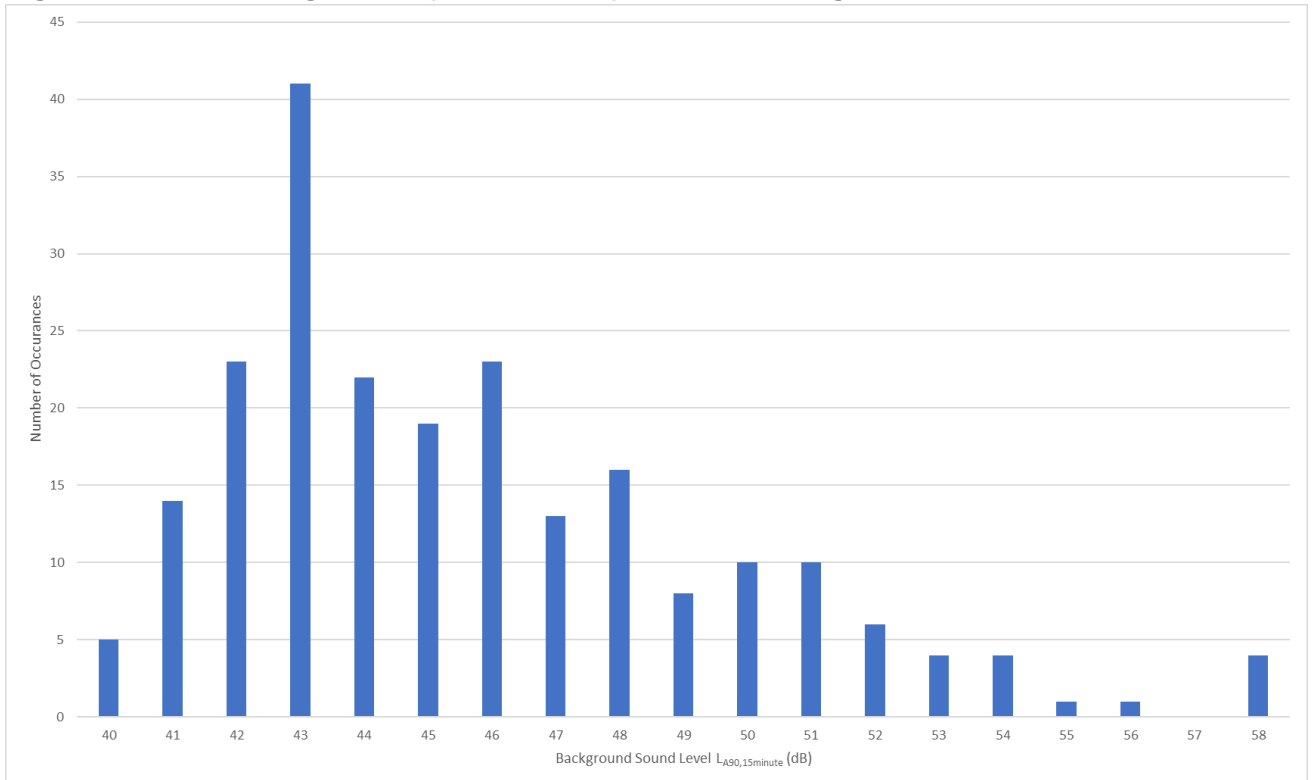




**Figure 7.3-3 - ML-2 Daytime (07:00 - 23:00)  $L_{A90,1hr}$  histogram**



**Figure 7.3-4 - ML-2 Night-time (23:00 - 07:00)  $L_{A90,15mins}$  histogram**





## RESULTS SUMMARY

**Table 7.3-1 – ML-1 Daytime and night-time background sound levels, free-field, dB(A)**

Noise Index / Indicator	Daytime (07:00 to 23:00)	Night-time (23:00 to 07:00)
Maximum $L_{A90,T^1}$	61	61
Minimum $L_{A90,T^1}$	42	36
Log Average $L_{A90,T^1}$	54	50
Linear Average $L_{A90,T^1}$	51	46
Most Commonly Occurring $L_{A90,T^1}$	46	41
Log Average Period $L_{A90,T^2}$	49	46
Linear Average Period $L_{A90,T^2}$	47	43
<b>Selected Representative Value</b>	<b>46</b>	<b>41</b>
<sup>1</sup> T = 1 hour for the daytime and 15 minutes for the night-time <sup>2</sup> T = 16 hours for the day time and 8 hours for the night-time		

**Table 7.3-2 – ML-2 – Daytime and night-time background sound levels, free-field, dB(A)**

Noise Index / Indicator	Daytime (07:00 to 23:00)	Night-time (23:00 to 07:00)
Maximum $L_{A90,T^1}$	58	58
Minimum $L_{A90,T^1}$	43	40
Log Average $L_{A90,T^1}$	51	48
Linear Average $L_{A90,T^1}$	49	46
Most Commonly Occurring $L_{A90,T^1}$	45	43
Log Average Period $L_{A90,T^2}$	47	45
Linear Average Period $L_{A90,T^2}$	46	44
<b>Selected Representative Value</b>	<b>45</b>	<b>43</b>
<sup>1</sup> T = 1 hour for the daytime and 15 minutes for the night-time <sup>2</sup> T = 16 hours for the day time and 8 hours for the night-time		

At ML-1 for the daytime period, the representative background sound level has been selected as 46dB(A). This is 15 dB lower than the maximum value and 4dB higher than the minimum. It is also



lower than the log and linear average values and the log and linear average period values whilst being equal to the most commonly occurring value.

At ML-1 for the night-time period the representative background sound level has been selected as 41dB(A). This is 20dB lower than the maximum value and 5dB higher than the minimum value. It is lower than the log and linear average values and the log and linear average period values whilst being equal to the most commonly occurring value.

