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## 1.0 Introduction

- 1.1 This policy statement ('Policy') sets out the approach the Promoter, Network Rail Infrastructure Limited ('Network Rail'), proposes to adopt to mitigate noise and vibration from the operation of the Airdrie - Bathgate Railway Line as proposed to be authorised by the Airdrie-Bathgate Railway and Linked Improvements Bill ('the Bill'). The powers of the Bill will be implemented by what the Bill calls the authorised undertaker. It is expected that Network Rail will become the authorised undertaker. In the event that it is not, Network Rail's legal commitment to this Policy will be legally binding on the authorised undertaker. Accordingly, references in this Policy to the Promoter include the authorised undertaker.
- 1.2 Impacts during construction will be covered by the project Code of Construction Practice (CoCP) for which there is a separate policy paper.<sup>1</sup>
- 1.3 The Promoter has, in accordance with accepted practice, undertaken an assessment of the impacts of noise and vibration as reported in the Environmental Statement. This has been undertaken by identifying noise sensitive receptors along the entire railway route, comparing predicted levels against impact assessment criteria,<sup>2</sup> and outlining mitigation measures where necessary to achieve these criteria. The impact assessment criteria refer to the 'significance of impact' which is discussed in Section 3 of the policy statement.
- 1.4 This Policy has been developed in the absence of any statutory requirements for noise and vibration mitigation from rail systems, whilst taking into consideration statutory requirements in controlling noise in Scotland. Unlike the situation for new roads in Scotland and throughout the UK, and for new railways in England and Wales, there are no noise insulation regulations or other statutory requirements to control noise from railways in Scotland. The Promoter therefore proposes to implement a noise and vibration mitigation scheme based upon non-statutory standards set out in this policy statement. Mitigation will be provided wherever the Promoter determines it is reasonably practicable to do so. It is important to recognise that this is a non-statutory arrangement and there will be cases where there are practical limitations as to what can be achieved. This Policy clarifies how these circumstances will be addressed. Section 2 refers to the process should the Promoter be unable to mitigate effectively for noise.
- 1.5 The Airdrie-Bathgate Railway and Linked Improvements Bill will make the planning permission conferred on the Promoter by the

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<sup>1</sup> This document is available on <http://www.airdriebathgaterailink.co.uk/information/>

<sup>2</sup> Refer to Section 3

Town and Country Planning (General Permitted Development) (Scotland) Order 1992 subject to a deemed planning condition requiring the authorised undertaker to comply with this Noise and Vibration Policy.

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## 2.0 Approach

2.1 The Promoter will undertake measures to mitigate noise and vibration impacts for residents and other noise and vibration impact sensitive receivers in the vicinity of the authorised works along the line of route. Where the significance of impact as described within the Environmental Statement accompanying the Bill (May 2006) is 'moderate' or worse and also where external  $L_{Amax}$  levels regularly exceed 82dB (free field) mitigation will be considered. 'Regularly' is defined in the Scottish Executive's Planning Advice Note No. 56 as more than twice in any one hour during night time hours<sup>3</sup>. In doing so the Promoter will take into account what is reasonably practicable and, where possible, take into account the views of affected parties in the circumstances of each location potentially affected by noise. This policy will be applied in accordance with the principle of best practicable means<sup>4</sup>.

- Firstly, the Promoter will use all reasonably practicable measures to avoid significant noise and vibration impacts through the design and the implementation of the authorised works.
- Secondly, where these measures are not sufficient to mitigate moderate or worse impacts, the Promoter will consider the provision of noise barriers to attenuate noise between the track and sensitive receivers.
- Thirdly, the Promoter will offer noise insulation within residential properties where, after all reasonably practicable and acceptable attenuation has been provided or discounted on practical grounds, residual noise levels would exceed given thresholds. Operational noise levels will be established by on-site monitoring rather than noise modelling.
- In cases where the Promoter finds that it is not possible to mitigate for noise impact to a satisfactory level then it would be open to the affected party to raise a claim for compensation under the Lands Compensation Regime.<sup>5</sup>

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<sup>3</sup> It is acknowledged that the categorisation of Noise Exposure categories as used in PAN 56 is intended for use in assessing suitability of sites for residential development and PAN 56 specifically states that the NEC's should not be used in reverse. The reference to 82dB  $L_{Amax}$  in this text is in relation to sleep disturbance and not site categorisation. In addition, for the purposes of assessment night time hours in this assessment are between midnight and 06.00 hours as per the Calculation of Railway Noise 1995 prediction methodology..

