SOUTH EDMONDSON PARK CONCEPT APPLICATION

NOISE & VIBRATION IMPACT ASSESSMENT

ACOUSTICS AND AIR

REPORT NO. 09190-LC
VERSION A

WILKINSON MURRAY

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AUGUST 2010

PREPARED FOR

LANDCOM

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1 INTRODUCTION

This noise and vibration assessment has been prepared by Wilkinson Murray (Sydney) Pty Ltd to accompany a Project Application under Part 3A of the Environmental Planning & Assessment Act, 1979 (EP&A Act) and a proposal for State significant site listing under Schedule 3 of State Environmental Planning Policy Major Development 2005 (SEPP Major Development) in relation to the former Ingleburn Army Base and certain adjoining lands within the Edmondson Park Precinct of the South West Growth Centre (referred to herein as 'Edmondson Park').

Landcom is proposing to deliver a new diverse and sustainable urban community at Edmondson Park South. Once complete, Edmondson Park will accommodate a mix of land uses, a diversity of housing (approximately 3,200 dwellings), a new town centre incorporating 35,000 – 45,000m2 retail, business and commercial floor space with employment opportunities for 1,000 people, multi-purpose community and education facilities, a new 150 hectare Regional Park, a number of other local parks and environmental conservation areas.

The new urban community at Edmondson Park South will meet the State Government's objectives to increase housing supply, provide community benefits and create jobs.

The Edmondson Park South project is the subject of a Part 3A Concept Plan and proposal to list Edmondson Park South as a State significant site under SEPP Major Development 2005. The purpose of the Concept Plan is to secure statutory approval for the overall planning framework for the site and to further resolve a number of remaining site-wide infrastructure delivery and land use planning issues. The Stage 1 Project Application (submitted concurrently with the Concept Plan) relates to early works, infrastructure and subdivision for the initial phases of the development and will enable site works to begin in 2010.

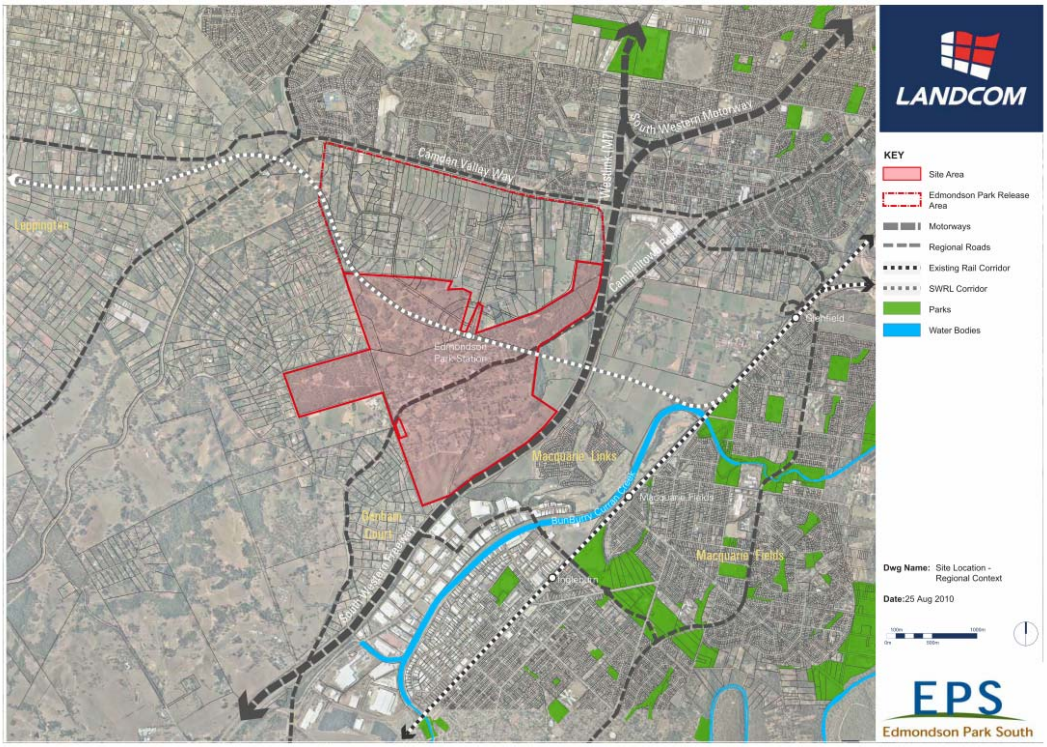
This report assesses noise and vibration impacts for the concept associated with the following sources:

- traffic noise associated with Campbelltown Road, Macdonald Road and the Motorway; and
- construction noise and vibration criteria associated the concept.

2 THE SITE

The subject site comprises an area of approximately 413.3 hectares and forms part of the larger Edmondson Park Release Area within the South West Growth Centre. It is located to the north-west of the M5 Motorway and lies approximately 40 km to the south west of Sydney CBD. Approximately 260.4 hectares of the site is located within the Liverpool LGA and approximately 152.9 hectares is located within the Campbelltown LGA. A location plan is shown at **Figure 2.1**

Figure 2.1 Site Plan



2.1 Concept Plan

The Concept Plan establishes the overall planning framework for the site, including:

- land use type and distribution;
- a mix of housing types and densities (approximately 3,200 dwellings);
- concept location of and approximately 35,000 – 45,000 m^2 of retail / business / commercial floor space within the new Edmondson Park Town Centre;
- identification and location of open space and drainage corridors, environmental conservation lands (to form the new Regional Park), and local active and passive recreation facilities, including levels of embellishment;
- expanded Ingleburn North Primary School and new combined Primary/High School to the north of the site;
- road network layout;
- pedestrian and cycleway network layout;
- pedestrian bridge over the south western railway;

- Campbelltown Road corridor including the establishment of key intersection locations and configuration;
- utilities (including power, telecommunications and gas), infrastructure strategy, potable water strategy, sewer concept plan and water cycle management plan;
- location and dimensions of Bushfire Asset Protection Zones;
- appropriate interpretation of European and Aboriginal heritage located on the site;
- erection of signage and billboards;
- remediation works;
- decommissioning of the existing Sewerage Treatment Plant (STP); and
- demolition.

The Concept Plan also sets out an approval framework that will enable the carrying out of the works necessary to remediate the site in accordance with a Remediation Strategy without the need for undertaking further environmental assessment.

A variety of housing types is proposed to be delivered. This will provide for a range of housing price points and will include moderate income housing and housing for seniors.

It is proposed to develop the Edmondson Park site progressively in stages over a 15-20 year period. The Concept Plan will address the staging and delivery of the overall development having regard to the progressive delivery of necessary infrastructure, services and facilities; and market demand.

The Concept Plan is accompanied by a proposal with respect to the future developer contributions framework for the provision of local facilities and services within the Liverpool and Campbelltown LGAs as well as State Infrastructure.