At ML- 2 for the daytime period, the representative background sound level has been selected as 45dB(A). This is 13dB lower than the maximum value and 2dB higher than the minimum. It is also lower than the log and linear average values and the log and linear average period values whilst being equal to the most commonly occurring value.

At ML-2 for the night-time period the representative background sound level has been selected as 43dB(A). This is 15dB lower than the maximum value and 3dB higher than the minimum value. It is lower than the log and linear average values and the log and linear average period values whilst being equal to the most commonly occurring value.

**Table 7.3-3 – ML-1 Ambient noise levels in construction periods**

Noise Index / Indicator	Weekday (07:00 to 19:00)	Saturday (07:00 to 14:00)
Thursday 17 October	52	-
Friday 18 October	51	-
Saturday 19 October	-	- <sup>1</sup>
Sunday 20 October	-	-
Monday 21 October	57	-
Tuesday 22 October	57	-
Wednesday 23 October	49	-
<b>Average</b>	<b>54</b>	<b>-<sup>1</sup></b>

<sup>1</sup> Data not required as Children's day nursery not open during these hours

**Table 7.3-4 – ML-2 Ambient noise levels in construction periods**

Noise Index / Indicator	Weekday (07:00 to 19:00)	Saturday (07:00 to 14:00)
Thursday 17 October	52	-
Friday 18 October	52	-
Saturday 19 October	-	54
Sunday 20 October	-	-



Noise Index / Indicator	Weekday (07:00 to 19:00)	Saturday (07:00 to 14:00)
Monday 21 October	60	-
Tuesday 22 October	53	-
Wednesday 23 October	49	-
<b>Average</b>	<b>55</b>	<b>54</b>

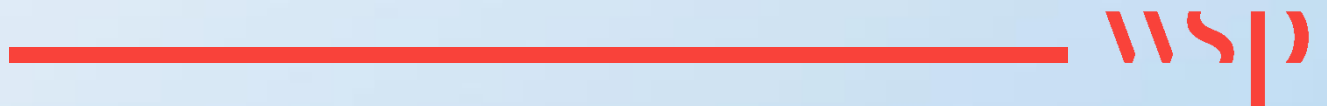




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# Appendix 7.4

## **CONSTRUCTION NOISE ASSESSMENT**



# CONSTRUCTION NOISE ASSESSMENT

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## IMPACT

It is inevitable with any proposed major development that there will be some disturbance caused to those nearby during the construction works. However, disruption due to construction is localised and temporary in nature.

At this stage, full details of the plant associated with the works are not yet known. Therefore, based on WSP's experience of similar developments elsewhere, predictions of the likely noise impacts from anticipated construction activities have been made which are considered indicative of the likely noise levels during the works. If required, more detailed assessment could be undertaken at a later stage, e.g. as part of the Construction Environmental Management Plan (CEMP), see **Chapter 3**.

It is proposed that standard construction working hours for the Proposed Development will be 07:00 to 19:00 hours, from Monday to Friday and 07:00 to 14:00 hours on Saturdays with no working on Sundays or Bank Holidays without prior agreement with St. Helens Council.

It is anticipated that there will be a 16 month construction programme for the detailed application site from site clearance to completion, commencing in September 2020. The outline application elements will depend on market conditions but for the purposes of this ES it has been assumed they will be operational by the end of 2024.

The precise phasing and construction methods to be employed are yet to be finalised and will be dependent upon the contractor, who will only be appointed subsequent to planning approval. Therefore, for to inform this assessment it has been necessary to make assumptions regarding the plant that are likely to be used, their number and likely assumed 'on-time' (i.e. the percentage of time that they will be in operation). This detail has been taken from **Chapter 3** and is duplicated in **Table 7.4-1** along with the corresponding construction working stage. The table also presents the sound power level that has been attributed to each plant item and associated source data references.

**Table 7.4-1 – Assumed Construction Plant Details**

Construction working stage	Plant type	No. of plant	Sound power level (L <sub>WA</sub> ), dB	Data source (BS 5228-1 Table ref. and row)	On-time (%)
Earthworks	Diesel generator	1	94	C.04 #78	90
	Tracked excavator	2	105	C.04 #63	50
	Dump truck	2	102	C.02 #32	40
	Lorry pulling up	1	111	C.11 #4	10
	Lorry unloading	1	111	C.11 #4	10

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	Dump truck (idling)	2	91	C.04 #5	40
Road Works	Asphalt paver & tipper lorry	1	105	C.05 #31	60
	Road roller	1	105	C.05 #26	30
	Tracked excavator	1	105	C.05 #31	50
Building Foundation Works	Excavator	1	95	C.04 #14	50
	Truck mixer with pump	1	108	C.04 #20	30
	Compressor	1	103	C.03 #19	60
	Poker vibrator	2	106	C.04 #33	30
	Dump truck	1	102	C.02 #32	40
	Dump truck (idling)	1	91	C.04 #5	40
	Piling rig	1	121	C.12 #23	30
Building Construction	Hammering	2	109	C.01 #20	20
	Lorry pulling up	1	111	C.11 #4	10
	Lorry unloading	1	111	C.11 #4	10
	Dump truck	1	102	C.02 #32	40
	Compressor	1	103	C.03 #19	75
	Forklift truck	1	95	C.04 #57	60
	Dump truck (idling)	1	91	C.04 #5	10

Drawing upon the content of Table 7.4-1, construction noise level calculations have been undertaken for the following Receptor Locations:

- Receptor 1: Children’s day nursery;
- Receptor 2: Dwellings at Old Hall Farm; and
- Receptor 3: Dwellings at Bembridge Close.

The calculations have been undertaken based on the proposed masterplan for the detailed planning application site, and the indicative masterplan for the outline planning application site (see **Figure 3.1**).

