SC6.21 Noise impact assessment planning scheme policy

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1 Introduction

1.1 Relationship to planning scheme

This planning scheme policy:

1. provides information the Council may request for a development application;
2. provides guidance or advice about satisfying an assessment benchmark which identifies this planning scheme policy as providing that guidance or advice;
3. states a standard for the following assessment benchmarks identified in the table.

|  |  |  |
| --- | --- | --- |
| Column 1 –Section or table in the code | Column 2 –Assessment benchmark reference | Column 3 –Standard in the planning scheme policy |
| Active frontages in residential zones overlay code |
| Table 8.2.1.3 | PO7 | All |
| Airport environs overlay code |
| Table 8.2.2.3.A | PO8 note | Section 2 |
| Animal keeping code |
| Table 9.3.1.3 | PO1 | All |
| Table 9.3.1.3 | PO2 | All |
| Caretaker's accommodation code |
| Table 9.3.2.3.A | PO2 note | Section 2 |
| Table 9.3.2.3.B | Table note | Section 6 |
| Centre or mixed use code |
| Table 9.3.3.3.A | PO1 note | Section 2 |
| Table 9.3.3.3.F | Table note | Section 5; Section 6 |
| Table 9.3.3.3.G | Table note | Section 6 |
| Table 9.3.3.3.H | Table note | Section 6 |
| Childcare centre code |
| Table 9.3.4.3  | PO10 | All |
| Commercial character building (activities) overlay code |
| Table 8.2.7.3 | PO4  | All |
| Community facilities code |
| Table 9.3.5.3.A | PO2 note | Section 2 |
| Table 9.3.5.3.B | Table note | Section 5; Section 6 |
| Table 9.3.5.3.C | Table note | Section 6 |
| Extractive industry code |
| Table 9.3.9.3.A | PO6 note | Section 2 |
| Table 9.3.9.3.A | PO7 note | Section 2 |
| Table 9.3.9.3.C | Table note | Section 5; Section 6 |
| Table 9.3.9.3.D | Table note | Section 6 |
| Table 9.3.9.3.E | Table note | Section 6 |
| Extractive resources overlay code |
| Table 8.2.10.3.A | PO5 note | Section 2 |
| Table 8.2.10.3.C | Table note | Section 6 |
| Indoor sport and recreation |
| Table 9.3.11.3.A | PO2 note | Section 2 |
| Table 9.3.11.3.B | Table note | Section 5; Section 6 |
| Table 9.3.11.3.C | Table note | Section 6 |
| Industrial amenity overlay code |
| Table 8.2.13.3.A | PO3 note | Section 2 |
| Table 8.2.13.3.E | Table note | Section 6 |
| Table 8.2.13.3.F | Table note | Section 6 |
| Industry code |
| Table 9.3.12.3.A | PO2 note | Section 2 |
| Table 9.3.12.3.E | Table note | Section 5; Section 6 |
| Table 9.3.12.3.F | Table note | Section 6 |
| Table 9.3.12.3.G | Table note | Section 6 |
| Multiple dwelling code |
| Table 9.3.14.3.A | PO41 note | Section 2 |
| Table 9.3.14.3.A | PO42 | All |
| Retirement and residential care facility code |
| Table 9.3.18.3.A | PO2 | All |
| Service station code |
| Table 9.3.21.3.A | PO9 note | Section 2 |
| Table 9.3.21.3.B | Table note | Section 5; Section 6 |
| Table 9.3.21.3.C | Table note | Section 6 |
| Short term accommodation code |
| Table 9.3.22.3 | PO3 | All |
| Special purpose code |
| Table 9.3.24.3.A | PO1 note | Section 2 |
| Table 9.3.24.3.A | PO24 note | Section 2 |
| Table 9.3.24.3.B | Table note | Section 5; Section 6 |
| Table 9.3.24.3.C | Table note | Section 6 |
| Table 9.3.24.3.D | Table note | Section 6 |
| Specialised centre code |
| Table 9.3.25.3.A | PO2 note | Section 2 |
| Table 9.3.25.3.B | Table note | Section 5; Section 6 |
| Table 9.3.25.3.C | Table note | Section 6 |
| Table 9.3.25.3.D | Table note | Section 6 |

1.2 Purpose

This planning scheme policy provides information for a development application, guidance and advice for satisfying assessment benchmarks and standards for:

1. preparing a noise impact assessment report;
2. the noise impact assessment methodologies to be used to assess the potential noise impacts of development and to demonstrate achievement of the noise criteria.