2.2 Project Application

The residential subdivision Project Application comprises:

- the creation of 206 residential lots, 4 super lots for future subdivision 15 Environmental Living lots and 3 lots for dedication to Campbelltown City Council as Public Reserve in 5 stages*;*
- the dedication of roads to Campbelltown City Council*;*
- On-site works comprising:
    - tree removal;
    - earthworks including excavation, cut and fill;
    - design and construction of physical infrastructure, including roads, stormwater drainage and utility reticulation, traffic management works, establishment of open space areas;
    - retaining walls as determined during detailed design;
    - design and construction of staged stormwater water quantity and quality infrastructure to achieve objectives required by the Water Cycle Management (WCM) strategy for the greater site;
    - demolition of all existing structures;
    - erosion and sediment control to areas of roadworks and bulk earthworks including provision of temporary sedimentation ponds and diversion drains;
    - Design and construction of an ornamental pond;
    - Landscaping of road reservations;

- erection of signage and billboards; and;
- Embellishment of open space.

- Off-site works comprising:
  - construction of the sewer lead in from the Sydney Water carrier main at Ash Road;
  - upgrade of overhead mains and construction of electrical lead-in feeders from the existing zone substation at Prestons;
  - connection to utility services, potable and recycled water, electricity, gas and telecommunications in Campbelltown and MacDonald Roads;
  - Connection to existing stormwater drainage;
  - tree removal;
  - earthworks including excavation, cut and fill;
  - design and construction of physical infrastructure, including roads, stormwater drainage and utility reticulation, traffic management works, including the connection to the existing MacDonald Road;
  - design and construction of staged stormwater water quantity and quality infrastructure to achieve objectives required by the Water Cycle Management (WCM) strategy for the greater site;
  - erection of an acoustic wall;
  - erection of signage and billboards;
  - extension or relocation of existing services including potable and recycled water, gas, telecommunication, power;
  - demolition of all existing structures; and;
  - Proposed new intersection to existing Macdonald Road.

It is intended to seek staged Construction Certificates as necessary to facilitate the efficient delivery of each phase of, the development works.

The first stage residential Project Application will include the proposed construction of a gravity sewer line through the future Regional Park.

* A number of residue lots will be created in undertaking the Project Application, the number of lots identified in the above description relate to the ultimate number of lots that will be created in the Project Application.

2.3 Planning Background

The Edmondson Park Precinct, including the subject site, has been the subject of broad strategic planning investigation and environmental assessment over a number of years by Liverpool and Campbelltown City Councils, the Department of Planning, the Department of Defence (the current landowner of the Ingleburn Army Base) and Landcom (owner of certain lands).

The whole of the Edmondson Park Precinct has been released for urban development by the Minister for Planning. Part of the site - the Ingleburn Army Camp - is currently the subject of a 'delayed' rezoning for urban purposes under Liverpool Local Environmental Plan 2008 and Campbelltown (Urban Area) Local Environmental Plan 2002.

In June 2010 the Minister for Planning considered a Preliminary Assessment Report for the Edmondson Park Project that provided justification for the planning, assessment and delivery of the project to occur under Part 3A of the EP&A Act, having regard to the demonstrated contribution that the project will have to achieving State and regional planning objectives.

The Minister for Planning formed the opinion that the Edmondson Park Project constitutes a Major Project to be assessed and determined under Part 3A of the EP&A Act, and also authorised the submission of a Concept Plan for the site. In doing so, the Minister also formed the opinion that a State significant site (SSS) study should be undertaken to determine whether to list the site as a State Significant site in Schedule 3 of SEPP Major Development.

The Part 3A process under the EP&A Act allows for the Edmondson Park Project to be planned, assessed and delivered in a holistic manner, with a uniform set of planning provisions and determination by a single consent authority. Given the scale of the proposal, the Concept Plan and SSS listing provide the opportunity to identify and resolve key issues such as land use and urban form, development staging, infrastructure delivery and environmental management in an integrated and timely manner.

This report has been prepared to fulfil the Environmental Assessment Requirements issued by the Director General for the inclusion of the Edmondson Park site as a State Significant Site under SEPP Major Development, and for a Concept Plan approval for the development.

Specifically, this report addresses the following overall requirements:

Noise

(1) Demonstrate that the proposal will be designed, constructed, operated and maintained so that there is no unacceptable impact from noise. In particular assess the noise impact for the proposed rail line and existing and proposed roads having regard for increased traffic generated by the proposal. This should be assessed in accordance with the *Environmental Criteria for Road Traffic Noise (EPA 1999), and Development Near Busy Road – Interim Guideline (Department of Planning).*

The site bounded by the South Western Freeway which is located on the South Eastern side of the site. Campbelltown Road and Macdonald Roads cross the site.

In addition the South Western Rail Link is to cross the Northern end of the site. As such, future operational rail noise and vibration requires consideration.

2.4 Acoustic Terminology

The following report uses specialist acoustic terminology. An explanation of common terms is provided in Appendix A.

3 AMBIENT NOISE LEVELS & SURROUNDING RECEIVERS

Long-term ambient noise levels were monitored at three locations, selected to cover the range of environments around the site. The locations are presented in Table 3-1, and shown in Figure 3-1.

Table 3-1 Long-Term Noise Monitoring Locations

Monitoring Site	Area	Relevant Noises Noted on Site Visits
A	South West of Site	Motorway Noise
B	Leichhardt Road	General and Motorway Noise
C	North East of Site	Motorway Noise

Noise monitoring was conducted between Friday, 16 July and Monday, 26 July 2010. The noise monitoring equipment used for these measurements consisted of ARL Type EL-215 environmental noise loggers set to A-weighted, fast response, continuously monitoring over 15-minute sampling periods. This equipment is capable of remotely monitoring and storing noise level descriptors for later detailed analysis. The equipment calibration was checked before and after the survey and no significant drift was noted.

The logger determines L_{A1}, L_{A10}, L_{A90} and L_{Aeq} levels of the ambient noise. L_{A1}, L_{A10} and L_{A90} are the levels exceeded for 1%, 10% and 90% of the sample time respectively (see Appendix A for definitions). The L_{A1} is indicative of maximum noise levels due to individual noise events such as the occasional pass-by of a heavy vehicle. The L_{A90} level is normally taken as the background noise level during the relevant period.

Detailed results for each monitoring location are shown in graphical form in Appendix B. The graphs show measured values of L_{Aeq}, L_{A90}, L_{A10} and L_{A1} for each 15-minute monitoring period.

Table 3-2 summarises the noise results, for daytime, evening and night time periods as defined by the DECCW. The summary noise descriptors are:

- $L_{Aeq,period}$ – the L_{Aeq} noise level measured over the assessment period; and
- RBL – Rating Background Level is a measure of typical background noise levels which is used in determining noise criteria.