<sup>4</sup> Best Practicable Means are defined in Section 72 of the Control of Pollution Act 1974 as those measures which are "reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to financial implications. Further, in respect of Network Rail's statutory duty to safely operate and maintain the rail network, the safety and integrity of the railway shall be key considerations.

<sup>5</sup> A separate note is being prepared, entitled 'A Guide to the Compulsory Acquisition Process and Code of Compensation', which will be available at

2.2 Noise and vibration sensitive receivers are defined in the Environmental Statement (ES) as places where people live and work, and include hospitals, schools and places used for recreation to include all types of dwellings, schools, libraries, hospitals, theatres and concert halls, places of worship, and vibration sensitive industrial processes.

2.3 In defining what is reasonably practicable (i.e. what constitutes best practicable means), the Promoter will take into account a variety of issues such as:

- engineering feasibility
- maintenance of train driver sight lines
- safe operation of the railway,
- safety of rail maintenance personnel
- safe interaction of the railway with road traffic,
- the safety of pedestrians and cyclists adjacent to the railway
- security and crime considerations

2.4 The Promoter will also take into account the cost of any proposed mitigation measure and the level of benefit achieved in terms of number of properties affected, the degree of noise reduction and the reduction in noise levels or vibration magnitude, such that costs are not disproportionate to the benefits achieved. In defining what is acceptable the Promoter will consult affected parties and take into account impacts on their amenity and that of other parties, such as recreational users of facilities, and any other environmental concerns.

2.5 The application of these principles is further described below. A key aspect of their application is the definition of what constitutes a 'moderate' impact. This is set out for noise in Section 3.0 before describing how this applies to the election of appropriate noise mitigation measures. Restriction of vibration generation and measures to damp vibration transmission will be implemented to restrict transmitted vibration to a level below that at which there is a probability of adverse comment from occupants of buildings.

2.6 Members of the public will be able to contact the 24-hour Network Rail National Helpline (freephone 08457 11 41 41) in the event that they experience noise or vibration they perceive to be in excess of the specified levels. Complaints will be referred in the usual way to Network Rail's Community Relations Team who will respond within two working days from the date of the complaint. In the event that any complainant considers that their complain has not been dealt with to their satisfaction, recourse is available to write formally to Network Rail<sup>6</sup> or to contact the Office of Rail Regulation (ORR), which is the body

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[www.airdriebathgaterailink.co.uk/information](http://www.airdriebathgaterailink.co.uk/information)

<sup>6</sup> For more details please see Network Rail's website - <http://www.networkrail.co.uk/asp/633.aspx>

responsibility for regulating Network Rail.<sup>7</sup>

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<sup>7</sup> For more details about the Office of Rail Regulation, please see ORR website - <http://www.rail-reg.gov.uk/>

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### 3.0 Definition of Significant Noise Impact

- 3.1 As noted above there are no statutory requirements for mitigating railway noise in Scotland. It is therefore necessary to define criteria to establish when noise mitigation should be considered. These have been based on various guidance used in the environmental impact assessment for the Airdrie - Bathgate Railway. The likelihood of exceeding these criteria will be determined in advance of construction by noise modelling.
- 3.2 Given the likely timetable for trains on the operational railway, as identified in the Accompanying Documents to the Bill (Environmental Statement Chapter 3 Section 18), the following information applies to daytime  $L_{Aeq(T)}$  levels.
- 3.3 Noise mitigation will be considered where the significance of impact is assessed as being moderate or worse. The assessment of the significance of impact compares the predicted level of noise to the existing residual noise level. Mitigation will also be considered in the event of regular exceedance of the 82 dB  $L_{Amax}$  (free field) criterion for maximum noise level during the night time period.

Predicted Railway Noise Level dB $L_{Aeq,18h}$ Free field <sup>*8</sup>	Increase in dB $L_{Aeq}$ (over existing residual noise level)			
	1 < 3	3 < 5	5 < 10	>10
<55	negligible	negligible	minor	minor
55 < 60	negligible	minor	moderate	moderate
60 < 65	negligible	minor	moderate	substantial
> 65	negligible	moderate	substantial	substantial

- 3.4 The derivation of how the levels for <55 and 55<60 in columns 5<10 and >10 are 'minor' and 'moderate' respectively is explained in Section 13.4 of the Environmental Statement.

