PACIFIC HIGHWAY UPGRADE
OXLEY HIGHWAY TO KEMPSEY
NOISE & VIBRATION WORKING PAPER

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7 MAXIMUM NOISE LEVEL ASSESSMENT

Although there are no specific criteria relating to sleep disturbance in the *Environmental Criteria for Road Traffic Noise* (ECRTN) (EPA 1999), the document recommends that an assessment of such levels be undertaken where impacts could occur during the night. The only guidance offered in terms of acceptable maximum noise levels are:

- *Maximum internal noise levels below 50-55 dB(A) are unlikely to cause awakening reactions.*
- *One or two noise events per night with maximum internal noise levels of 65-70 dB(A) are not likely to significantly affect health and wellbeing.*

The RTA's *Environmental Noise Management Manual* (ENMM) (RTA 2001) puts forward a protocol for assessing maximum traffic noise levels. In Practice Note (iii) the document states:

> *At locations where road traffic is continuous rather than intermittent, the $L_{Aeq,9hr}$ target noise levels should sufficiently account for sleep disturbance impacts.*
>
> *A 'maximum noise event' can therefore be defined as any passby for which*
>
> L_{Amax}-$L_{Aeq,\ 1hr}$ >= 15 dB(A)

7.1 Measurement of maximum noise levels

Recent technical innovations have enabled the easier collection of accurate data regarding maximum noise levels, and in particular, frequency of occurrence of 'maximum noise events' using a noise logger. Traditional environmental noise loggers capture several statistical parameters including maximum noise level over any period greater than one minute and typically fifteen minutes. While this data would indicate the absolute maximum level over the measurement period, there is no way of knowing how frequently such maxima occurred.

During the background noise monitoring survey outlined in Chapter 2, a MADMax recorder was connected to an ARL environmental noise logger at two of the noise monitoring locations (Table 7-1) to detect and measure maximum levels from truck passbys. This device can be programmed to record all maximum levels above a specific sound pressure level. The data can later be downloaded and analysed. The following default parameters were used in setting up the MADMax devices:

- Sample time: time between readings of the instantaneous sound pressure level from the logger. 125 milliseconds is the default, and is adequate for events such as vehicle passbys.
- Minimum drop between maxima (default 3 dB(A)): if the noise level does not fall by at least this amount between two local maxima, they are treated as being part of the same event.
- Minimum time between maxima (default 3 seconds): if two local maxima are separated by less than this period, they are treated as being part of the same event.
- Maximum wait time for drop (default 25 seconds): if the noise level does not fall by the minimum drop value within this time period after a local maximum, the maximum is not considered to be an event.
- Minimum recorded maxima (default 50 dB(A)): noise events are not recorded in the database if the maximum level is below this value.

Maximum noise levels were collected over the course of one night at the locations listed in Table 7-1.

Table 7-1 Location of MADMax devices

Location	Date	Distance from Road (m)
Cassegrain Winery, 764 Fernbank Creek Road (Site 12)	22/12/06-23/12/06	40
5 Cooperabung Drive, Telegraph Point (Site 8)	22/12/06-23/12/06	80