Table 3-2 Summary of Measured Noise Levels

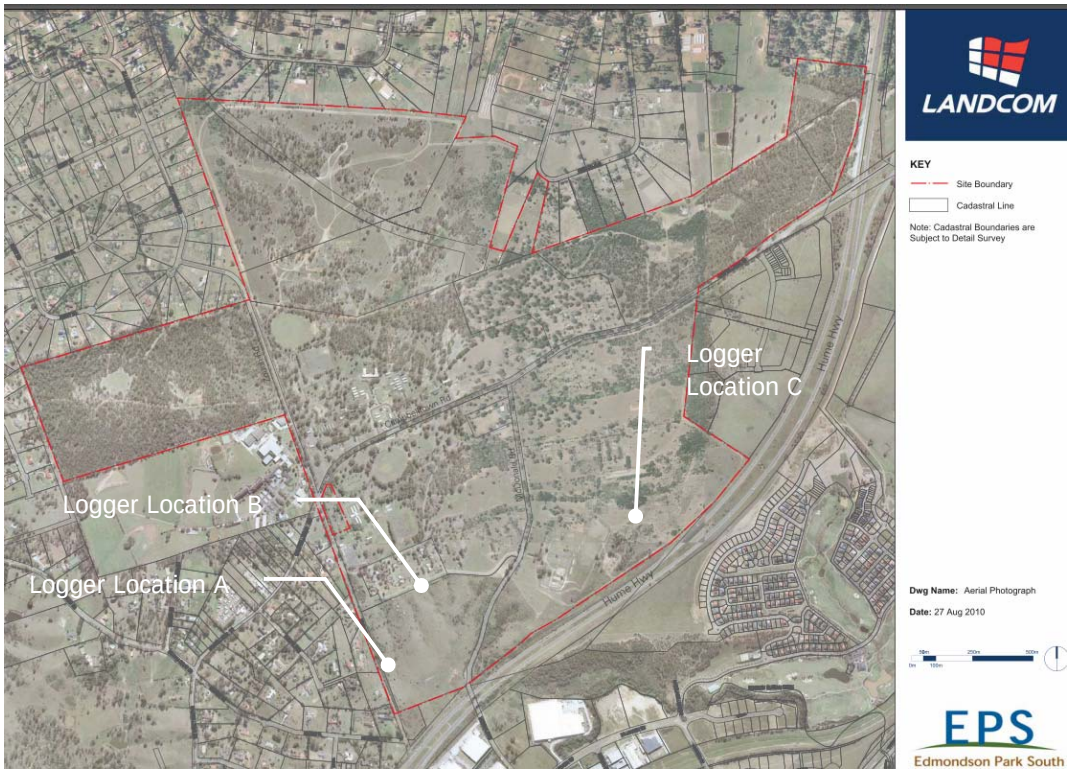
Noise Logging Site	RBL (dBA)				$L_{Aeq,period}$ (dBA)			
	Daytime 7am-6pm	Evening 6-10pm	Night Time 10pm-7am	Saturday 8am-1pm	Daytime 7am-6pm	Evening 6-10pm	Night Time 10pm-7am	Saturday 8am-1pm
A	49	46	41	46	56	53	51	52
B	48	49	44	46	55	55	51	51
C	51	52	44	49	58	58	56	56

In addition, the results of noise monitoring were processed to establish traffic noise descriptors over the day and night periods as defined in the DECCW's *Environmental Criteria for Road Traffic Noise*. These are presented in Table 3- 3.

Table 3- 3 Measured Free Field Traffic Noise levels

Location	Daytime $L_{Aeq(15\ hrs)}$ - dBA	Night Time $L_{Aeq(9\ hrs)}$ - dBA
A	54.2	50.6
B	55.1	50.9
C	58.2	56.2

Figure 3-1 Noise Monitoring Locations



4 PERFORMANCE CRITERIA

The following sections detail the applicable site specific construction and operational noise and vibration criteria based on guidelines from the DECCW and the Department of Planning, being;

- *Interim Construction Noise Guideline*,
- *Environmental Criteria for Road Traffic Noise* and;
- *Development Near Rail Corridors and Busy Roads – Interim Guideline.*

4.1 Construction Noise Criteria

The DGR requirements for the concept has not required detailed assessment of construction noise and vibration at the Concept Stage of this project; however applicable noise objectives have been established to assist in guidance in future Project Applications associated with the development. The DECCW released the "*Interim Construction Noise Guideline*" *(CNG)* in July 2009. The guideline provides noise goals that assist in assessing the impact of construction noise.

For residences, the basic daytime construction noise goal is that the noise should not exceed the RBL background noise by more than 10dBA. This is for construction during standard hours: Monday to Friday 7.00am to 6.00pm, and Saturday 8.00am to 1.00pm. Outside the standard hours, the criterion would be background + 5dBA. A more complete description of the guidelines is in Table 4-1.

Table 4-1 Construction Noise Goals at Residences using Quantitative Assessment

Time of Day	Management Level $L_{Aeq,(15min)}$ *	How to Apply
Recommended Standard Hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or Public Holidays	Noise affected RBL + 10dBA	• The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{ea,(15min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.

Time of Day	Management Level $L_{Aeq,(15min)}$ *	How to Apply
	Highly noise affected 75dBA	• The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. • If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.
Outside recommended standard hours	Noise affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community. • For guidance on negotiating agreements see section 7.2.2.

In addition, the following construction noise management levels $L_{Aeq,15\ min}$ are recommended for other receivers and areas as follows.

- Active recreation areas (such as parks): external $L_{Aeq,15\ min}$ 65dBA;
- Industrial premises: external $L_{Aeq,15\ min}$ 75dBA; and
- Offices, retail outlets external $L_{Aeq,15\ min}$ 70dBA.

Based on the above, Table 4-2 presents the applicable noise management levels of surrounding residences during construction activities. These are based on the noise logger at location B, which is the location most representative of noise levels at existing surrounding residences the site.

Table 4-2 Site Specific Construction Noise Management Levels

Location	Construction Noise Management Level, L_{Aeq} (dBA)				Maximum Construction Noise Level, L_{Aeq} (dBA)
	Day	Evening	Night	Saturday	
Existing Residences	58	54	49	56	75
Active recreation areas (such as parks)	65 dBA				

4.2 Traffic Noise Criteria – Residences External to the Site

It is proposed that Campbelltown Road will be redeveloped to a four lane roadway to service this development and others. In addition, the eastern motorway is currently being upgraded so that there are four lanes in the northern direction.

Criteria for assessment of road traffic noise are set out in the NSW Government's *Environmental Criteria for Road Traffic Noise (ECRTN)*. Under the definitions in that document, the project would be described under "*Land use developments with potential to create additional traffic on existing freeways / arterials"*.

Table 4-3 shows the relevant noise criteria for this case. The criteria in columns 2 and 3 of the table are referred to as "base" criteria. These should be met in all cases, where possible. Criteria in the fourth column of the table are referred to as "allowance" criteria. The "existing" noise levels referred to here represent traffic noise immediately before opening of the project. Noise levels for comparison with these criteria should be for a time 10 years after opening of the project, and in this report, predicted traffic volumes for the year 2026 are used in noise assessment.