<sup>8</sup> Free field means at least 3.5m away from reflective surfaces, except the ground

## 4.0 The Mitigation Hierarchy

4.1 Where consideration needs to be given to alleviate the impact of noise the Promoter will employ any one or a combination of mitigation measures listed below. This is a hierarchy of measures in order of the Promoter's proposed approach to mitigation.

### Track Design

4.2 The Promoter will adopt all reasonably practicable and acceptable measures which the Promoter considers necessary to reduce noise at source by design of the track forming part of the authorised works to attenuate noise and vibration. Ways this may be done could include:

- track alignment for example keeping track level as low as reasonably practical (subject to other constraints) so as to make use of natural screening of adjacent grass verges;
- materials used for example correct standard of rubber rail pads and minimising on site rail welds and joints;
- appropriate ballast depth and compaction; and
- cant of the track for example correctly designed curves/cant can reduce risk of wheel squeal (subject to other design constraints).

### Noise Barriers

4.3 Following the design of the track, where moderate or worse noise impacts are still predicted to occur, the Promoter will consider the provision of noise screening structures adjacent to affected properties. The dimensions (length and height) and form of each structure will be determined by modelling and in consultation with owners and/or occupiers of affected properties.

4.4 Para.18.3 of the ES states *'Where noise is an issue a physical barrier such as a close boarded fence may be required. The barrier may be supplemented by tree and shrub planting in the railway corridor where the Vegetation Management Plan allows'*. It should be noted that lineside vegetation has no effect in mitigating noise.

4.5 Noise barriers will not always be appropriate as there are other considerations to be taken into account. These include:

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Track Safety:	There are Her Majesty's Railway Inspectorate's requirements to limit structures close to railway tracks so as to allow room for escape and provide a place of safety for maintenance personnel. This means that generally a noise barrier can be located no closer than approximately three metres from the track.
Sight Lines:	On curves, noise barriers could compromise line of sight ahead and so may be impracticable.
Visual Impact	In highly visible locations noise barriers may not be desirable.
Creation of Crime Havens	In built-up areas, such as near stations, noise barriers could create areas where criminal activity could be hidden from view and thus be facilitated.
Construction and Maintenance Difficulties	Noise barriers may require deep foundations or be unstable on sloped land. They may interfere with access or maintenance and they can attract graffiti in unfavourable locations.

4.6 While it is anticipated that noise barriers may offer a solution in some locations along the railway, there may be certain locations where local conditions do not permit noise barriers.

4.7 As part of the iterative EIA process a number of locations where barriers could have been beneficial in mitigating noise impact were considered as inappropriate for example due to elevation of track on an embankment at east end of Plains adjacent to the bridge over the A89.

## **Noise Insulation**

4.8 The Promoter will provide noise insulation on the same basis as in the Noise Insulation (Railways and Other Guided Systems) Regulations 1996, which apply in England and Wales. Under this scheme noise insulation will be provided for residential properties affected by the authorised works, if train noise reaches the qualifying façade levels:

- 68 dB  $L_{Aeq, 0600 - 0000}$  hours during the day and evening; and
- 63 dB  $L_{Aeq, 0000 - 0600}$  hours at night.

4.9 Details of the noise insulation package that will be offered are as set out in The Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996. The provisions of the 1996 Regulations, which came into force under the Land Compensation Act 1973, do not extend to Scotland (Scotland has the Land Compensation (Scotland)

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Regulations 1973, as amended). The 1996 regulations apply to new or improved railways and the procedure only deals with the airborne component of railway noise, but this is the major component from surface railways built at grade or on earthwork structures. However, while the 1996 regulations are not legally applicable in Scotland, and because there is no Scottish equivalent, the qualifying criteria and procedures are accepted by the Promoter as relevant in Scotland.