2 Noise impact assessment report

1. A noise impact assessment report is to:
2. Describe the impact of noise by the development, where the development emits noise.
3. Describe the impact of noise on the development, where the development is a sensitive use and exposed to noise.
4. A noise impact assessment report is to describe the existing acoustic environment, present the future forecasted acoustic environment, assess impacts using direct comparisons to noise criteria and describe the noise impact control measures that will be applied by the development.
5. A noise impact assessment report is to contain the following information as relevant to the specific assessment, although there may be circumstances that warrant further content:
6. description and location of sensitive uses or sensitive zones that may be affected by noise emissions from the development or description and location of existing noise emission sources if the development is a sensitive use;
7. description of and justification for, the noise model and algorithms used to predict the propagation of noise from the noise sources relevant to the development;
8. noise model configuration and justification for the model configuration;
9. an inventory of noise emission sources in accordance with section 3;
10. model input data and the representativeness, accuracy and resolution of the input data, including noise source sound power levels, operating hours of each noise source, ground cover assumptions, topography assumptions, road gradient where relevant, reflections from buildings and acoustic fences and noise source and receiver heights;
11. methods and assumptions for calculating the effectiveness of noise impact control measures, including the predicted attenuation from shielding from buildings, acoustic fences, fences, walls, mounds or enclosures, in accordance with the requirements of section 4;
12. details of noise model calibration method and results;
13. assumptions and uncertainties associated with the noise modelling;
14. noise modelling results for the relevant assessment period(s), including day (07:00 – 18:00), evening (18:00-22:00) and night (22:00-07:00) periods, presented in tabular and graphical form, including contours overlayed on a map or aerial photograph to scale;
15. details of modifying factor adjustments in accordance with section 6.1;
16. where measuring existing noise sources, details of noise monitoring equipment, field calibration, location and results; including:
17. noise sample times and measurement intervals;
18. weather conditions during measurement, including wind speed, wind direction and rainfall;
19. adjustments for reflecting surfaces where relevant;
20. table summary of measured noise levels;
21. graphical presentation of measured noise levels using 15 minute intervals, for each noise descriptor;
22. site photograph indicating the position of the noise monitoring equipment.
23. A site plan to scale showing:
24. the location of the noise sources assessed;
25. the location of the sensitive uses and/or sensitive zones that may be impacted by noise from the development, or where the development is for a sensitive use, the location of existing noise sources that may impact the development;
26. the location of noise monitoring equipment used in the assessment;
27. the location of existing or proposed structures, including but not limited to buildings and acoustic fences;
28. the location of any earth mounding, cuttings or other significant topographical features.
29. a comparison of the measured and predicted source noise levels, including modifying factor adjustments to the noise criteria;
30. a description of the noise impact control measures necessary to achieve the noise criteria, including hours of operation, acoustic fences, enclosures and dwelling insulation and including details of the construction materials and the design;
31. the noise level to be achieved at the boundary or specific location at the site that is necessary for achieving the noise criteria at a sensitive use or sensitive zone;
32. conclusions;
33. recommendations;
34. references;
35. sample calculations, that is screenshots of spread sheet or relevant software used:
36. digital modelling inputs: ground data (topography, absorption), noise source and receiver data, buildings, barriers, road/rail traffic.
37. data, ESRI shapefile or DXF versions;
38. digital modelling output of noise contours in 1dB increments (shapefile or DXF) or 5m grid output (Shapefile, TXT or CSV).