In summary, the noise level goals at the residential receivers, for this project, based on the *ECRTN* are:

- $L_{Aeq,15hr}$ = 60dBA day;
- $L_{Aeq,9hr}$ = 55dBA night; or
- where base criteria are already exceeded, *ECRTN* allowance criteria (existing +2dBA) applies.

Table 4-3 Traffic noise criteria extracted from the NSW *ECRTN*

Type Of Development	Criteria		
	Day (7am-10pm) dB(A)	Night (10pm-7am) dB(A)	Where Criteria Are Already Exceeded
Land use developments with potential to create additional traffic on existing freeways / arterials	$L_{Aeq,15hr}$ 60	$L_{Aeq,9hr}$ 55	Where feasible, existing noise levels should be mitigated to meet the noise criteria. Examples of applicable strategies include appropriate location of private access roads; regulating times of use; using clustering; using 'quiet' vehicles; and using barriers and acoustic requirements. In all case, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dBA

Accordingly, all existing residences potentially affected by traffic noise arising from the development will be assessed with respect to the above criteria.

4.3 Rail and Road Traffic Noise at Residences Within the Site

Noise and Vibration criteria relevant to the amenity of future residential development subjected to road and rail operations is documented in the New South Wales Government Infrastructure SEPP. Guidance for application of this SEPP is provided in the NSW Department of Planning's "Development near Rail Corridors and Busy Roads– Interim Guideline" 2008."

The following noise criteria are applicable for the site.

If the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded:

- *in any bedroom in the building : 35dB(A) at any time 10pm–7am*
- *anywhere else in the building (other than a garage, kitchen, bathroom or hallway): 40dB(A) at any time.*

If internal noise levels with windows or doors open exceed the criteria by more than 10dB(A), the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia.

The above criteria are consistent with the Edmondson Park DCP.

The SEPP criteria can be translated to external noise levels by allowing an additional 10 dBA for the noise reduction from outside to inside through an opening.

Table 4-4 $L_{Aeq(period)}$ Rail and Road Noise Criteria

Room Type	Internal Criteria dBA	External Criteria (open windows) dBA	Level at Which Ventilation is Required dBA
Bedrooms (Night Only)	35	45	55
Any Habitable Room	40	50	60

For school classrooms the relevant criterion is that internal noise levels should not exceed 40 dBA $L_{Aeq,1hr}$.

For a park, the Infrastructure SEPP does not specifically nominate a criterion, but based on criteria in the *ECRTN*, a value of 60 dBA $L_{Aeq,1hr}$ can be assumed.

4.4 Rail Vibration at Residences within the Site

The Heggies Australia report *"South West Rail Link – Noise and Vibration Assessment Stage 2- Glenfield to Leppington Train Stabling Facility- Heggies Australia Pty Ltd Report Number 10-6055-R3 Revision 0."* provides a discussion of rail vibration levels due to the proposed rail line through the site. The report concludes that a criterion vibration velocity of 108 dBA re 10^{-9} m/sec from a train passby is appropriate for this site. This represents a criterion for human comfort, and is significantly more stringent than relevant criteria for building damage.

Wilkinson Murray is in general agreement with this conclusion.

5 RAIL NOISE AND VIBRATION AFFECTING THE SITE

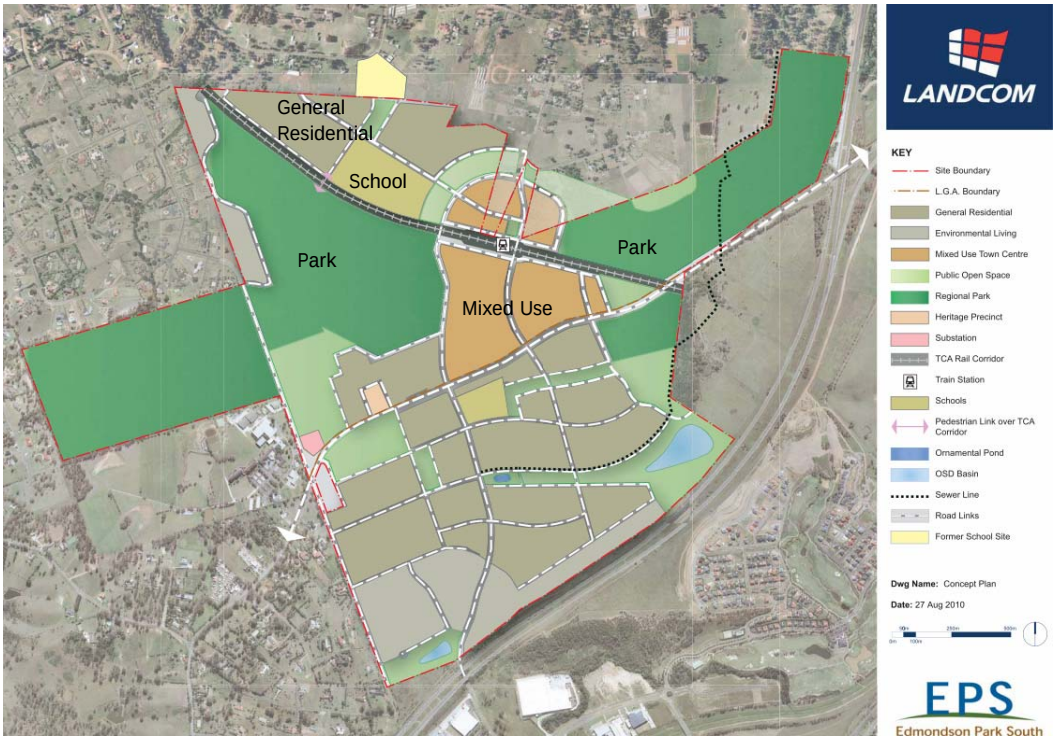
The Environmental Assessment for the South West Rail Link has been prepared by the proponent, being the Transport Construction Authority (formerly TIDC), and submitted to the Department of Planning for public exhibition. Part of the EA consists of a noise and vibration assessment prepared by Heggies Australia in May 2010, being:

"South West Rail Link – Noise and Vibration Assessment Stage 2- Glenfield to Leppington Train Stabling Facility- Heggies Australia Pty Ltd Report Number 10-6055-R3 Revision 0."

The report presents predicted night-time $L_{Aeq,9\ hr}$ rail noise levels along the railway route. This approach is based on the finding that the night period represents the worst case scenario, because daytime noise levels will be 3-4 dB higher than night time noise levels, while daytime noise criteria are 5 dBA higher than night criteria.