The calculations for each construction working stage, have assumed that all plant items would be located 10m inside the closest relevant working areas to each receptor. It is considered unrealistic to assume that all plant would be operated simultaneously at the very closest distances.

**Table 7.4-2** sets out the resulting construction noise levels calculated for each adopted receptor location.

**Table 7.4-2 – Predicted example construction noise levels – Façade  $L_{Aeq,12hr}$  (dB)**

Receptor location	Earthworks	Road works	Building foundation works	Construction
1 - Children's day nursery	63	57	62	53
2 - Dwellings at Old Hall Farm	39	37	46	37
3 - Dwellings at Bembridge Close	42	38	48	39

For each receptor location, the baseline data detailed within Table 7.4.-1 have been adopted. These data have then been used to determine the applicable construction noise assessment criteria when applying the 'ABC' assessment method detailed within BS 5228-1 [Ref. 7.1]. The derived assessment criteria are detailed in **Table 7.4-3**.

**Table 7.4-3 – Construction noise assessment criteria**

Receptor location	Representative measured ambient noise level, $L_{Aeq,12hr}$ Free-field	BS 5228-1 ABC category	ABC assessment criterion ( $L_{Aeq,T}$ )
1 - Children's day nursery	54	A	65
2 - Dwellings at Old Hall Farm	55	A	65
3 - Dwellings at Bembridge Close	54	A	65

By comparison of **Table 7.4-2** and **Table 7.4-3**, the degree by which the construction noise criteria would be complied with / exceeded can be determined, as detailed in **Table 7.4-4**.

**Table 7.4-4 – Construction noise ABC criterion compliance, dB**

Receptor location	Earthworks	Road works	Building foundation works	Construction
1 - Children's day nursery	-2	-8	-3	-12
2 - Dwellings at Old Hall Farm	-26	-28	-19	-28
3 - Dwellings Bembridge Close	-23	-27	-17	-26



It can be seen from **Table 7.4-4** above that for all receptors, and each considered working scenario, the applicable BS 5228-1 [Ref. 7.1] ABC construction noise assessment criterion would be met.

For the Children's day nursery, the criteria are predicted to be met by margins of between 2 and 12dB.

For dwellings at Old Hall Farm, the criteria are identified to be met by margins of between 19 and 28dB.

For dwellings at Bembridge Close, the criteria are identified to be met by margins of between 17 and 27dB.

In accordance with Table 7-6 the magnitude of impact is identified to be No Change to Negligible at worst. For Medium sensitivity receptors, as present in this case, these impacts correspond to effects ranging from No Change to Negligible at worst (not significant). These effects would be medium-term, direct, local and temporary.

It is recognised that occasionally, higher construction noise level could arise, e.g. if particularly intensive works are required on the site boundaries immediately adjacent to receptors. However, such works would be occasional, of short duration and therefore not significant.

With regards to the NPSE [Ref. 7.9], the applicable Effect Levels would be NOEL.

It is also recognised that the final noise levels that will arise at the Children's day nursery will be dependent upon the final masterplan that is brought forward for the outline planning application site. For example, higher building foundation and construction noise levels could arise if the final masterplan has buildings closer to this receptor than the indicative masterplan that has been used to inform the assessment. However, margins of compliance of 3 and 12dB have been identified allowing higher levels to be generated without giving rise to a significant effect.

Notwithstanding this, consideration has been given to mitigation measures as detailed within the following section, the employment of which will allow greater margins of compliance and flexibility.

## MITIGATION

Generic safeguards exist to minimise the effects of construction noise, these include:

- The various EC Directives and UK Statutory Instruments that limit noise emissions of a variety of construction plant; and
- The powers that exist for local authorities under Sections 60 and 61 of the *Control of pollution act* [Ref. 7.14] to control noise from construction Sites.

The adoption of Best Practicable Means (BPM), as defined in Section 72 of the *Control of Pollution Act 1974* [Ref. 7.14], is usually the most effective means of controlling noise from construction sites. Such measures would be included within the CEMP, to which the appointed contractor will be required to comply. This will include the following

- The contractor and their sub-contractors will at all times apply the principle of BPM as defined in Section 72 of the *Control of pollution act 1974* [Ref. 7.14] and carry out all work in such a manner as to avoid or reduce any disturbance from noise (and vibration) as far as is practicable.
-

- Guidance given in BS 5228-1 [Ref. 7.1]] (Section 8: *Control of noise and Annex B: Noise sources, remedies and their effectiveness*) will be followed as far as is practicable and advice and training on noise minimisation given to staff during Site induction procedures.
- All plant brought on to Site will comply with the relevant EC/UK noise limits applicable to that equipment or should be no noisier than would be expected based on the noise levels quoted in BS 5228-1 [Ref. 7.1]. Each plant item will be well maintained and operated in accordance with manufacturers' recommendations and in such a manner as to minimise noise emissions.
- Electrically powered plant will be preferred, where practicable, to mechanically powered alternatives.
- The use of sound reduced plant fitted with suitable silencers, or operated within enclosures will be preferred.
- Pneumatic tools will be fitted with silencers or mufflers.
- Deliveries to Site will be programmed and routed to minimise disturbance to local residents.
- Items of plant operating intermittently will be shut down in the periods between use.
- Where feasible, all stationary plant will be located so that the noise effect at receptors is minimised and, if practicable, every item of static plant, when in operation, will be noise attenuated using methods based on the guidance and advice given in BS 5228-1 [Ref. 7.1].
- Careful selection of construction methods and plant will be implemented and utilised, for example, breaking-out of concrete structures using, where possible, low noise methods such as munching or similar, rather than percussion breaking.
- Temporary acoustic barriers and other noise containment measures such as screens, sheeting and acoustic hoarding at the Site boundary (and where required around individual plant) will be erected where appropriate to minimise noise breakout and reduce noise levels at potentially affected receptors.
- There will be a considerate and neighbourly approach to relations with local residents.
- The site manager, or other appointed site representative, will be responsible for logging all received environmental noise and vibration comments/complaints, as well as the action that is taken in response to each point raised, and whether this was successful. Where not successful, supplementary actions will be carried out and resulting effects logged. The contact details for the site representative will be openly advertised so that local residents have a point of contact in case of any issues arising. The site representative will be responsible for keeping an open line of contact with local residents and advising the timing and programming of potentially noisy works.

