Noise impact assessment for the modification of existing industrial premises

Background

Chapter 10 of the *NSW Industrial Noise Policy* (INP) outlines the application of the policy to existing industrial premises.

As well as being used to assess noise emissions from new industrial premises, the INP is also applied to situations where existing industrial premises are modified, expanded or upgraded.

Where a modification is proposed, the noise level targets for the premises (termed Project Specific Noise Levels) are to be determined firstly excluding any noise from the subject premises. The noise from the existing premises is then assessed against these targets to determine if there is a need to consider noise mitigation for existing operations. The predicted noise level from the proposed modification is then assessed, both in isolation and in combination with noise from the existing premises.

The total noise emissions from the modified premises should ideally not exceed the Project Specific Noise Levels. If the existing premises cannot achieve these targets, the allowable noise emissions from the proposed modification will be set so that the modification does not significantly increase the existing noise emissions.

Recommended approach

This application note outlines these processes together with the degree of information required to support a proper assessment of modifications to an existing industrial premises.

A noise impact assessment for the modification of existing industrial premises should include, as a minimum:

- existing noise criteria contained in consents, approvals or licences, that are applicable to the premises;
- Project Specific Noise Levels (PSNLs) for the premises determined in accordance with the INP and relevant application notes (see, for example, Appendix A4 of the INP). *Note: care should be taken to exclude noise from the existing premises when quantifying background and existing industrial noise levels* (further guidance is in the INP in Chapter 11.1.2);
- where application of the INP results in a PSNL more stringent than existing noise criteria, the PSNL should be adopted for noise assessment purposes. *Note: the INP acknowledges that the PSNL is a goal sought to be achieved through the application of feasible and reasonable noise mitigation measures and is not necessarily applied as a statutory limit by default.*
- measured or predicted noise levels from the existing premises at noise sensitive receiver locations;
- predicted noise contribution from the proposed modification, in isolation, at noise sensitive receiver locations; and
- cumulative noise levels from the entire premises (i.e. combined level from existing and proposed modification) compared to the PSNL.

Where noise from the existing premises exceeds the PSNL

Where it can be determined that noise from the existing premises alone is currently exceeding the PSNL, a preliminary analysis of potential noise mitigation measures, and conceptual noise reductions, needs to be undertaken for the existing premises.

Note: this does not mean that in all circumstances noise mitigation to existing premises will be required as part of a modification. Decisions of this nature will be determined on a case-by-case basis, taking into account various factors, for example, feasible and reasonable mitigation options, the absolute level of noise and existing measures of community impact, including complaints.

Once the conceptual mitigated level of noise performance of the existing premises (i.e. what can be achieved) has been determined, the contribution noise level goal for the modification can be determined. The noise level goal for the modification should be set at least 10dB below the PSNL, or where it has been determined that the existing premises cannot achieve the PSNL, it should be set at least 10dB below the conceptual mitigated noise performance of the existing premises.

This approach is designed to ensure that noise from the modification does not become the limiting factor in noise from the entire premises potentially meeting the PSNL.

Determining temperature inversion parameters from direct measurement

Background

The propagation of noise from a source, such as an industrial premises, to a receiver can be enhanced by local weather effects, including temperature inversions.

Inversions occur where air temperatures increase with height above ground level, and are most commonly caused by radiative cooling of the ground at night leading to the cooling of the air in contact with the ground. Higher air that is more removed from ground contact will not cool as much, resulting in warmer air aloft than nearer the ground. This effect is especially prevalent on cloudless nights with little wind.

As a result, sound waves travelling upwards into the atmosphere are refracted back down towards the ground, often tending to focus in localised areas. This can increase noise levels at certain locations by 5 to 10 decibels or more in extreme conditions.

Where an industrial premises is to operate during the night-time period (10pm to 7am), the presence of temperature inversion conditions at that location for over 30% of the total night-time hours during winter means that night-time operations at the premises must be assessed under temperature inversion conditions according to Section 5.2 of the Industrial Noise Policy (INP). This is determined by analysing past weather data patterns at or near the site.

Recommended approach

This application note clarifies which weather data is to be included in the analysis, and how to deal with situations where multiple options may exist for certain parameters used in the analysis.