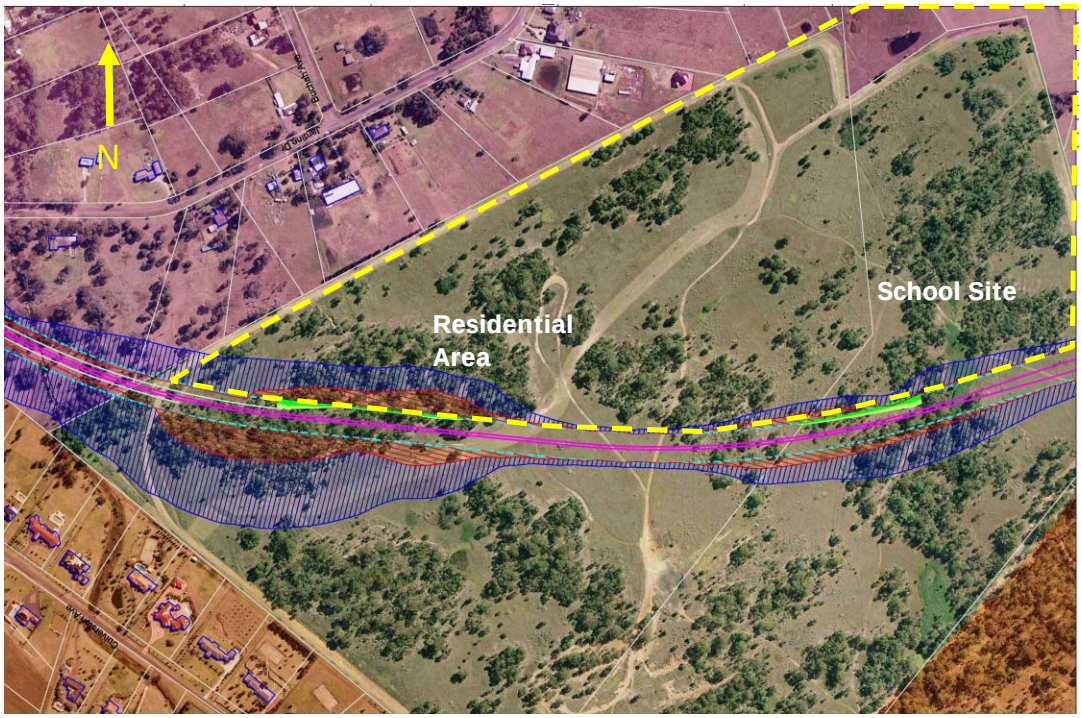
Figure 5-1 shows the area of the area of the Edmondson South site that is potentially affected by SWRL operations.

Figure 5-1 Site showing area potentially affected by SWRL Rail Operations



Night time rail noise contours for the Year 2026 are presented in the technical report, showing the 60 dBA (In Red) and 55 dBA (In blue) noise contours across the site. These contours are shown in Figures 5-2 and 5-3.

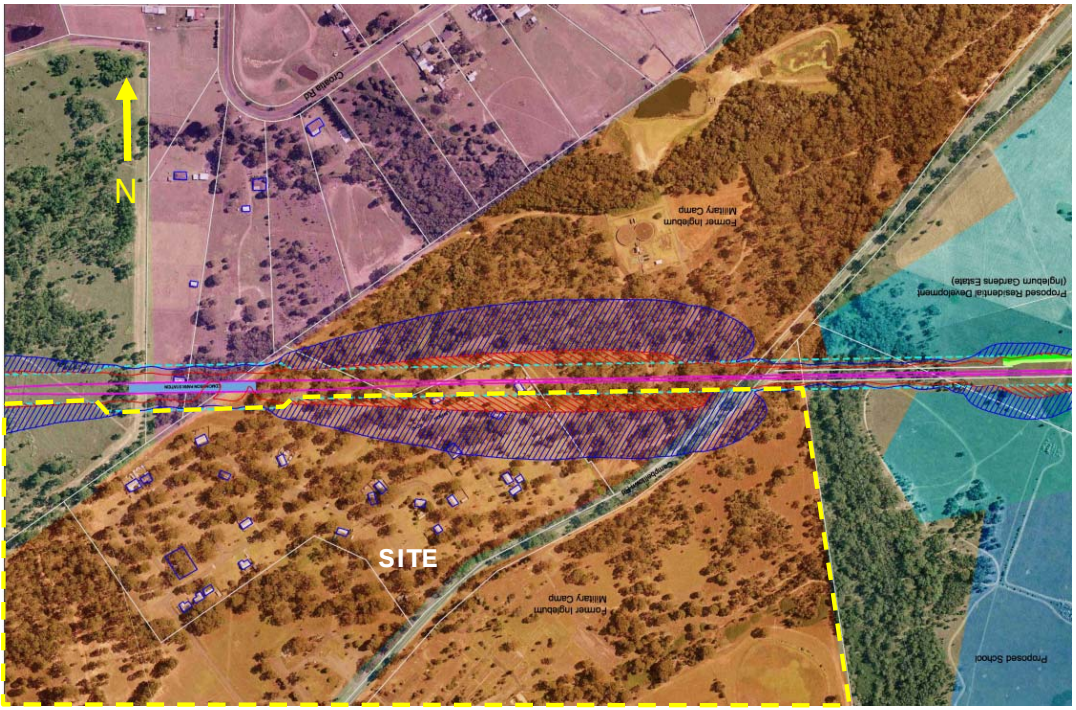
Figure 5-2 Rail $L_{Aeq,9hr}$ Night time Noise Contours west of Edmondson Station (Source: Heggies)



The area of development site which bounds the rail corridor west of Edmondson Railway Station, shown in Figure 5.1, will consist of:

- a school site;
- detached dwellings to the west of the school; and
- a regional park south of the line.
- A town centre and mixed used development.

Figure 5-3 Rail $L_{Aeq(9\ hr)}$ Night time Noise Contours west of Edmondson Station (Source Heggies)



The southern development site which bounds the rail corridor shown in Figure 5-3, will consist of;

- mixed commercial / retail; and
- high density multi level residential development.

The following sections describe potential impacts on each of these uses.

5.1 Residences West of Edmondson Station

In the case of residences bounding the rail corridor, any residence within the blue 55 dBA noise contour will require bedroom windows to be closed and ventilation to be supplied. An alternative may be to locate bedrooms on the side of the building that is shielded from the rail line, or use other buildings to shield the bedrooms.

Any residence within the red 60 dBA contour is likely to require improved glazing for bedrooms, such as 10 mm float glass in rooms affected by rail noise. In addition, ventilation will need to be supplied for all habitable rooms.

5.2 School

The noise criteria for schools, during the hours of 9 am to 4 pm are;.

- Internal classroom rail $L_{Aeq(1\ hr)}$ noise levels of 40 dBA .This equates to an external noise level of $L_{Aeq(1\ hr)}$ 50dBA at school buildings assuming that classroom windows are open.
- External Noise Levels for passive recreation areas of $L_{Aeq(15\ f\ hr)}$ 60 dBA.