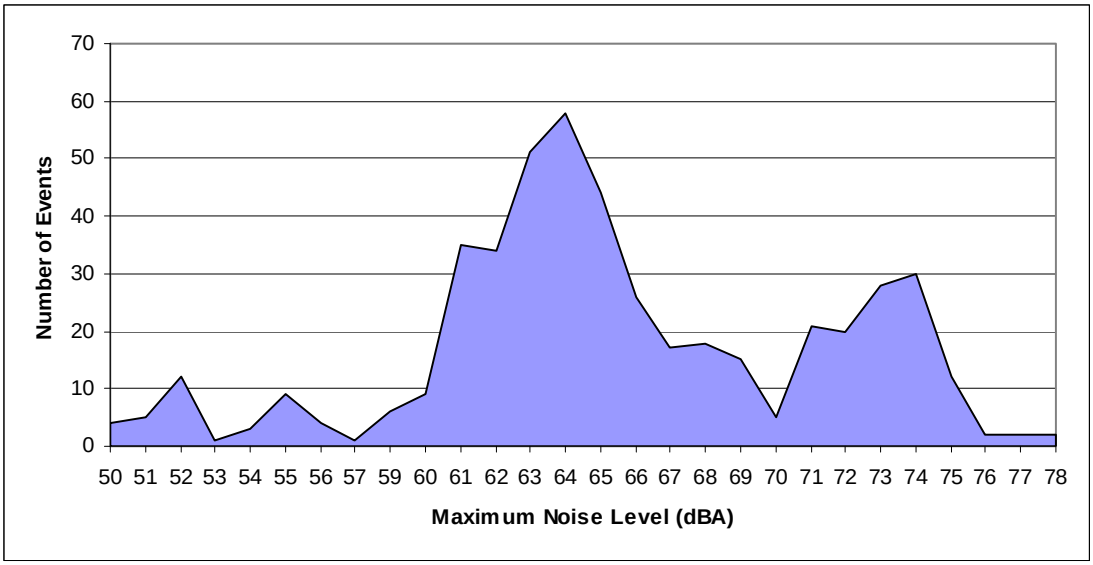
Locations were chosen that were relatively close to the existing Pacific Highway so as to ensure that captured levels were from passing vehicles and not extraneous noise from other sources. The equipment calibration was checked before and after the survey and no significant drift occurred. Data was downloaded and maxima from the night time (10pm-7am) period analysed.

7.2 Assessment of maximum noise levels

7.2.1 Cassegrain Winery

Figure 7-1 shows the frequency curve for recorded maximum noise events at Cassegrain Winery. Given the proximity to the existing highway it is highly unlikely that any of the measured maxima are caused by anything but the passing of vehicles at night.

Figure 7-1 Frequency distribution of maximum external noise levels Cassegrain Winery



There are two clear peaks in the graph which define the frequency distribution of passing cars (62-65 dB(A)) and trucks (72-75 dB(A)) respectively.

The above graph does not however allow for any assessment of sleep disturbance as it is likely that many of the L_{Amax} events above would not be sufficiently above the ambient noise level to cause awakening reactions.

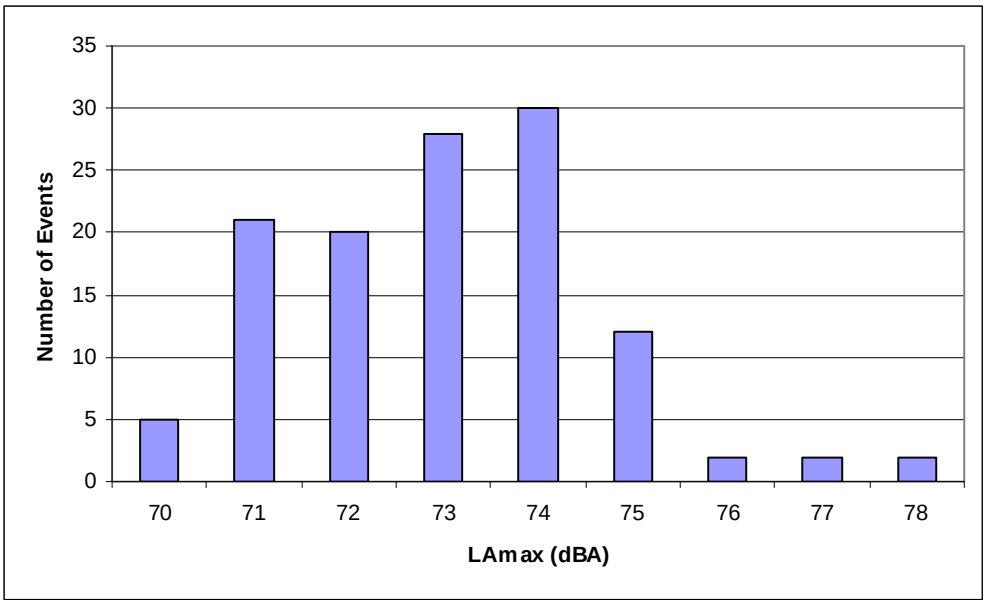
Using the protocol outlined in the ENMM which defines a maximum noise event, namely $L_{Amax} - L_{Aeq,1hr} >= 15$ dB(A), the measured $L_{Aeq,\ 1hr}$ traffic noise levels during the measurement period at Cassegrain Winery are shown in Table 7-2 below.