3 Inventory of noise emission sources

1. A noise impact assessment report is to include a comprehensive and representative inventory of noise emissions associated with the development and from other sources, including:
2. all the proposed and existing noise emission sources relevant to the development;
3. the sound power level or sound pressure level, how often it occurs, duration and operating times of each noise source;
4. the characteristics of each noise source, including low frequency, vibration, tonal or impulsive characteristics;
5. whether each noise source produces steady sound or non-steady sound.
6. The noise emission inventory data is to be used to assess the noise impacts associated with the development.

4 Noise impact control measures

1. A noise impact assessment report is to include the details of the noise impact control measures that will be applied by the development, including the following:
2. A description of the effectiveness of the measures and the noise attenuation performance of the measures.
3. A description of any ongoing maintenance requirements to ensure that the stated noise attenuation performance of the measure does not deteriorate with time.

Note—The information provided in the noise impact assessment report may be used to guide the drafting of approval conditions and also emission limits where the development is an environmentally relevant activity. Therefore the development proponent must be confident that the noise attenuation performance and noise impact control measures stated in the noise impact assessment report are achievable and are consistent with the design, competent operation and maintenance of the development. Post-commissioning testing may also be required as a condition of approval to establish that noise sources or noise impact control measures comply with statements made in the noise impact assessment report.

1. The noise impact control measures to be considered, include the following:
2. acoustic fences, mounds, enclosures or buildings;
3. siting noisy activities such as loading and unloading areas, waste collection areas or car parks at the greatest distance from neighbouring or nearby sensitive uses;
4. siting noisy equipment, plant or machinery at the greatest distance from neighbouring or nearby sensitive uses;
5. orientating building openings or noisy equipment, plant or machinery so that noise emissions are directed away from sensitive uses;
6. scheduling the use of noisy equipment or undertaking noisy activities, at the least-sensitive time of day (e.g. 7am to 6pm on a business day);
7. incorporating noise attenuation into building construction, including masonry construction, ceiling insulation, thick window glazing, double glazed windows or acoustically sealed windows and doors;
8. locating bedrooms and living rooms on the shielded side of the dwelling away from the noise source.
9. The noise impact control measures selected for the development are not to be reliant on behavioural performance that introduces a significant risk of noise impacts or which would require a high level of compliance monitoring by Council.
10. The noise impact control measures selected for the development are to be consistent with and not compromise other City Plan objectives, such as safety and surveillance, visual amenity and active street frontages. In general acoustic fences above the heights stated in Table 1 are not appropriate noise impact control measures.

Table 1—Guide to maximum acoustic fence heights

|  |  |
| --- | --- |
| Acoustic fence location | Height above natural ground level |
| Residential front fences | Up to 1.5m depending on density of the residential zone and fence material. |
| Where between dwellings, the side setback forward of the building line  | Up to 1.5m; or Up to 1.8m where the dwelling is built to the boundary  |
| Where between dwellings, the portion of the side boundary adjacent to private open space;battle-axe blocks;lane frontages | Up to 1.8m |
| Fronting major roads (arterial, motorway), commercial or industrial uses | Up to 2.4m |