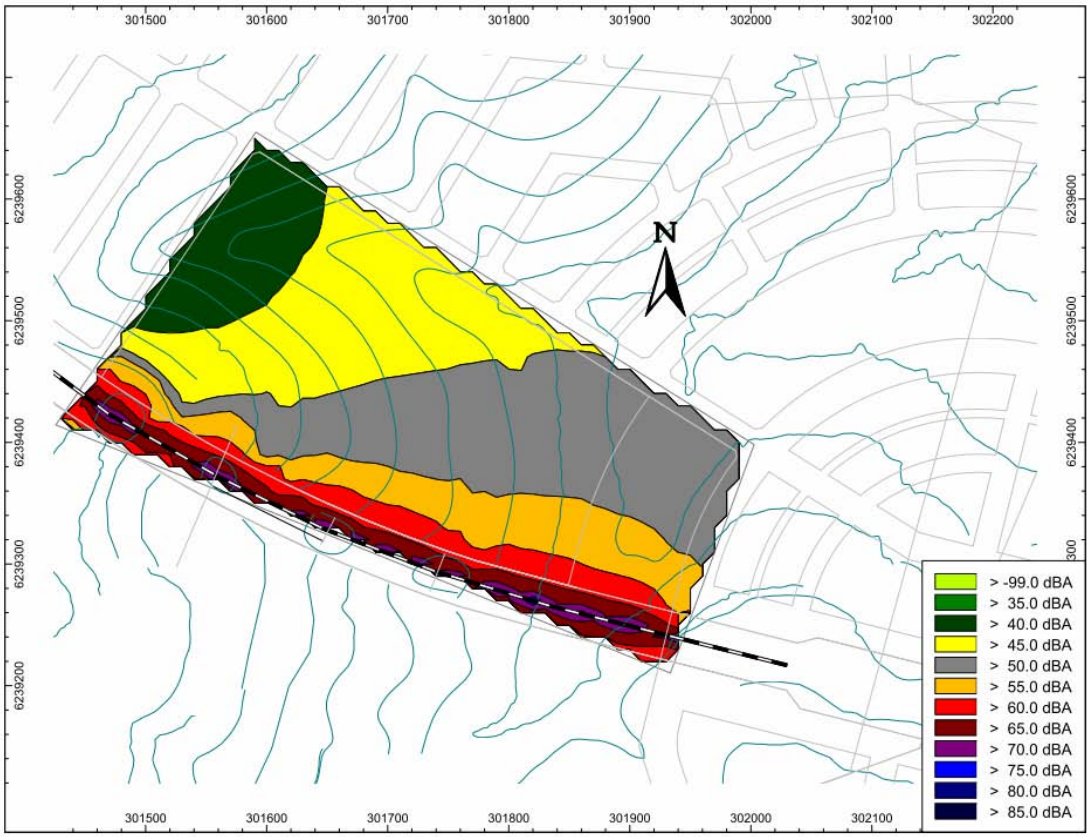
Whilst details of hourly rail movements are not known at this stage, it is reasonable to assume

that, as school hours are outside rail peak hours, the daytime $L_{Aeq,1hr}$ rail noise level will be in the order of 3-4 dBA higher than the contours presented in Figure 5-2.

In this case the 55 dBA $L_{Aeq,1hr}$ contour would extend across much of the school site, thereby triggering the need to consider ventilation to the buildings across the site. Alternatively, a barrier or bund in the order of 3 – 4 metres in height could be constructed between the site and the rail line to reduce noise levels by approximately 10 dBA.

Figure 5-4 shows the predicted site daytime noise levels without any noise controls. It is can be seen that anywhere on the site that between the rail corridor and the grey (50 dBA) zone will be affected by rail noise. Therefore any buildings in this are would required the windows to be closed to achieve acceptable internal noise levels

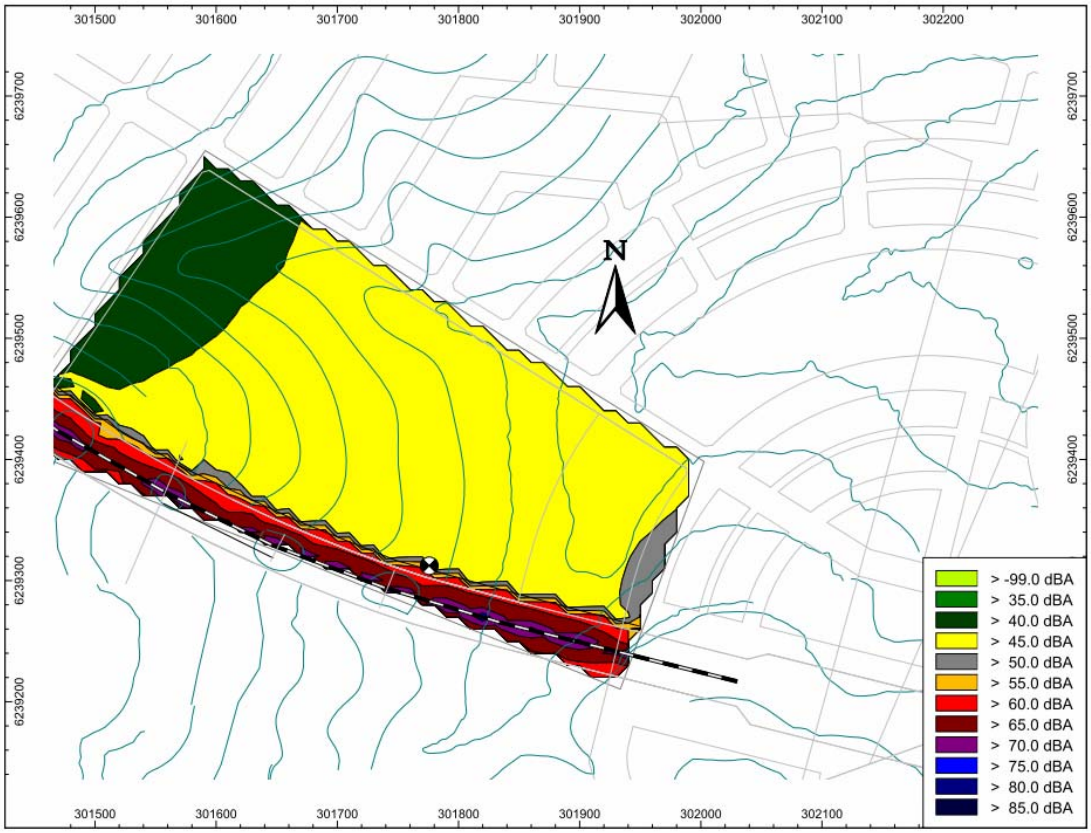
Figure 5-4 Predicted $L_{Aeq(1\ hr)}$ Daytime Noise Levels on the Edmondson School Site.



Following this modelling a 4 metre barrier along the boundary with the rail corridor has been modelled. Figure 5-5 shows the ground level rail noise levels across the site with the noise barrier. A review the results indicates that with the barrier on the boundary noise levels across the entire school site will be 50 dBA or lower. This means that standard single level school buildings can be built any where across the site.