All of the above measures would be implemented through the CEMP which would be prepared and submitted to St. Helens Council for approval. If necessary, this could also include a requirement for the undertaking of a revised construction noise assessment once the construction contractor has been appointed and the final confirmed construction working methods and programme are known. The results of this re-assessment would be used to identify any areas where construction noise has the potential to give rise to significant effects as defined using Table 5-4 and Table 7-6.

## **RESIDUAL**

The impacts arising as a result of construction noise have been identified to range from No change to Negligible. For Medium sensitivity receptors, as present in this case, these impacts correspond to effects ranging from No Change to Negligible (not significant).

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It has been recognised that occasionally, higher construction noise levels could arise, e.g. if particularly intensive works are required at the site boundary closest to receptors, but that such works would not give rise to significant effects due to being occasional and of short duration.

With regards to the NPSE [Ref. 7.9], the applicable Effect Levels would be NOEL.

In addition, it has been recognised that the completed assessment has been based on an indicative masterplan for the outline planning application site, and that the final noise levels that will arise at the Children's day nursery will be dependent upon the final masterplan that is brought forward. Whilst the assessment has identified margins of compliance ranging from 3 to 12dB for this receptor, additional consideration has been given to mitigation measures, to further increase the degrees compliance. With the committed mitigation measures in place, it is considered that the resulting effects could be controlled to be within those identified, e.g. for a final masterplan with development buildings in the immediate vicinity of the site boundary.

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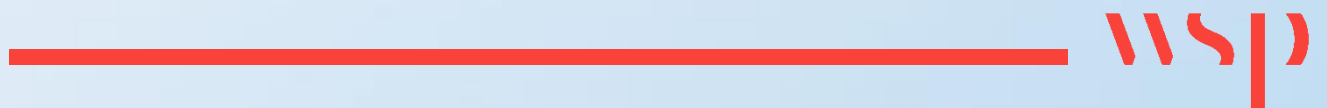




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# Appendix 7.5

## **CONSTRUCTION VIBRATION ASSESSMENT**



# CONSTRUCTION VIBRATION ASSESSMENT

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## IMPACT

Groundborne vibration calculations have been performed for typical site preparation, earthworks and construction activities / machinery based on the empirical prediction procedures presented within BS 5228-2 [Ref. 7.3], TRL RR 246: *Traffic induced vibration in buildings* 1990 [Ref. 7.23] (applicable to Heavy Goods Vehicle (HGV) induced vibration), and TRL Report 429: *Groundborne vibration caused by mechanical construction works* 2000 [Ref. 7.24] (applicable to vibratory rollers).

Such predictions have been undertaken in order to determine the possible distances at which the adopted magnitude of impact criteria may be registered based on a specified confidence limit (where applicable). In this regard, groundborne vibration levels and associated distances have been identified, as presented in **Table 7.5-1**, for a sample of typical vibration sources which may be associated with the construction of the Proposed Development.

**Table 7.5-1 - Predicted groundborne vibration levels applicable to typical vibration generating site preparation, earthworks and construction activities**

Operation	Confidence Limit	PPV (mms <sup>-1</sup> )	Distance
Vibratory Rollers - start & end	95	0.3	60
	95	1.0	23
Vibratory Rollers - Steady State <sup>1</sup>	95	10	3.3
Piling - driven cast in place	95	0.3	215
	95	1.0	85
	95	10	15
HDVs <sup>2</sup>	N/A	0.3 <sup>3</sup>	50
	N/A	1.0 <sup>3</sup>	17
	N/A	10 <sup>3</sup>	2.5
Rotary Bored Piling - Augering	N/A	0.3	20
	N/A	1.0	6
	N/A	10	0.6
Rotary Bored Piling - auger hitting base	N/A	0.3	45
	N/A	1.0	14
	N/A	10	1.4

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Rotary Bored Piling - Driving casing	N/A	0.3	75
	N/A	1.0	23
	N/A	10	2.3

<sup>1</sup> Assumes 2 rollers, 0.4mm amplitude, drum width of 1.3m, e.g. heavy-duty ride on roller.

<sup>2</sup> Assumes max height/depth of surface defect of 50mm, max speed of 30km/h, and that surface defect occurs at both wheels.

<sup>3</sup> Where alluvium soils are present, higher vibration levels can be expected.

The data presented within **Table 7.5-1** is general in nature and is not site specific. Furthermore, there may be a variety of different potential vibration generating activities employed other than those listed.

The Children's day nursery is located approximately 41m from the site boundary of the outline planning application site, whilst dwellings at Old Hall Farm are located approximately 445m from the boundary of the detailed planning application site (where construction works would-be undertaken). Dwellings at Bembridge Close are located at a distance of approximately 340m from the site boundary.

Table 7.5-2 below presents the identified magnitudes of impact at these distances drawing upon **Error! Reference source not found.** and Table 7.5-1. The associated Effect Levels are also presented.