Table 7-2 Measured $L_{Aeq,\ 1hr}$ traffic noise levels

Period	$L_{Aeq,\ 1hr}$
10pm-11pm	58.3
11pm-12am	57.7
12am-1am	57.8
1am-2am	56.5
2am-3am	55.7
3am-4am	56
4am-5am	55.6
5am-6am	55.4
6am-7am	56.7

Applying the dataset of L_{Amax} levels illustrated in Figure 7-1 to these ambient L_{Aeq} levels, a graph of *Environmental Noise Management Manual* (ENMM) (RTA 2001) maximum noise events is derived and shown in Figure 7-2 below.

Figure 7-2 Frequency distribution of ENMM maximum external noise events Cassegrain Winery

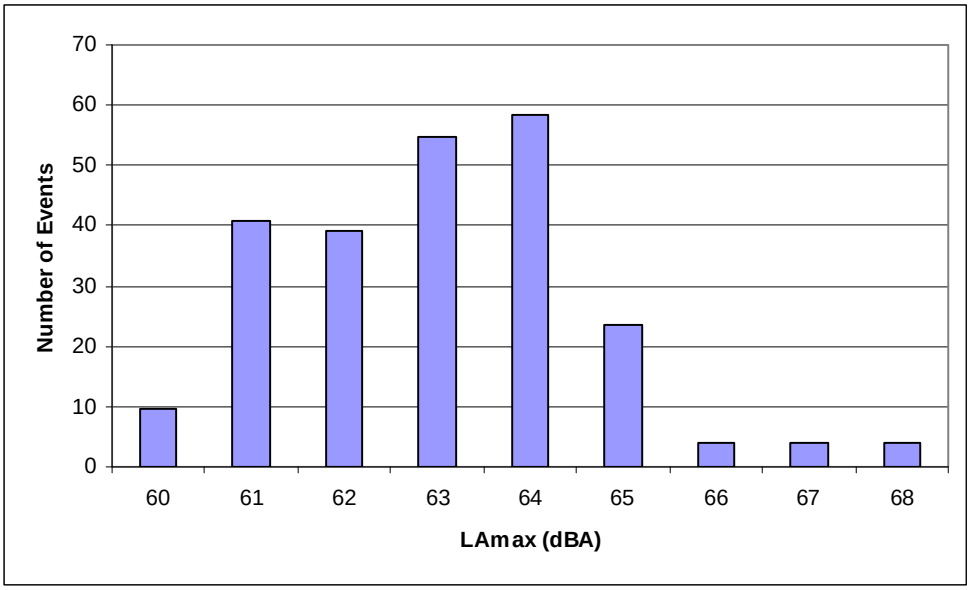


In order to predict the number of internal maxima, the following adjustments are made to the frequency curve in Figure 7-2:

- 10 dB(A) is subtracted from the measured maxima to conservatively estimate internal noise levels with windows open for ventilation.
- The number of maxima is increased by 95% to account for the projected maximum increase in current heavy vehicle movements at night from 2006 to 2026.

Figure 7-3 shows the adjusted frequency distribution curve for maximum internal noise events at Cassegrain Winery, which reflects the predicted frequency of internal maximum noise levels for 2026.