5 Assessment of existing acoustic environment

1. The following information is to be included in the noise impact assessment report for the assessment of the existing acoustic environment:
2. A qualitative description of the existing acoustic environment.
3. Description of the noise monitoring equipment and procedures used to assess the existing acoustic environment.
4. A site plan to scale showing:
5. the location of any existing noise sources that may contribute to the existing acoustic environment including roads, railways, airports, industry and commercial premises;
6. the location of the sensitive uses and sensitive zones that may be impacted by noise from the development, or where the development is for a sensitive use, the location of existing noise sources that may impact the development;
7. the location of noise monitoring equipment used to assess the existing acoustic environment, including distance to any existing noise source that may contribute to the existing acoustic environment;
8. the location of existing or proposed structures, including but not limited to buildings, acoustic fences, walls and fences;
9. the location of any earth mounding, cuttings or other significant topographical features.
10. Site photograph indicating the position of the noise monitoring equipment.
11. Details of noise monitoring equipment field calibration results.
12. Noise monitoring results including:
13. sample times and measurement intervals;
14. weather conditions during measurement including wind speed, wind direction and rainfall;
15. adjustments for reflecting surfaces where relevant;
16. description of noise sources that make up the existing acoustic environment (e.g. aircraft, industry, mechanical plant, dog barking) and discussion of extraneous noise and any effect it may have on the results;
17. table summary of measured sound pressure levels and results;
18. graphical presentation of measured sound pressure levels using 15 minute intervals and including the LAmax, LAeq and LA90 noise descriptors;
19. methodology used for predicting sound pressure levels at locations other than at those monitored;
20. electronic Microsoft Excel version of the logged data.
21. Rating background levels relevant to the development for day, evening and night for the most affected sensitive zones or sensitive uses, determined in accordance with section 5.1.
22. Existing ambient sound pressure levels, including LAmax and LAeq for day, evening and night for the most affected sensitive zones or sensitive uses. Quantify the contribution of existing transport noise (road, rail, aircraft), industry/commerce in LAmax, LAeq11hr, LAeq4hr, LAeq9hr for day evening and night respectively.

5.1 How to determine the rating background level (RBL)

1. The rating background level (RBL) is the overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period.
2. The assessment of the rating background level is to comply with the method listed in this section, unless a detailed justification is made to and accepted by Council, for any departure from the approved method.
3. Measure the LA90, 1 hour background sound pressure levels for each hour during the day (0700-1800), evening (1800-2200) and night (2200-0700) assessment period relevant to the operating times and days of the development. That is, only those days and assessment periods that are applicable to the times of operation of the proposed development are required to be assessed.
4. Provided that the assessment period represents the typical background noise characteristics of the site; generally a minimum of 48 hours continuous background measurement is to be undertaken. Some situations may require further logging where the site experiences a variable background noise level.
5. Determine an assessment background level (ABL) for each day (0700-1800), evening (1800-2200) and night (2200-0700) assessment period, using the tenth percentile method. The ABL is a measure of background noise (LA90, 1 hour) in the absence of noise from the source. The tenth percentile method may be determined automatically using a spreadsheet package, or manually by applying the method in Table 2.

Table 2—Method for determining the tenth percentile

|  |  |
| --- | --- |
| Step 1 | Sort the LA90, 1 hour data in each assessment period in ascending order. |
| Step 2 | Work out the tenth per cent position of the number of samples in the assessment period. This can be calculated by multiplying the number of samples by 0.1. |
| Step 3 | Determine the tenth percentile:If the tenth per cent position (from step 2) is an integer, then the tenth percentile is determined by taking the arithmetic average of the value at the tenth per cent position and the value at the next highest position. If the tenth per cent position (from step 2) is not an integer, then the tenth percentile is the value at the next highest position.Examples:For a dataset of size 40, the tenth per cent position is 4 (i.e. 0.1x40). As this is an integer, the tenth percentile is the average of the values at the 4th position and the 5th position from the top of the sorted data (from step 1).For a dataset of size 44, the tenth per cent position is 4.4 (i.e. 0.1x44). As the value is not an integer, the tenth percentile is the value at the 5th position from the top (from step 1). |

1. Determine the RBL to be used for assessment purposes. This is taken to be the median value of the corresponding day/evening/night ABLs. For example, for a week’s worth of monitoring, the evening RBL is the median of the seven evening ABLs – i.e. the fourth highest (or lowest) value. Where this level is found to be less than 25dB(A), the RBL is to be set to 25dBA. A practical example is illustrated in Table 3.