**Table 7.5-2 - Predicted magnitude of impact and Effect Levels for construction vibration at closest receptors**

Activity	Magnitude of Impact	Effect Level
<b>Children's Day Nursery</b>		
Vibratory Rollers	Small	LOAEL
Piling – driven cast in place	Medium	SOAEL
HDVs	Small	LOAEL
Rotary Bored Piling	Negligible	NOEL
<b>Dwellings at Old Hall Farm</b>		
Vibratory Rollers	Negligible	NOEL
Piling – driven cast in place	Negligible	NOEL
HDVs	Negligible	NOEL
Rotary Bored Piling	Negligible	NOEL
<b>Dwellings at Bembridge Close</b>		

Vibratory Rollers	Negligible	NOEL
Piling – driven cast in place	Negligible	NOEL
HDVs	Negligible	NOEL
Rotary Bored Piling	Negligible	NOEL

For dwellings at Old Hall Farm and Bembridge Close, the magnitude of impact has been identified to be Negligible at worst. For Medium sensitivity receptors, as present in this case, these impacts correspond to Negligible Effects (not significant). These effects would be short-term, direct, local and temporary.

With regards to the NPSE [Ref. 7.9], the applicable Effects Levels at these receptors are identified to be NOEL at worst.

For the Children’s day nursery, the magnitude of impact has been identified to be Negligible or Small for use of vibratory rollers, the passing of HDV’S and for rotary bored piling works, but Medium for driven piling works.

For Medium sensitivity receptors, as present in this case, these impacts correspond to Negligible to Minor Effects at worst (not significant) with the exception of driven piling works. For driven piling works, without mitigation, a Moderate effect (significant) is identified. These effects would be short-term, direct, local and temporary.

With regards to the NPSE [Ref. 7.9], the applicable Effect Levels at this receptor would be NOEL to LOAEL, but rising to SOAEL for driven piling works (without mitigation). Consideration has therefore been given to mitigation in the section below.

## MITIGATION

Significant effects have only been identified should driven piling works be undertaken in close proximity to the Children’s Day nursery. The completed assessment is based on a worst-case separation distance of 41m to the site boundary.

Considering the example outline planning application site master plan (See Figure 3.1), the closest proposed building, and therefore requirement for piling works, is at a distance of 128m from this receptor. When works are undertaken at this distance effects are reduced to be Minor (not significant).

Notwithstanding this, it is recognised that the final Proposed Development masterplan to be brought forward for the outline planning application site (that closest to the Children’s day nursery) is yet to be finalised. Therefore, the following mitigation measures will be employed:

- Once the required locations for any driven piling works (or similarly vibration generative construction operation) are finalised, a revised predictive assessment of groundborne vibration impact will be undertaken.
- The revised assessment will reflect the nature/type of the works to be undertaken at the site, including the types of plant to be utilised, piles to be inserted and the local ground conditions.
- Where the results of the revised assessment identifies a likelihood of groundborne vibration levels in excess of 1mm/s PPV (Medium magnitude of impact) at the Children’s day nursery, then the proposed working method shall be revisited (e.g. a low vibratory piling method such as auger

bored piling shall be adopted where such an approach would result in the required pile performance).

- Where adoption of a low vibratory working methods is not possible (e.g. due to pile performance requirements), the Children's day nursery will be provided with notice of when all such works within 100m of their facility shall be undertaken. A groundborne vibration survey shall also be undertaken for the duration of those works, to provide confirmation of the levels that are generated in practice, either at the site boundary, or at the Children's day nursery itself. The measurement results shall be made available to the Children's day nursery where required.
- Were the live measurement results identify that vibration levels in excess of 2mm/s are arising in practice (at the Children's day nursery), the works shall cease unless it can be demonstrated to St. Helens Council that the works are being undertaken in accordance with the principles of Best Practicable Means (BPM).

The above measures would ensure that where driven piling works (or similarly vibration generative working operations) with the potential to give rise to a significant effect are required, these would be undertaken following a neighbourly approach and in accordance with the principles of BPM. The above measures could be ensured through the implemented through the CEMP which would be prepared and submitted to St. Helens Council for approval.

## **RESIDUAL**

The identified mitigation measures would be appropriate to ensure that any driven piling works (or similarly vibration generative works) in the vicinity of the Children's day nursery that have the potential to give rise to a significant effect would be undertaken following the principles of BPM and in a neighbourly and considerate manner.

With these reassurances in place, the Magnitude of impact is reduced to be no greater than Small. For Medium sensitivity receptors, as present in this case, these impacts correspond to Minor effects at worst (not significant). These effects would be short-term, direct, local and temporary.

With regards to the NPSE [Ref. 7.9], the applicable Effect Levels at these receptors are identified to range from NOEL to LOAEL at worst.

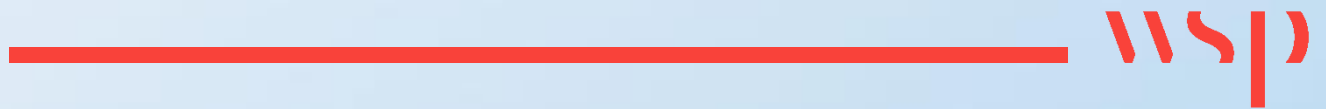
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# Appendix 7.6

## **DEVELOPMENT GENERATED TRAFFIC NOISE ASSESSMENT**





# DEVELOPMENT GENERATED TRAFFIC NOISE ASSESSMENT

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## IMPACT

The results of the TA have been used as the basis for determining the change in noise levels that would arise on the local road network as a result of development generated road traffic noise.

Road traffic noise calculations have been carried out in accordance with CRTN [Ref. 7.4], being undertaken for a notional receptor location 10m from the edge of the carriageway of each road considered. A notional receptor has been used because the change in traffic noise level adjacent to any given road will be the same at all distances where noise from that route is dominant. Traffic noise calculations have been undertaken to establish the change in the daytime  $L_{A10,18hr}$  noise level.