The procedure for determining inversion parameters from direct measurement is set out in Table E2 in Appendix E of the INP.

Table E2 is to be revised as follows (changes marked in bold type):

Step	Procedure
1	Sort the night-time (the period between 1 hour before sunset to 1 hour after sunrise - taken to be 6 pm to 7 am) temperature gradients with associated wind speed in ascending order.
2	Convert the temperature gradients into their corresponding stability categories according to Table E1.
3	If F or G stability categories occur for a period of 30 per cent of the total night-time or more, either separately or in combination, then temperature inversions are considered to be a significant feature of the area and need to be assessed.
4	If F or G stability categories occur for a period of 30 per cent of the total night-time or more, determine the ninetieth percentile temperature gradient value from the full **F and G stability category subset created at Step 3** (that is, the highest tenth per cent value). This may be done automatically using the percentile function available in many spreadsheet programs; or the value may be determined manually by sorting the data in ascending order by temperature gradient and choosing the highest tenth per cent value. The wind speed associated with the chosen temperature gradient is the one to be used in the assessment. **In the event that there is more than one wind speed associated with the chosen temperature gradient, the average of the associated wind speeds should be used in the assessment.**

Notes to table:

Step 3 - When undertaking an analysis of temperature inversions at a site, all F class and G class stability data should be included in the assessment of occurrence for 30% or more of the night-time period in winter for establishing significance at the F class gradient value. G class values are only significant by themselves if G class alone accounts for more than 30% of the time. This applies where rainfall is greater than 500mm per year.

Step 4 - "full data set" has been replaced with "F and G stability category subset created at Step 3" because other stability categories below F (i.e. A, B, C, D and E) do not represent significant weather.

- As there may be more than one wind speed associated with the ninetieth percentile value, clarification has been added to state that an average of the associated wind speeds should be used.

Determining what weather conditions should be used when predicting noise

Background

The *NSW Industrial Noise Policy* (INP) intends that the noise levels used in assessing noise impacts at the consent stage are the reasonable worst case conditions that will occur in practice when the development operates. This means that the effects of weather conditions such as temperature inversions and wind on the noise level experienced at sensitive receivers should be adequately assessed at the consent stage.

The application note *'Determining temperature inversion parameters from direct measurement'* explains how temperature inversions can enhance noise propagation. Wind can also enhance noise propagation compared with calm conditions (where there is no wind). When a wind blows, friction causes the air to move more slowly close to the ground than at higher altitudes. This phenomenon of wind speed increasing with height is termed 'wind shear'. The increase in noise occurs because sound waves from the source are bent through this 'wind shear' back towards the ground.

Unlike temperature inversions, wind can enhance propagation during any time of the day, evening or night. Wind does not increase noise in all directions and can also reduce noise. For example, wind blowing from the south to the north (termed a 'southerly' wind) increases noise to the north of an industrial premises and also reduces noise to the south of that premises.

In some instances, where one or more significant weather conditions have been identified as part of a noise assessment, noise levels from the industrial premises under only these significant weather conditions have been assessed, but noise levels under calm conditions have not.

The INP describes in Chapter 5 when weather is "significant" (i.e. it occurs more than 30% of the relevant time period) and how to apply this in the noise assessment. This approach may result in noise levels at some receivers being underestimated, as in the southerly prevailing wind scenario described above.

Recommended approach

This application note clarifies that in all cases at each receiver:

1. noise levels from the premises under calm conditions as well as any *significant* weather conditions as defined in the INP should be predicted or measured
2. the highest of the noise levels from Step 1 is to be used in the assessment for that receiver.

The intent of the INP is not to require that these conditions should be applied exclusively where the *significant* weather conditions act to reduce noise at a sensitive receiver.

For example, where a *significant* prevailing wind of speed less than three metres per second increases noise levels at a receiver to the north of a development (compared with those predicted under calm conditions), the noise levels predicted under that prevailing wind should be used at that receiver. For receiver(s) to the south of the same development, if the noise levels predicted under calm wind conditions are

higher than those predicted under the *significant* prevailing wind, the noise levels predicted under calm wind conditions should be used at the southern receiver(s).

DECCW has previously accepted (and will accept) noise predictions based on modelling noise emissions using long term weather data, as it can present a higher level of analysis than that required under the INP.