Figure 7-3 Adjusted frequency distribution of maximum internal noise levels Cassegrain Winery

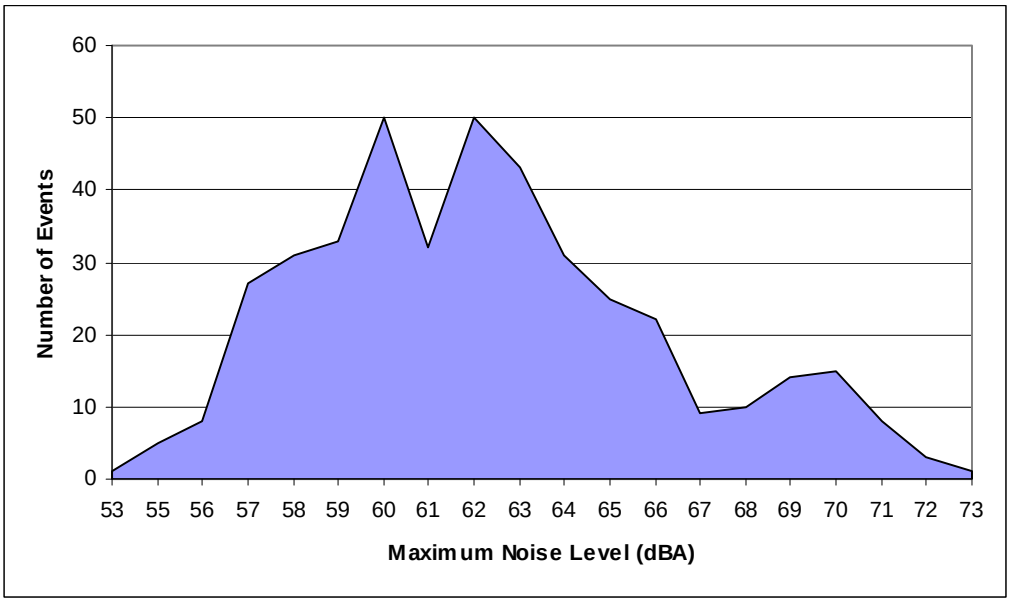


The maximum predicted internal levels do not exceed the upper end of the health and wellbeing guidelines of two events at 65-70 dB(A) per night. Twelve events are predicted with a maximum level exceeding the lower end of the noise guidelines.

7.2.2 5 Cooperabung Drive

Figure 7-4 shows the frequency curve for recorded maximum noise events at 5 Cooperabung Drive. Given the proximity to the existing highway it is highly unlikely that any of the measured maxima are caused by anything but the passing of vehicles at night.

Figure 7-4 Frequency distribution of maximum external noise levels 5 Cooperabung Drive



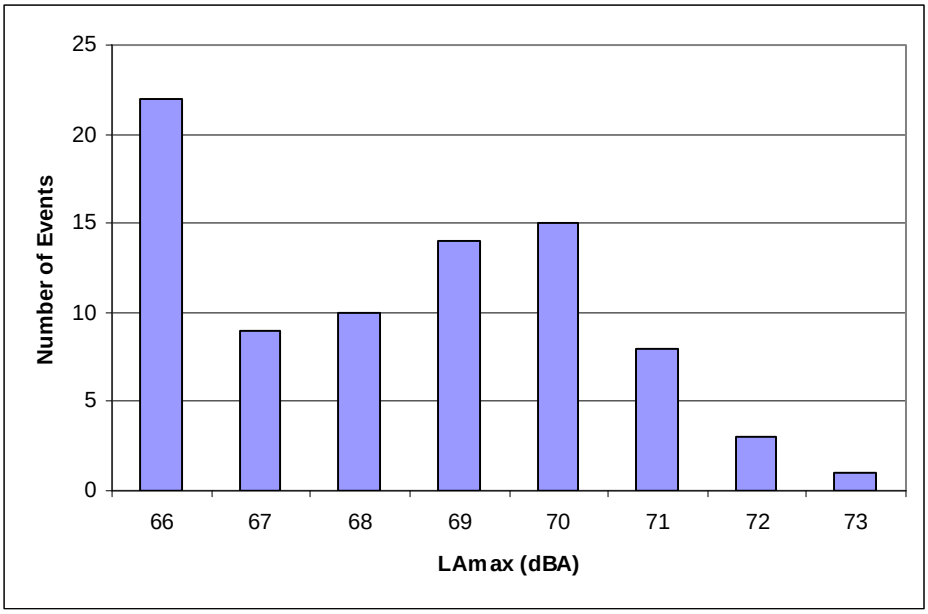
Similarly to the Cassegrain Winery site, there are two clear peaks in the graph, which define the frequency distribution of passing cars (59-64 dB(A)) and trucks (69-70 dB(A)) respectively.