- 4.10 The Regulations impose a duty on the authority responsible for constructing the transport system concerned, or for adding to an existing system, to provide certain buildings with insulation against noise or to pay grant for insulation work to be carried out to such buildings. There is also a discretionary power to provide such insulation or to pay such grant that is given to the responsible authority where an existing system is altered, or where noise from construction work is expected to affect such buildings.
- 4.11 To be eligible for insulation or grant, buildings have to be residential and located within 300 metres of the works constituting the new, added to or altered system. They must also be subject to a predicted noise level increase of at least one decibel (weighted to reflect the varying emphasis given by the ear), as a result of vehicles using the system at night (weighted as before).
- 4.12 The noise index used  $L_{Aeq(T)}$ , describes the level of hypothetically steady sound which, over the period of measurement, would deliver the same noise energy as the actual intermittent noise. The procedures to be used for predicting noise levels from guided transport systems are those described in a technical memorandum, Calculation of Railway Noise 1995. They are based on conditions which represent the noisiest traffic flows expected to occur within a period of 15 years of the date on which the works in question are first used. The memorandum also specifies procedures and requirements for the measurement of noise levels where prediction is not possible.
- 4.13 Finally, the Regulations also set out the procedures for offering and accepting insulation work or grant, and for appeals. Schedule 1 specifies the insulation work to be carried out and reference to Schedule 1 shows that the specifications for insulation works offer a standard package that includes existing windows being retained and converted to double windows. The following table is reproduced to give the specification of the glass for the second pane:

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<b>Width of Window</b>	<b>Thickness of Glass</b>
Not more than 250 mm wide	6 mm
More than 250 mm, but not more than 1,100 mm	8 mm
More than 1,100 mm, but not more than 2,250 mm	10 mm

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More than 2,250 mm

12 mm

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4.14 However, the Regulations also allow, if desired by the claimant, a double-glazed window to be installed in place of the double window, whether or not the standard of acoustic performance provided by such a double-glazed window is comparable to that provided by the double window specified within the relevant clause.

### **Train Horn Noise**

4.15 Railway operating procedures require that horns are sounded in the following circumstances:

- When necessary for safe working for example, where there are trespassers on the railway;
- To warn personnel working on or maintaining the railway. This includes use of horns by rail plant during any future engineering works on the line;
- Whistle boards at level crossings;<sup>9</sup>
- When approaching or passing a location where shunting is taking place;<sup>10</sup>
- When approaching tunnels; <sup>11</sup>
- When passing a signal at danger or moving within a possession; or
- When making a wrong direction movement which is unsignalled.<sup>12</sup>

4.16 While the points above state the circumstances in which train horns may be used, the nature of the Airdrie-Bathgate Railway means that there will be minimal use of train horns as most of the circumstances where they would require to be used have been designed out – i.e. there are no level crossings or tunnels proposed on the route. The remainder of the aforementioned circumstances are expected only to require use of the horn in emergencies or during specified maintenance periods. Where possessions of the track are required for maintenance, notification will be provided to affected parties not later than 14 days in advance of the possession.

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<sup>9</sup> There are no level crossing on the Airdrie-Bathgate Railway

<sup>10</sup> It is unlikely that there will be shunting on the Airdrie-Bathgate Railway

<sup>11</sup> There are no tunnels on the Airdrie-Bathgate Railway

<sup>12</sup> This is a very rare occurrence on the rail network

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## **Operational Public Address System Noise**

4.17 Noise impacts from public address systems (PA) systems will be controlled through design, siting and specification of the PA system. This will involve the following:

- design and selection of station finishes;
- design, geometry and siting of speakers; and
- Station structures.

4.18 There are no formal statutory regulations covering noise levels from station PA systems. Network Rail currently has internal guidelines which apply when such systems are renewed or upgraded. These include aims to ensure the PA system is at least 10dB louder than ambient noise levels, that the PA system must be adjustable as ambient noise levels change, and that it must be audible in all parts of the station where passengers are likely to wait. This includes ticket halls/concourses, walkways, subways and footbridges, waiting rooms and all sections of platform where passengers normally congregate. The Disability Discrimination Act 1995 requirements are also relevant, as blind or partially sighted passengers in particular need to rely heavily on station PA systems for train travel information.