Table 3—Example of determining the RBL for 1-hour samples over 5 days

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Day 1 |  | Day 2 |  | Day 3 |  | Day 4 |  | Day 5 |  |
| Measured | Ascending order | Measured | Ascending order | Measured | Ascending order | Measured | Ascending order | Measured | Ascending order |
| 7:00 | 46.5 | 46.5 | 45 | 45 | 46.5 | 46 | 47 | 47 | 48 | 48 |
| 8:00 | 49.5 | 47.5(1) | 47.5 | 46(1) | 48 | 46.5(1) | 49 | 47(1) | 50 | 48.5(1) |
| 9:00 | 48.5 | 47.5 | 46.5 | 46 | 47 | 46.5 | 48.5 | 47.5 | 49.5 | 49 |
| 10:00 | 47.5 | 47.5 | 46 | 46.5 | 46.5 | 47 | 47.5 | 48 | 49 | 49 |
| 11:00 | 47.5 | 48 | 46.5 | 46.5 | 46 | 48 | 47 | 48.5 | 48.5 | 49.5 |
| 12:00 | 49 | 48 | 48 | 46.5 | 48.5 | 48 | 49.5 | 48.5 | 50 | 49.5 |
| 13:00 | 49.5 | 48.5 | 48.5 | 46.5 | 49 | 48 | 50.5 | 49 | 49.5 | 49.5 |
| 14:00 | 50.5 | 49 | 49.5 | 47.5 | 51 | 48.5 | 51 | 49 | 52 | 50 |
| 15:00 | 47.5 | 49.5 | 46 | 48 | 48 | 48.5 | 48.5 | 49.5 | 51 | 50 |
| 16:00 | 48 | 49.5 | 46.5 | 48.5 | 48.5 | 49 | 49 | 50.5 | 49.5 | 51 |
| 17:00 | 48 | 50.5 | 46.5 | 49.5 | 48 | 51 | 48 | 51 | 49 | 52 |
| ABL |  | 47.5 |  | 46 |  | 46.5 |  | 47(2) |  | 48.5 |
| RBL | 47(2) |  |  |  |  |  |  |  |  |  |

Note—

(1)Number of ascending order samples is 11. (11 x 0.1=1.1)

(2)Median value of the 5 days of measurements

Note – As 1.1 is not an integer, adopt the next position: 2

6 Noise impact assessment method

1. The assessment of noise impacts is to comply with the methods listed in this section, unless a justification is made to and accepted by the Council, for any departure from the approved methods.
2. A noise impact assessment report is to include a comprehensive description of the impact assessment methodology and sufficient detail to enable replication of the methodology and results of the noise impact assessment by the Council or third parties.
3. The noise impact assessment of proposed noise sources is to be undertaken using an appropriate noise prediction model, as relevant to the development.
4. Noise prediction models are to be calibrated by field measurement verification.
5. The noise impact assessment of existing noise sources is to be undertaken using noise monitoring and where appropriate, noise prediction modelling.

6.1 Modifying factor adjustments

1. Noise impacts at sensitive uses or sensitive zones can be greater where the source noise has any of the following characteristics:
2. tonality;
3. impulsiveness;
4. modulation;
5. low-frequency content.
6. The modifying factor adjustments listed in Table 4 are to be applied to the measured/predicted source noise level at the receiver before comparison with the noise criteria, where a source noise contains any of the above characteristics (modifying factors).
7. A noise impact assessment report is to include a comprehensive description of the modifying factor adjustments made as part of the noise impact assessment.
8. The modifying factor corrections should be applied having regard to:
9. noise from all sources, individually and in combination, that contribute to the total noise;
10. the site;
11. the nature of the noise source and its characteristics;
12. the maximum modifying factor adjustment to be applied to the noise level of the relevant noise source(s) where the noise contains two or more modifying factors, is 10dB(A).

Table 4—Modifying factor adjustments

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Modifying factor | Assessment/ measurement | When to apply | Adjustment to the measured or predicted source noise level | Comments |
| Tonal noise | One-third octave or narrow band analysis | If the source is known to be tonal or if the level of a one-third octave band exceeds the level of the adjacent bands by 5dB or more | Add 5dB to the relevant one-third octave band. Maximum of 5dB total adjustment.If the source is known to be tonal and one-third octave data is not available for a proposed source, apply a 5dB adjustment. | Narrow-band frequency analysis may be required to precisely detect occurrence. |
| Impulsive noise | Fast response and impulse response | If difference in maximum noise levels between fast response and impulse response is greater than 2dB | Apply difference in measured levels as the correction, up to a maximum of 5dB. |  |
| Modulating noise | Subjectively assessed | Level varies by more than 5dB and has a rhythmic characteristic | Add 5dB |  |
| Fluctuating low-frequency noise | C weighted overall level | If the low-frequency noise is fluctuating +/- 5dB (i.e. 10dB(C) overall difference between LC10 and LC90 using fast response) | Add 5dB | All noise energy down to 10Hz should be considered. |