In undertaking these calculations, traffic speeds have been set to the applicable speed limit for each route considered.

Road traffic noise level predictions have been undertaken for the following scenarios:

- Scenario A: Year of opening 'Do Minimum' (i.e. without Proposed Development) (2021DM);
- Scenario B: Year of opening 'Do Something' (i.e. with Proposed Development) (2021DS); and
- Scenario C: Future year (year of opening +15) 'Do Something' (i.e. with Proposed Development) (2036DS).

The results for Scenario A have been subtracted from the results for Scenario B to identify the noise level changes that would arise as a result of the Proposed Development in the short-term (i.e. upon opening).

The result for Scenario A have then been subtracted from the results for Scenario C to identify the noise level changes that would arise as a result of the Proposed Development in the long-term (i.e. to the future design year, including for natural traffic growth).

The calculation results, including identified noise level changes are presented in **Table 7.6-1** below. Calculations have been undertaken for the full extent of the network considered in the TA, but it should be noted that some of the links do not have any noise sensitive receptors in close proximity.

**Table 7.6-1 – Predicted changes in road traffic noise levels due to development generated traffic and natural growth -  $L_{A10,18hr}$ , dB**

Route section	Noise level $L_{A10,18hr}$ , dB			Noise level change [B-A / C-A]
	2021 DM [A]	2021 DS [B]	2036 DS [C]	
Burtonwood Road (N)	67.1	67.2	67.3	0.1 / 0.2
Burtonwood Road (S)	70.7	70.7	70.8	0.0 / 0.1
Skyline Drive	70.8	72.2	72.3	1.4 / 1.5
Omega Boulevard	67.5	67.7	67.9	0.2 / 0.4
Catalina Way	56.5	66.5	66.6	10.0 / 10.1

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M62 Eastbound east of J8	81.4	81.5	81.7	0.1 / 0.3
M62 Westbound east of J8	81.3	81.3	81.6	0.0 / 0.3
M62 Eastbound west of J8	81.9	82.0	82.2	0.1 / 0.3
M62 Westbound west of J8	81.8	81.9	82.1	0.1 / 0.3

From the table above, it can be seen that noise level changes on Catalina Way are identified to be approximately 10dB in both the short-term and long-term. Whilst these changes correspond to a Large magnitude of impact, there are no noise-sensitive receptors in the vicinity of this route. Therefore, no significance effect would arise.

For the remaining routes (Burtonwood Road, Omega Boulevard, the M62 and Skyline Drive), not level changes are identified to be less than 3dB in both the short-term and the long-term, with the majority of routes subject to a change of less than 1dB. These changes correspond to a magnitude of impact ranging from Negligible to Small at worst.

For Medium sensitivity receptors, as present in this case, these impacts correspond to Negligible to Minor Effects at worst (not significant). These effects would be long-term, indirect, local and permanent.

In the 2021 DM scenario, the absolute noise levels (at a nominal 10m distance from each route section), range from 56.5 to 81.9dB  $L_{A10,18hr}$ . With respect to the NPSE [Ref. 7.9], and based on Table 7-6-1, these levels range from the LOAEL to the SOAEL. This range of Effect Levels remains unchanged when considering the 2021DS and 2036DS scenarios.

## MITIGATION

The assessment of development generated road traffic noise level increases has identified that effects would range from None to Negligible at worst (not significant). Therefore, further consideration to mitigation is not warranted.

## RESIDUAL

Noise level increases due to both the Proposed Development in isolation and the Proposed Development in conjunction with natural traffic growth have been identified give rise to effects ranging from Negligible to Minor at worst (not significant). Given that significant effects have not been identified, consideration to mitigation is not considered warranted and the identified (not significant) effects would remain. These effects would be long-term, indirect, local and permanent.

The identified noise level changes are not sufficient to change the NPSE [Ref. 7.9] Effect Level range of NOEL to SOAEL as already present without the Proposed Development.

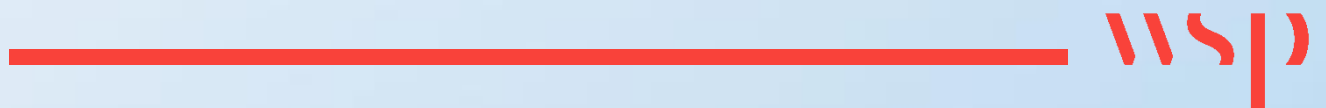
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# Appendix 7.7

## **INDUSTRIAL / COMMERCIAL NOISE ASSESSMENT**



# INDUSTRIAL / COMMERCIAL NOISE ASSESSMENT

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## IMPACT

The noise model has been used to generate operational specific sound levels ( $L_{Aeq,T}$ ) across the site and surrounding area. The resulting noise contours are presented in **Figure 7.2: Noise contours - Ambient goods operation** and **Figure 7.3 Noise contours - Chilled goods operation**; at 4.0m above local ground height. These contours do not include for the noise mitigation measures presented within the corresponding section below.

Operational noise levels are predicted for dwellings at Old Hall Farm and at Bembridge Close. The levels are been assessed using BS 4142 [Ref. 7.5]. Acoustic character corrections are applied based on nature of the operations associated with each assessed scenario. Representative background sound levels are taken from the noise survey results, see Table 7.7-1.

At the Children’s day nursery, operational noise levels are assessed against AoS [Ref. 7.6] external noise criteria. The assessment is daytime only and an acoustic character correction is applied (although BS 4142 is strictly only applicable to dwellings).

