2 November 2016

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Our Ref: MW 021116 TRAFFIC Ver 2
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Mike Williams
Legacy Property
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SYDNEY NSW 2000

Dear Mike

Re: Caddens - Central Bypass Road Traffic Noise – Stage 2-6

We have conducted a detailed noise assessment of potential future traffic noise associated with the Caddens Precinct at the Eastern Precinct of the Central Bypass Road (Road 1). The assessment has been conducted to determine necessary noise control measures in accordance Item **"E1.5.1 Visual Privacy and Acoustic Amenity"** of the Penrith DCP 2014 which addresses the Caddens Precinct.

Subject Lots in these stages consist of:

Stage 2

201, 208, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245.

Stage 4

410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432.

1 Traffic Noise Predictions

Daytime Peak Hour $L_{Aeq(1\ hr)}$ traffic noise levels at future residences on the central bypass road have been conducted using the CADNA A noise prediction software. The predictions of traffic noise are based on:

- Peak Hour traffic flows as presented in the Final WELL TMAP traffic report revision D figure 4 (attached).
- 3% Heavy Vehicles. (As advised by the Traffic Consultants).
- Topographic details and road design as supplied by the landscape architects and urban designers.
- The CoRTN traffic noise prediction procedure.

Traffic noise levels have been predicted for the daytime peak hour periods only as no traffic flow data is available for the night periods. It is likely that traffic flows will be significantly higher in the daytime than night for the bypass road, therefore the daytime noise levels are likely to represent a "worst case" scenario.

2 Traffic Noise Criteria

Traffic noise criteria are detailed in the DCP as follows:

> "Residential subdivision and development must be designed to comply with the NSW Road Noise Policy criteria".

However, the NSW Road Noise Policy only addresses noise at existing residences affected by new roads or additional traffic noise on roads. Therefore, the conditions of the DCP are the applicable noise objectives for this site. The following internal noise criteria as specified in the DCP is to be achieved.

7) For new residential development along the Caddens Road By-pass, where external traffic noise levels cannot be met at the nearest facade of the dwelling to the noise source, dwellings must be designed to meet the following internal noise levels:

   a) In a naturally ventilated - windows open condition (i.e, windows open up to 5% of the floor area, or attenuated natural ventilation open to 5% of the floor area), or mechanically ventilated windows closed condition:

Sleeping areas	LAeq 1 hour, Day	40dB
	LAeq 1 hour, Night	35dB
Living areas	LAeq 1 hour, Day	45dB
	LAeq 1 hour, Night	40dB

   b) Where a naturally ventilated - windows open condition cannot be achieved, it will be necessary to incorporate mechanical ventilation compliant with AS1668 and the Building Code of Australia. The noise levels above shall be met with mechanical ventilation or air-conditioning systems not operating. The following LAeq noise levels shall not be exceeded when doors and windows are shut and mechanical ventilation or air conditioning is operating:

Sleeping areas	L_{Aeq} 1 hour, Day	43dB
	L_{Aeq} 1 hour, Night	38dB
Living areas	L_{Aeq} 1 hour, Day	46dB
	L_{Aeq} 1 hour, Night	43dB

Note: These levels correspond to the combined measured level of external sources and the ventilation system operating normally

Note: LAeq 1 hour noise levels shall be determined by taking as the second highest LAeq 1 hour over the day and night period for each day and arithmetically averaging the results over a week for each period (5 or 7 day week, whichever is highest)

A review of the above DCP traffic noise requirements indicates that the internal acoustic amenity of residences is to be protected by a suitable facade construction that provides a noise reduction to habitable areas of a residence.

It is a commonly accepted fact that, for standard glazing, a traffic noise reduction in the order of 10 dBA can be expected through an open window and 20 dBA with windows closed. Therefore, the internal windows open / closed criteria can be translated to an external traffic noise level as detailed in Table 1.

Table 1 Equivalent External Traffic Noise Criteria

Period	Room Type	Windows Open	Windows Closed
Day	Living	55	65
(7 am to 10 pm)	Sleeping	50	60
Night	Living	50	60
(10 pm to 7 am)	Sleeping	45	55

3 Noise from Bypass Road to Future Residences

Predicted peak hour traffic noise levels have been predicted at future residences that bound the Bypass Road. The predictions have been based on residences with a setback of 8-10 metres from the front boundary of each residential block.

Daytime traffic noise levels at the most affected facades range between 65 and 66 dBA at the most affected facade of these residences. The following Figure 2 shows predicted facade reflected noise levels at representative residential locations bounding the bypass road.