6.2 Determining LAmax level

1. As operational LAmax levels can vary, the LAmax is considered by assessing:
2. the arithmetic average of the maximum levels from up to 15 single events over a given night-time period, 10pm to 7am;
3. the absolute highest LAmax level.
4. LAmax assessment only applies to ‘specified noise sources’ which are defined as:
5. impact noises;
6. hammering;
7. loading/unloading;
8. dropping items;
9. beepers, alarms, bells, phones, sirens;
10. power tools;
11. valve releases;
12. air brakes;
13. door slamming.

Note—People noise and vehicle pass-by noise (engine, exhaust, induction, tyres) are specifically excluded.

6.3 Low-frequency noise

1. The C-weighting offers a more appropriate method to assess low-frequency noise. All energy down to 10Hz should be considered. Low-frequency sources are typically located in power stations, industrial sites, extractive industries and wind farms. The low-frequency C-weighted noise is to be adjusted in the same manner as the A-weighted level, as per section 6.1. That is, tonal, impulsive, modulating and fluctuating noise adjustments are to be applied.
2. A low-frequency assessment may often not be required where the noise being considered does not involve a significant contribution from low frequencies. Some specific source examples where low frequency should be considered are:
3. gas turbines;
4. boilers;
5. forced draft and induced draft fans;
6. shakers on hoppers;
7. vibratory screens;
8. wind farms;
9. power stations, generators;
10. night clubs or uses that provide amplified music.

6.4 Vibration

1. The descriptors used to define vibration are not the same as those used to describe sound. Vibration can generally be described in terms of acceleration, velocity or displacement. The most commonly used descriptor for vibration for structural damage and human comfort is velocity.
2. AS 2187.2—Explosives—Storage Transport and Use, Part 2 Use of Explosives describes the commonly used damage criteria for buildings in terms of peak particle velocity (PPV) in mm/s. The peak particle velocity is the maximum vector sum of three time synchronised velocity components and it is measured at the ground surface.
3. Detailed analysis is outlined in BS 7385-2 : 1993 Evaluation and measurement for vibration in buildings, Guide to damage levels from groundborne vibration which provides frequency range vibration levels. Building damage is more closely related to stress, which is related to displacement. Constant peak to peak displacement levels at differing frequencies translate to vibration velocity, which increases with frequency. Because of this, the criterion allows greater vibration velocity levels at higher frequency.
4. Cosmetic building damage from sources such as piling, construction activities, machinery or road/rail traffic is also covered in BS 7385-2 : 1993 Evaluation and measurement for vibration in buildings, Guide to damage levels from groundborne vibration. The criteria for cosmetic damage are component levels, not PPV. Values referred to are at the base of the building.
5. For certain buildings, such as those of historical value or those containing equipment that is sensitive to vibration, vibration levels lower than those shown in the criteria may be required.
6. For human vibration comfort level assessment in buildings, BS 6472 : 1992 Guide to evaluation of human exposure to vibration in buildings (1 to 80 Hz) describes suggested vibration levels in buildings for human comfort.
7. Continuous vibration continues uninterrupted for a defined period (usually throughout daytime and/or night-time). Continuous vibration includes: machinery, steady road traffic and continuous construction activity (such as tunnel boring).
8. Impulsive vibration is a rapid build-up to a peak followed by a damped decay that may involve several cycles of vibration (depending on frequency and damping). It can also consist of a sudden application of several cycles at approximately the same amplitude, providing that the duration is short, typically less than 2 seconds. Impulsive vibration includes: infrequent activities that create up to 3 distinct vibration events per day or night period, e.g. dropping of heavy equipment, occasional loading and unloading.
9. Intermittent vibration is interrupted periods of continuous vibration or repeated periods of impulsive vibration, or continuous vibration that varies significantly in magnitude. Intermittent vibration includes: trains, intermittent construction activity, passing heavy vehicles, forging machines, impact pile driving, jack hammers. Where the number of events is 3 or fewer per day or night period, these can be assessed against impulsive criteria.
10. There is a low probability of adverse comment or disturbance to building occupants at vibration values below the preferred criteria. Activities should be designed to meet the preferred values where an area is not already exposed to vibration. Where all reasonable and practical measures have been applied, values up to the maximum value may be used if they can be justified, e.g. temporary disturbances and infrequent events of short term duration. For values beyond the maximum value, a management plan in accordance with the Management plans planning scheme policy is required.