The noise barrier can be an earth berm, a solid fence or a combination of both. Suitable materials are timber fencing (Acoustic Rating of a least Rw 30) or Masonry Walls.

Figure 5-5 Predicted $L_{Aeq(1\ hr)}$ Daytime Noise Levels on the Edmondson School Site with a 4 m Barrier (Ground Level).



It should be noted that the 2026 predictions presented in the EA were based on indicative train numbers supplied by Railcorp on the assumption that the new Waratah trains will generate similar noise levels to Millennium and Tangaras. Therefore the noise levels predicted here are likely to be typical "worst case" noise levels. Further detailed modelling at the project application stage is likely to reduce the barrier design and height. As such the 4 m barrier height is indicative of the maximum barrier height that is required based on currently available information.

5.3 Regional Park

It is noted that the daytime noise criterion of L_{Aeq1hr} 60 dBA is likely to be exceeded for much of the western end of the site. It is uncommon for any mitigation to be adopted for such an area.

5.4 Mixed Commercial / Retail

Commercial and retail uses do not require the high level of acoustic amenity required by residential properties. Given the predicted noise levels presented in the SWRL EA, we believe that no special acoustic measures are required for these users.

5.5 High density multi level residential

The 55 dBA rail noise contours at the eastern end of the station will extend into the zone proposed for high density housing. It is likely that the first row of multi level buildings will

require acoustic measures to be adopted to meet the Infrastructure SEPP acoustic provisions.

In the case of residences bounding the rail corridor, any residence within the blue 55 dBA noise contour will require bedroom windows to be closed and ventilation to be supplied. Any residence within the red 60 dBA contour is likely to require improved glazing for bedrooms, such as 10 mm float glass in rooms affected by rail noise. In addition, ventilation will need to be supplied for all habitable rooms.

5.6 Rail Induced Vibration

A review of the site and the predicted vibration contours which are contained in the Appendices of the Heggies report reveals that compliance with the vibration criterion of 108 dB re 10^{-9} m/s is achieved at a maximum distance of approximately 22 metres from the nearest centreline of the railway track. This falls almost entirely within the nominal 40 metre rail corridor. Accordingly no mitigation measures considered warranted for vibration.

6 ROAD TRAFFIC NOISE AFFECTING THE SITE

6.1 Modelling Procedures

Predictions of traffic noise affecting the site have been based on projected traffic volumes in 2026 using the CORTN traffic noise prediction algorithms as implemented in the Cadna A noise model. Table 6-1 presents vehicle speed and percentage of heavy vehicles used in the model.

Table 6-1 $L_{Aeq(period)}$ Rail and Road Noise Criteria

	North Bound	Percentage HV	South Bound	Percentage HV
Motorway - M5 Motorway				
Day (7 am - 10 pm)	54827	13	68786	13
Night 10 pm to 7 am)	17600	21	9357	7
Campbelltown Road				
Day (7 am - 10 pm)	7969	5	7396	5
Night 10 pm to 7 am)	1897	5	930	5
Macdonald Road				
Day (7 am - 10 pm)	7693	5	7927	5
Night 10 pm to 7 am)	1375	5	1523	5

A noise model of the site has been created to establish indicative traffic noise propagation across the site. Factors that are addressed in the noise modeling are:

- traffic flows and percentage heavy vehicles;
- source heights;
- screening effects from barrier;
- receiver locations;
- ground topography;
- noise attenuation due to geometric spreading;
- ground absorption; and;
- atmospheric absorption.

6.2 Model Validation

The model was validated with respect to measured existing traffic noise levels as detailed in Table 3-2. Results of the validation are shown in Table 6-2.

Table 6-2 Validation of Traffic Noise Model

Location	Daytime $L_{Aeq(15\ hrs)}$ - dBA		Night time $L_{Aeq(9\ hrs)}$ - dBA	
	Measured	*Predicted*	Measured	*Predicted*
A	54.2	*57.7*	50.6	*52.3*
B	55.1	*55.1*	50.9	*49.2*
C	58.2	*60.2*	56.2	*55.7*

Some variation has been identified at location A which is affected by the partial southern barrier on the motorway and road works.

6.3 Results

Figures 6.1 and 6.2 illustrate predicted 2026 traffic noise levels across the site. Note that where external daytime noise levels exceed 60 dBA, ventilation will be required in all habitable rooms of a residence.