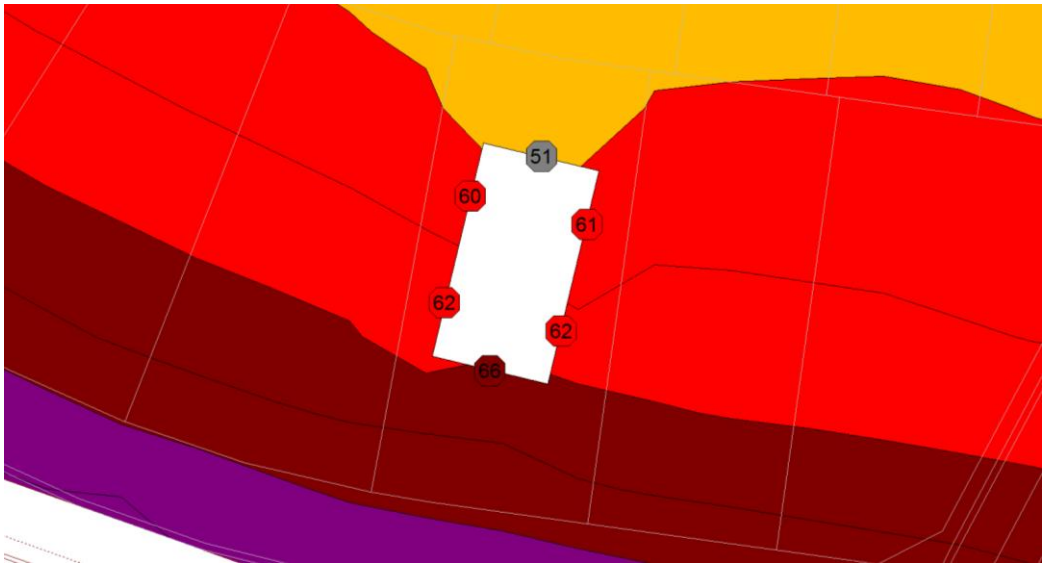
Figure 2: Predicted $L_{Aeq(1hr)}$ Daytime noise levels (Eastern Precinct) *.

*Daytime noise contours are attached at the end of this report.

As external noise levels at future residences along the bypass route are predicted to exceed applicable windows open noise criteria during the daytime peak hour compliance then with the internal windows closed criteria, as detailed in the DCP, is applicable. It is noted that these daytime levels represent a "worst case" traffic noise scenario where night levels will be more than 5 dBA below these levels, as such design for daytime traffic noise levels will result in compliance at night as well.

As stated previously standard 5mm domestic glazing provides a typical traffic noise reduction of 10 dBA and 20 dBA for windows open and closed, respectively. Figure 3 shows indicative reduction in noise around a residence.

Figure 3: Example of Noise Reduction of Traffic Noise around a Building



Conclusion

Based on the above the following internal noise levels can be expected within living and bedroom areas of future residences directly affected by traffic noise on the Bypass Road.

Table 2: Predicted Daytime Internal Noise Levels (Standard Glazing)

Room Orientation	Predicted Internal Noise Level - dBA	
	Windows Open	Windows Closed
Facing Road	55-56	45-46
Side of House	50-51	40-41
Rear of House	32-33	22-23

Therefore, the following treatments have been determined to be applicable for Living rooms (Table 3) and Bedrooms (Table 4) of residences on the Bypass Road (Road 1);

Table 3: Acoustic Requirements for Living Rooms of Residences on the Bypass Road.

Room Orientation	Glazing	Ventilation
Facing Road	Standard Glazing with Q-Lon seals	Install Ducted Ventilation or Wall Ventilator to rooms where the natural ventilation requirements of the BCA cannot be satisfied.
Side of House	Standard Glazing with Q-Lon seals	Install Ducted Ventilation or Wall Ventilator to rooms where the natural ventilation requirements of the BCA cannot be satisfied.
Rear of House	Standard Glazing	Open windows

Table 4: Acoustic Requirements for Bedrooms of Residences on the Bypass Road.

Room Orientation	Glazing	Ventilation
Facing Road	6.38 mm Laminated Glass with Q-Lon seals	Install Ducted Ventilation or Wall Ventilator to rooms where the natural ventilation requirements of the BCA cannot be satisfied.
Side of House	Standard Glazing with Q-Lon seals	Install Ducted Ventilation or Wall Ventilator to rooms where the natural ventilation requirements of the BCA cannot be satisfied.
Rear of House	Standard Glazing	Open windows

4 Mechanical Ventilation

The need for mechanical ventilation should be reviewed for each particular dwelling along the route at DA stage by a mechanical engineer. Rooms at the rear of a residence do not require ventilation as any openings will be shielded from traffic noise. This is illustrated in the following Figure 3 which shows the reduction in traffic noise levels on each facade of a typical building.

In addition, some rooms, such as living rooms, may be have windows directly exposed to traffic noise on one side whilst at the same time also have windows or doors on a side of the building that are shielded from traffic. In such case the natural ventilation requirements of the BCA may be achieved and therefore no mechanical ventilation will be required.

5 Conclusion and Recommendations

An assessment of traffic noise at the Caddens Precinct (Stages 2-6) based on the TMAP 2016 traffic flows indicates the following future eastern precinct residences on the bypass road are likely to be subjected to traffic noise levels during daytime peak hours that exceed the DCP noise criteria.

Accordingly noise controls will be required at houses as detailed in Tables 3 and 4 of this assessment. In order to satisfy the requirements of the DCP the following procedure should be adopted;

- Review the design of proposed dwellings to be located on the Bypass road and determine room types and orientation with respect to the roadway.
- In the case of Living areas select appropriate treatments as detailed in Table 3.
- In the case of Bedrooms select appropriate treatments as detailed in Table 4.
- Document these requirements on the on the DA drawings.

The above procedure will ensure that the acoustic amenity of future resident is protected. It should be noted that the above procedures are applicable only to residences on the Bypass road (Road 1) as residences behind the first row of residences will be shielded from traffic noise by this first row of residences.

I trust this information is sufficient. Please contact us if you have any further queries.

Yours faithfully
WILKINSON MURRAY PTY LIMITED

Brian Clarke
Senior Associate

Figure 4: Daytime Peak Hour $L_{Aeq(1\ hr)}$ Traffic Noise Levels – Eastern Precinct (Stage 2-6)