7 Comparison to noise criteria and where noise criteria are exceeded

1. Where the noise criteria are forecast to be exceeded after the application of noise impact control measures (as per section 4), the noise impact assessment report is to include the following:
2. Justification that there are no technically and economically feasible noise impact control measures that can be applied to the development to enable achievement of the criteria.
3. A description of the predicted nature and scale of the noise impact on sensitive uses in accordance with the methodologies in this section, to enable an analysis of impact versus benefit of the development.
4. In certain circumstances it may be demonstrated that the effect of the proposed noise source is minimal where the existing environment has a more significant impact and has similar characteristics (e.g. where the development may produce occasional vehicle noise at a location where the sensitive use is exposed to existing frequent road traffic noise)
5. The potential impact resulting from the inability to achieve the noise criteria is to be assessed by comparing:
6. the relationship between community annoyance and noise metrics curves for aircraft, road traffic, rail traffic and industrial noise shown in Figure a;
7. the relationship between sleep awakenings and internal night time noise level shown in Figure b.
8. The predicted community annoyance from the existing acoustic environment (for industry, aircraft, road and rail noise) can be determined from Figure a. This is to be compared to the predicted community annoyance from the proposed new noise sources, expressed as the percentage of the community highly annoyed, which is to be determined using the following formulas:
* Aircraft %HA = –9.199 × 10–5 (DENL – 42)3 + 3.932 × 10–2 (DENL–42)2 + 0.2939 (DENL – 42)
* Road traffic %HA = 9.868 × 10–4 (DENL – 42)3 – 1.436 × 10–2 (DENL–42)2 + 0.5118 (DENL – 42)
* Railways %HA = 7.239 × 10–4 (DENL – 42)3 – 7.851 × 10–3 (DENL–42)2 + 0.1695 (DENL – 42)
* Industry %HA = 36.307 - 1.886 DENL + 0.02523 DENL2
* DENL = 10 log [(12/24) × 10LD/10+ (4/24) × 10(LE+5)/10 + (8/24) × 10(LN+10)/10]

Note—

* %HA is the per cent of people highly annoyed by the noise.
* LD is the A-weighted long-term LAeq for the day (0700–1900 hr) determined over the year at the most exposed facade.
* LE is the A-weighted long-term LAeq for the evening (1900–2300 hr) determined over the year at the most exposed facade.
* LN is the A-weighted long-term LAeq for the night (2300–0700 hr) determined over the year at the most exposed facade.
* The day, evening and night time periods for this descriptor are based on the European Union (EU) metric, this is different from the day, evening and night time periods used in this planning scheme policy.
* DENL is the 'day, evening, night level' defined in terms of averaged LAeq for the day, evening and night, and applies a +5dB adjustment for evening and +10dB adjustment for night.



1. Where the development involves a proposed sensitive use in an existing noisy environment, sleep awakenings (the worst case number of noise-induced awakenings per person per year) are to be estimated using the following formula and compared to Figure b:

Worst case number of noise-induced awakenings per person per year

=

Note—Lnight\_i is the internal night noise indicator, which describes the annoyance due to environmental noise, based on the LAeq measured over the night period 23.00 to 07.00 averaged over 1 year.

Note—When using this method for the purpose of facade design for new sensitive uses, windows can be assumed to be closed.