Using the procedure outlined above, a graph of ENMM maximum noise events shown in Figure 7-5 is derived from the measured $L_{Aeq,\ 1hr}$ traffic noise levels shown in Table 7-3 below.

Table 7-3 Measured $L_{Aeq,\ 1hr}$ taffic noise levels

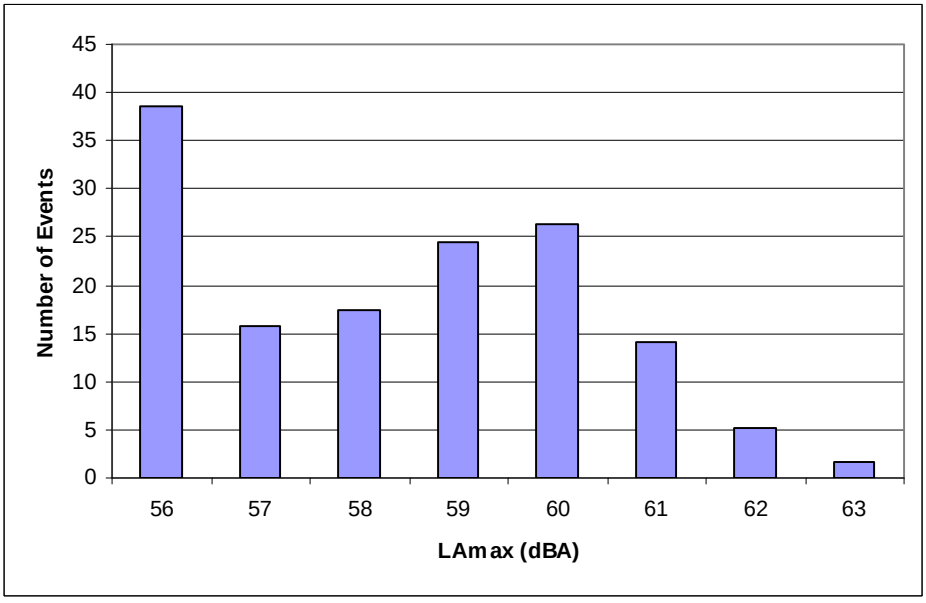
Period	$L_{Aeq,\ 1hr}$
10pm-11pm	54.3
11pm-12am	53.5
12am-1am	53.5
1am-2am	52.9
2am-3am	52.4
3am-4am	52.4
4am-5am	51.4
5am-6am	52.8
6am-7am	52.3

Figure 7-5 Frequency distribution of ENMM maximum external noise events 5 Cooperabung Drive



In order to predict the number of internal maxima, the same adjustments described above are made to the frequency distribution curve in Figure 7-5. The adjusted frequency distribution curve for maximum internal noise events at 5 Cooperabung Drive, which reflects the predicted frequency of internal maximum noise levels for 2026, is shown in Figure 7-6.

Figure 7-6 Adjusted frequency distribution of maximum internal noise levels 5 Cooperabung Drive



7.3 Summary of Results

There are 14 residences within approximately 80m of the Proposal, of which 7 are located within the footprint of the Proposal and would be demolished during construction. The 7 remaining residences are generally located between 50 and 80 metres from the Proposal and noise levels could exceed the lower end of the wakening reaction range. These residences are already identified for architectural treatment.