**Table 7.7-1 – BS 4142 Assessment – Dwellings at Old Hall Farm**

<b>Assessment step</b>	<b>Ambient operation</b>		<b>Chilled goods (30% electric chiller) operation</b>	
Modelled Specific Sound Level [A]	40.0		45.4	
Tonality [B]	2		2	
Impulsivity [C]	0		0	
Intermittency [D]	0		0	
Rating level [E] = [A+B+C+D]	42.0		47.4	
Period	Day	Night	Day	Night
Background sound level ( $L_{A90,T}$ ) [F]	45.0	43.0	45.0	43.0
Rating level verses background sound level [E-F]	-3.0	-1.0	+2.4	+4.4
Magnitude of impact	Negligible	Negligible	Small	Medium
NPSE category	NOEL	NOEL	NOEL to LOAEL	LOAEL to SOAEL
Effect	<b>Negligible</b>	<b>Negligible</b>	<b>Minor</b>	<b>Moderate</b>

From **Table 7.7-1**, for dwellings at Old Hall Farm for ambient operation, the Rating level is 42.0  $L_{Ar,T}$  dB. This level is 3.0 dB below the daytime background sound level; and 1.0 dB below the

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night-time background sound level. For both daytime and night-time period a **Negligible** (not significant) effect is identified.

When assuming that 30% of operations include use of electric chillers, the Rating level is 47.4  $L_{Ar,T}$  dB. This level is 2.4 dB above the daytime background sound level, and 4.4 dB above the night-time background sound level. For the daytime, a **Minor** (not significant) is identified; in the night-time a **Moderate** (significant) effect is identified. These effects would be long-term, direct, local and permanent.

**Table 7.7-2 – BS 4142 assessment – Dwellings at Bembridge Close**

Assessment step	Ambient operation		Chilled goods (30% electric chiller) operation	
	Day	Night	Day	Night
Modelled Specific Sound Level [A]	38.7		44.3	
Tonality [B]	2		2	
Impulsivity [C]	0		0	
Intermittency [D]	0		0	
Rating level [E] = [A+B+C+D]	40.7		46.3	
Period	Day	Night	Day	Night
Background sound level ( $L_{A90,T}$ ) [F]	46.0	41.0	46.0	41.0
Rating level versus background sound level [E-F]	-5.3	-0.3	+0.3	+5.3
Magnitude of impact	Negligible	Negligible	Small	Medium
NPSP category	NOEL	NOEL	NOEL to LOAEL	LOAEL to SOAEL
Effect	<b>Negligible</b>	<b>Negligible</b>	<b>Minor</b>	<b>Moderate</b>

From **Table 7.7-2**, for dwellings at Bembridge Close for ambient operation, the Rating level is 40.7  $L_{Ar,T}$  dB. This level is 5.3 dB below the daytime background sound level; and 0.3 dB below the night-time background sound level. For both daytime and night-time periods a **Negligible** (not significant) effect is identified.

When assuming that 30% of operations include use of electric chillers, the Rating level is 46.3  $L_{Ar,T}$  dB. This level is 0.3 dB above daytime background sound level, and 5.3 dB above the night-time background sound level. For the daytime, a **Minor** (not significant) is identified; in the night-time a **Moderate** (significant) effect is identified. These effects would be long-term, direct, local and permanent.

**Table 7.7-3 – BB93 assessment – Children’s day nursery**

Assessment step	Ambient operation	Chilled goods (30% electric chiller) operation
Modelled Specific Sound Level [A]	49.9	54.7
Tonality [B]	2	4
Impulsivity [C]	0	0
Intermittency [D]	0	0
Rating level [E] = [A+B+C+D]	51.9	58.7
Period	Day	Day
BB93 external criteria [F]	50.0	50.0
Operational level verses BB93 external criteria [E-F]	+1.9	+8.7
Magnitude of impact	Medium	Medium
NPSE category	LOAEL to SOAEL	LOAEL to SOAEL
Effect	<b>Moderate</b>	<b>Moderate</b>

From **Table 7.7-3**, for the Children’s day nursery for ambient operation, the Rating level is 51.9  $L_{Aeq}$  dB. This level is 1.9 dB above the external noise level criteria. A **Moderate** (significant) effect is identified. The effect would be long-term, direct, local and permanent.

When assuming that 30% of operations include use of electric chillers, the Rating level is 54.7  $L_{Aeq}$  dB. This level is 8.7 dB above the external noise level criteria. A **Moderate** (significant) effect is identified. The effect would be long-term, direct, local and permanent.

As significant effects are identified mitigation measures are considered in the section below.

**Fixed plant and equipment**

There is the potential for noise to be generated from fixed plant and equipment installed at the Proposed Development. As the requirement for fixed plant and equipment is unknown at this stage, noise level limits are specified in **Table 7.7-4**. The noise level limit is set to achieve a Rating level 7  $L_{Ar,T}$  dB below the measured background sound level.

The fixed plant noise level limits are 10 dB lower than the level at which for HGV and service yard noise would become significant. This is sufficiently low that plant noise would not give rise to a change in the operational noise effects reported above. A planning condition could be used to ensure that the noise level limits in **Table 7.7-4** are complied with in practice.

**Table 7.7-4 – Fixed plant and equipment noise limits**

Receptor(s)	Rating level	
	Daytime ( $L_{Ar,1h}$ )	Night-time ( $L_{Ar,15min}$ )
Dwellings at Old Hall Farm	38	36
Dwellings at Bembridge Close	39	34
Children's day nursery	39	N/A

## MITIGATION

For ambient goods operation, noise attenuation is required to reduce daytime operational levels at the Children's day nursery.

For chilled goods (30% electric chiller) operation, noise attenuation is required to reduce daytime operational levels at the Children's day nursery. It is also required to reduce night-time operational levels for dwellings at Old Hall Farm and Bembridge Close.