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## 5.0 Vibration

- 5.1 Vibration<sup>13</sup> is the oscillatory motion of any structure or substance. Vibration may be continuous, intermittent or transient and it can be sinusoidal, random or impulsive. Vibration may be imperceptible to humans but interfere with processes such as scanning electron microscopes, perceptible to humans at amplitudes as low as about  $2 \times 10^{-6}$  m at around 1 Hz (1 cycle/second), or might be that experienced in a truck over rough ground, from earth tremors or earthquakes, or in sway of tall buildings in wind storms. The vibration from trains passing a building is generally of sinusoidal form and at very low, but often perceptible, amplitudes in the frequency range about 8 Hz to 80 Hz in a building. Noise is vibration in air and audible to humans in the frequency range about 16 Hz to several thousand Hz. Noise can lead to vibration of structures such as windows or perceived vibration by humans whose chest walls are caused to vibrate by the noise.
- 5.2 Where vibration from a source is prevented from transmission to surrounding strata or structures this is termed vibration isolation. Vibration isolation can be achieved by spring mounting a vibration source. In the case of vibration from passing trains the rails can be mounted on resilient materials to accomplish this and there are several proprietary systems available.
- 5.3 Human sensitivity to vibration varies between people and circumstances, but the threshold of perception is usually taken to be in the Peak Particle Velocity (PPV) range 0.15 and 0.3 mm/s.
- 5.4 The rail tracks adjacent to sensitive receptor buildings will be vibration isolated or designed using 'best practical means' to keep within the guideline magnitudes for vibration dose value (VDV) given in BS6472:1992 below which the probability of adverse comment is low:
- Day (0700-2300 hours)  $0.40 \text{ m/s}^{1.75}$
  - Night (2300-0700 hours)  $0.13 \text{ m/s}^{1.75}$
- 5.5 Vibration from railways takes the form of a series of 'vibration events' and their number during the day or night time period. VDV is highly biased towards higher vibration levels. To double the VDV it would be necessary to double the event or acceleration, or to increase the number of events by a factor of 16.
- 5.6 The limitation of vibration peaks has also been related to perception thresholds for average and sensitive humans to avoid

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<sup>13</sup> A to-and-from motion, moving about a fixed equilibrium position.

short periods of more perceptible vibration being masked in the overall dose values. The Promoter will ensure that the number of vibration events remains at a level below the level at which the above thresholds might be breached.

- 5.7 Excessive vibration will be designed out where reasonably practical through, for example:
- Excavation of poor ground material;
  - Use of standard approved railway components which are designed to minimise vibration; and
  - Varied ballast depths to suit local ground conditions.
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## 6.0 Maintenance and Monitoring

6.1 The Promoter is legally obliged <sup>14</sup> to maintain the track forming part of the authorised works.

6.2 Following construction of the railway under the powers sought in the Bill, the operation of the railway will be separately regulated under the Railways Act 1993. The following is related to the operation of the railway rather than the implementation of the Bill's powers:

- Track monitoring using both manual and train borne techniques will be used to assess infrastructure condition and any remedial maintenance work required. Certain track defects can result in additional noise being generated and this monitoring process is designed to ensure that repairs are carried out before this stage is reached. Train Operators are required by Railway standards to have a wheel monitoring and maintenance regime in place. These regimes prevent unsatisfactory train wheels being on the network and minimises risk of additional wheel noise.
- A noise and vibration monitoring scheme will be agreed with North Lanarkshire Council's Department of Planning and Environment, West Lothian Council's Department of Environmental Health and Trading Standards and the City of Edinburgh Council's Environmental and Consumer Services Department. The Appendix gives details of the minimum requirements of the noise monitoring system. The monitoring results will be reported to the appropriate Local Authority.
- The Promoter will also comply with its Standard Maintenance Procedure 'Noise and Vibration Management from Maintenance Activities' as may be amended from time to time. This procedure sets out the process by which Network Rail's Maintenance organisation manages noisy or vibration inducing activity thus ensuring minimum nuisance to neighbours.

6.3 All results derived from monitoring of noise and vibration will be published in accordance with Appendix 1

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<sup>14</sup> Railways Act 1993

## GLOSSARY

**Noise** The terms sound and noise can be used interchangeably, but noise can be defined as unwanted sound. Sound is an essential and desirable part of everyday life. However, when noise is imposed on people (from industry, construction or transportation) it can lead to annoyance, disturbance and other undesirable effects.

**Sound** Any variation in atmospheric pressure which the ear can detect. For the ear to detect these variations as sound they must occur at least 20 times per second.

**Decibels (dB)** Not an absolute unit of measurement it is a logarithmic ratio of the variation in atmosphere pressure relative to an agreed reference pressure. It should be noted that because the decibel scale is logarithmic noise levels do not add up according to simple linear arithmetic. For example, adding two equal noise sources results in a combined noise level that is 3dB higher than the individual levels. For example  $50\text{dB} + 50\text{dB} = 53\text{dB}$  (not 100 dB).

Also, because the ear responds to changes in noise logarithmically, a relatively large change in sound energy is needed before it is perceived to be louder or quieter. For example, it is generally accepted that an increase or decrease of 1dB cannot usually be heard in everyday conditions (although possibly in 'laboratory' conditions); an increase or decrease of 3dB is generally accepted as just perceptible, an increase or decrease of 5dB is a clearly perceptible change in noise; and an increase or decrease of 10dB is perceived to be a subjective doubling or halving of noise. To place this into context, to change a noise level by around 3dB there would need to be a doubling or halving of the noise energy; and a change of 10dB would need a ten-fold change in noise energy.

**dB(A)** A scale designed to simulate how the ear behaves, in other words a particular way of measuring the different frequencies in sound designed to match how the human ear perceives noise, called the 'A'-weighting.

Examples of noise levels in common situations are shown overleaf.

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### Typical Noise Levels and Subjective Evaluation

Noise Level dB(A)	Description
120	Threshold of pain
95	Pneumatic drill (unsilenced); 7m distance
83	Heavy diesel lorry (40 km/h at 7m distance)
81	Modern twin-engined jet (at take-off at 152m distance)
70	Passenger car (60 km/h at 7m distance)
60	Office environment
50	Ordinary conversation at 1m
40	Library
35	Quiet bedroom
0	Threshold of hearing

$L_{Aeq,T}$  The 'continuous equivalent sound pressure level. It represents a time varying noise level by calculating the constant noise level that would have the same sound energy content over the measurement period (T). The letter 'A' denotes that 'A'-weighting has been used.

#### Or in Other Words

$L_{Aeq}$   $L_{Aeq}$  is defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A – weighted fluctuating sound measured over that period.

$L_{Amax}$  This is a measure of the maximum A-weighted noise level. For railway noise, it is the highest level experienced when the vehicles passes, usually occurring as it is directly in front of the receptor location.

#### Or in other words

$L_{Amax}$   $L_{Amax}$  is the maximum A - weighted sound pressure level recorded over the period stated.  $L_{Amax}$  is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall  $L_{eq}$  noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.

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**L<sub>A10,T</sub>** The A-weighted sound pressure level of the residual noise in decibels exceeded for 10% of a given time interval. This is the parameter defined by the government to describe road traffic noise.

**L<sub>A90,T</sub>** The A-weighted sound pressure level of the residual noise in decibels exceeded for 90% of a given time interval.

**Or in other Words:**

**L<sub>10</sub> & L<sub>90</sub>** If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L<sub>n</sub> indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L<sub>10</sub> is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L<sub>90</sub> is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L<sub>10</sub> index to describe traffic noise.

**Frequency (Hz)** The number of cycles per second, for sound this is subjectively perceived as pitch.

**Façade Effect** A facade sound level is that determined 1m in front of a facade. Sound is reflected from hard surfaces in a similar manner to light by a mirror and the effect is to produce a higher (2.5/3 dB) sound level than would occur if the building was not there.

**Free Field** At least 3.5m away from any reflective surface (façade) other than the ground.

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## APPENDIX 1

### NOISE AND VIBRATION MONITORING PROCEDURES

1. A list of representative noise and vibration monitoring locations will be agreed with the appropriate local authorities. There are, various factors to be considered in identification of monitoring systems, such as the type of properties to be used a monitoring location, frequency of monitoring, presence of other noise sources, safety, accessibility for checking calibration etc., whilst at the same time limiting the opportunity for sabotaging of the meters. The list will be reviewed from time to time by Network Rail and the appropriate local authorities and amended if deemed necessary. The monitoring will in respect of operational noise commence once the line is operational.
  2. Train noise and vibration measurements for the authorised works will be carried out as prescribed below in the following circumstances:
    - During commissioning of the authorised works;
    - Within 6 months after commencement of passenger service; and
    - At yearly intervals for the first 7 years of operation.
  3. At the agreed monitoring locations, measurements will be taken of the  $L_{Amax}$  Slow (time response) and SEL (Single Event Level) noise levels of a pass-by of each of the vehicles on the track, under normal operation. Vibration measurements will be taken to provide peak vibration magnitudes for each train pass or event and the vibration dose values for day and night. The results of the noise and vibration monitoring will be made available to the public in the following ways:
    - local authorities will be given copies for public viewing;
    - they will be available on the Airdrie-Bathgate website;
    - available for discussion at community for a; and
    - available on request from Network Rail.
  4. To ensure consistency, it is intended that all operational noise and vibration monitoring would be undertaken by the same specialist company throughout the whole monitoring period. This will be done in accordance with the relevant British Standards.
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