Actual noise levels generated from site activities will be dependent upon the nature and intensity of the future operations, as well as the final Proposed Development layout and design that is brought forward for the outline planning application site as part of any future reserved matters application. Notwithstanding this, there are a number of mitigation measures that can be employed to reduce and control operational noise emissions from the site. These include:

- Earth bunds and noise barriers, e.g. at site boundaries and around noisy parts of the site.
- Operational controls, such as limiting the areas where specific activities will be undertaken (e.g. the use of HGV trailer chillers could be contained within parts of the site that are fully screened from receptors by acoustic screening or the proposed development buildings themselves).
- The use of good practice design measures in the development of the final Proposed Development layout to be brought forward for the outline planning application site, including:
  - Use of distance buffers;
  - Locating proposed buildings, such that they screen service and plant areas; and
  - The use of local acoustic screening.

To demonstrate principle, the benefit afforded by incorporation of the following mitigation measures has been assessed for ambient goods operation, see **Figure 7.4: Mitigation - Ambient goods operation**:

- Noise barrier 1.4m high, 278 long, east of Unit 3.

To demonstrate principle, the benefit afforded by incorporation of the following mitigation measures has been assessed for chilled good operation, see **Figure 7.5: Mitigation - Chilled goods operation**:

- Noise barrier 2m high, 393m long, wrapping around the south west corner of Unit 1;
- Noise barrier 2m high, 277m long, west of Unit 2;
- Noise barrier 3m high, 376m long, east of Unit 3;



- Noise barrier 2m high, 542m long, south of Unit 3 and Unit 4;
- Noise barrier 2m high, 353m long, wrapping around the north-west corner of Unit 4; and
- Chilled goods prohibited from using and accessing the eastern side of Unit 3.

A noise barrier could be an acoustic fence, a solid wall, an earth bund, or a combination of these structures (e.g. an earth bund with a noise barrier along its ridge).

Updated noise contour plots have been generated to reflect the resulting noise levels with these measures in place. These can be seen in **Figure 7.6: Residual noise contours - Ambient goods operation** and **Figure 7.7: Residual noise contours - Chilled goods operation**; at 4.0m above local ground height .

## RESIDUAL

**Table 7.7-5** to **Table 7.7-7** below present the revised assessments of operational noise accounting for the identified mitigation measures.

**Table 7.7-5 – BS 4142 Assessment – Dwellings at Old Hall Farm with mitigation**

Assessment step	Chilled goods (30% electric chiller) operation	
Modelled Specific Sound Level [A]	43.7	
Tonality [B]	2	
Impulsivity [C]	0	
Intermittency [D]	0	
Rating level [E] = [A+B+C+D]	45.7	
Period	Day	Night
Background sound level ( $L_{A90,T}$ ) [F]	45.0	43.0
Rating level versus background sound level [E-F]	+0.7	+2.7
Magnitude of impact	Small	Small
NPSE category	NOEL to LOAEL	NOEL to LOAEL
Effect	Minor	Minor

**Table 7.7-5** presents the residual impact for dwellings at Old Hall Farm with mitigation in place. The assessed scenario includes for 30% electric chiller operations. The Rating level is 45.7  $L_{A,T}$  dB, this level is 0.7 dB above the daytime background sound level, and is 2.7 dB above the night-time background sound level. For both the daytime and night-time periods a **Minor** effect is identified. The effect would be long-term, direct, local and permanent.

**Table 7.7-6 – BS 4142 Assessment – Dwellings at Bembridge Close with mitigation**

Assessment step	Chilled goods (30% electric chiller) operation	
Modelled Specific Sound Level [A]	41.4	
Tonality [B]	2	
Impulsivity [C]	0	
Intermittency [D]	0	
Rating level [E] = [A+B+C+D]	43.6	
Period	Day	Night
Background sound level ( $L_{A90,T}$ ) [F]	46.0	41.0
Rating level versus background sound level [E-F]	-2.6	+2.4
Magnitude of impact	Negligible	Small
NPSE category	NOEL	NOEL to LOAEL
Effect	<b>Negligible</b>	<b>Minor</b>

**Table 7.7-6**, presents the residual impact for dwellings at Bembridge Close with mitigation in place. The assessed scenario includes for 30% electric chiller operations. The Rating level is 43.6  $L_{Ar,T}$  dB, this level is 2.6 dB below daytime background sound level, and is 2.4 dB above the night-time background sound level. For the daytime, a **Negligible** (not significant) effect is identified; in the night, a **Minor** (not significant) effect is identified. These effects would be long-term, direct, local and permanent.

**Table 7.7-7 – BB93 assessment – Children’s day nursery with mitigation**

Assessment step	Ambient operation	Chilled goods (30% electric chiller) operation
Modelled Specific Sound Level [A]	46.1	46.9
Tonality [B]	2	2
Impulsivity [C]	0	0
Intermittency [D]	0	0
Rating level [E] = [A+B+C+D]	48.1	48.9
Period	Day	Day



BB93 external criteria [F]	50.0	50.0
Operational level verses BB93 external criteria [E-F]	-1.9	-1.1
Magnitude of impact	Small	Small
NPSE category	NOEL to LOAEL	NOEL to LOAEL
Effect	<b>Minor</b>	<b>Minor</b>

**Table 7.7-7** presents the residual impact for the Children’s day nursery with mitigation in place. The assessed scenario includes ambient and chilled goods (30% electric chiller) operations.

For ambient operation, the Rating level is 48.1  $L_{Aeq}$  dB, this level is 1.9 dB below the external noise level criteria. A **Minor** (not significant) effect is identified. The effect would be long-term, direct, local and permanent.

When assuming that 30% of operations include use of electric chillers, the Rating level is 48.9  $L_{Aeq}$  dB. This level is 1.1 dB below the external noise level criteria. A **Minor** (not significant) effect is identified. The effect would be long-term, direct, local and permanent.



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