Figure 6.1 Daytime $L_{Aeq,15\ hr}$ 2026 Traffic Noise Levels

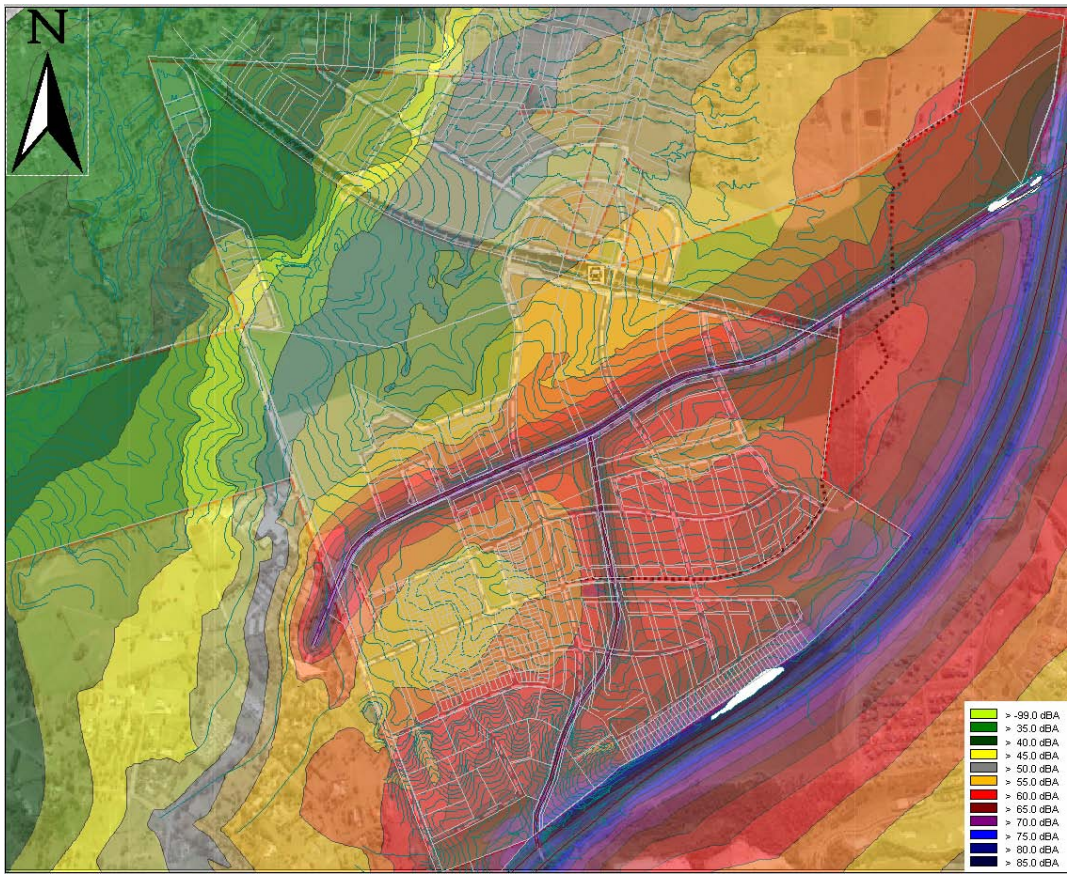
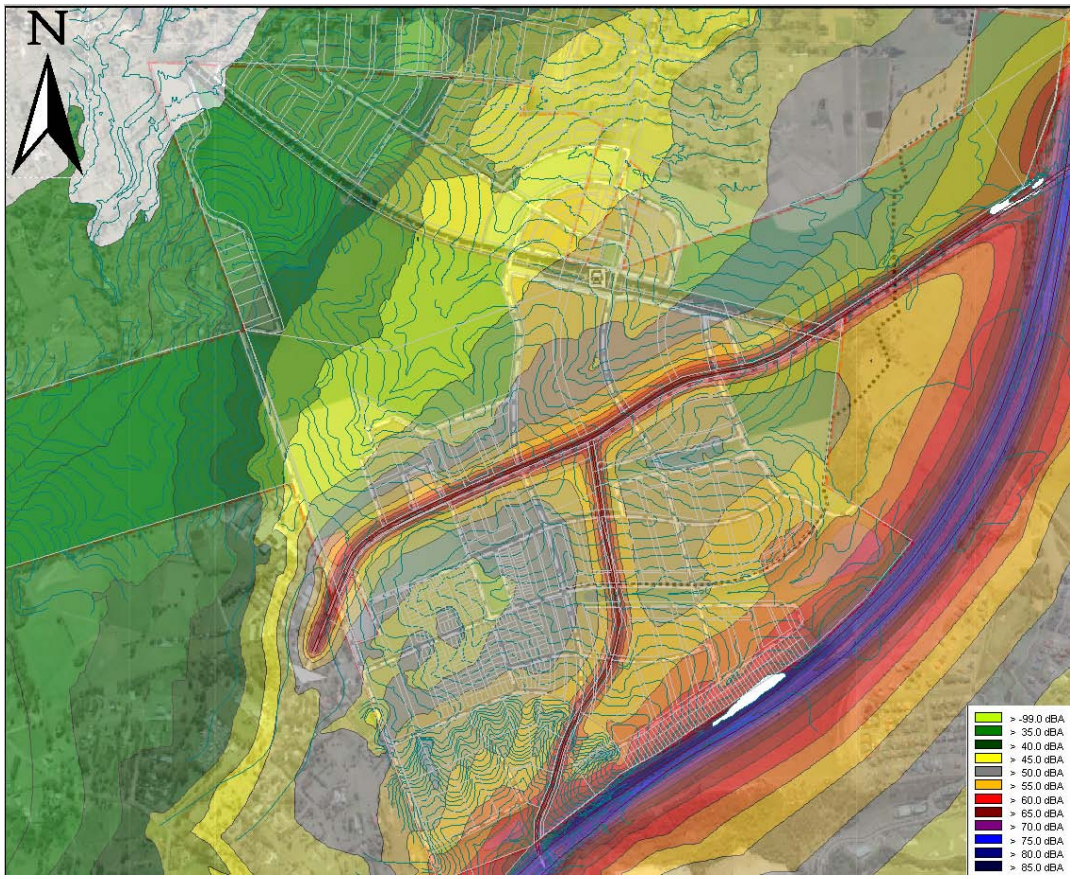


Figure 6.2 Night $L_{Aeq,9\ hr}$ 2026 Traffic Noise Levels



A review of the noise plots of 2026 traffic flows reveals the following.

- Residences north of the immediate vicinity of Campbelltown Road, that is beyond the first row of houses, will not require treatment, such a ventilation, to be provided under the criteria in the Infrastructure SEPP.
- Residences on Campbelltown Road and Macdonald Road will require the provision of noise treatment in the form of either barriers or ventilation and improved glazing, such as laminated glass, to habitable rooms to achieve compliance with internal noise criteria, unless at-road treatments can be provided as part of the road upgrading process.
- Residences immediately bounding the M5 motorway will be exposed to the highest traffic noise levels (up to 70 dBA) whereby double glazing and ventilation will be required. Alternatively, a barrier and reduced glazing can be adopted at these residences.

Note that although Figure 6-1 indicates large areas of the site would require ventilation, in practice buildings close to the major roadways would shield those behind, as described below. Hence the total number of residences requiring ventilation would be smaller than indicated by this Figure.

6.4 Traffic Noise Mitigation

Mitigation of traffic noise can be achieved by the flowing measures.

6.4.1 Control at Source

This approach involves reducing the noise emissions from the roadway. For the Motorway, this could be achieved by a change in road surface, or installation of additional noise barriers (possibly including one in the median strip) to shield noise from the south-bound carriageway.

In the case of Campbelltown Road, however, the RTA may adopt noise mitigation measures including a reduced road speed and open grade asphalt, at the time of Road upgrade.

6.4.2 Modification of the Noise Path - Control in Transmission

The second approach to noise control involves modifying the transmission path of the traffic noise emissions between the road and the residential receiver. Noise barriers can be utilised on the boundaries of the site to mitigate the noise to adjunct residences. Typically barriers up to 4 -5 metres are practical, meet urban design principles and are consistent with existing barriers along the M5 motorway.

A balance between aesthetics, overshadowing, cost and acoustics is required to achieve an acceptable outcome.

In addition, new perimeter buildings can be used as noise barriers themselves by constructing higher residences on the perimeter so that inner residences are shielded. Alternatively, commercial premises in these areas, which are less noise sensitive, can serve this function.

Figure 6.3 illustrates the use of a carriage house design as an example of this approach.

Figure 6.3 Carriage Houses and Walls used as Noise Treatment

6.4.3 Treatment at Residential Receivers

This approach consists of treatment of the building to protect the internal acoustic amenity of residents. Measures that are typically adopted are:

- double or laminated glazing with seals to affected facades;
- insulation and treatment of roof area;
- seals to entrance doors; and
- mechanical ventilation to rooms that cannot meet the natural ventilation requirements of the BCA. Not all rooms in residences will require ventilation due to room orientation and shielding provided by other elements of the building. As such the need for this measure will need to be determined on a house by house basis in residences bounding Campbelltown and Macdonald Roads and the Motorway.

In addition, the design and orientation of residences can reduce the degree of acoustic treatment required. A "Quiet House" design as detailed in the Department of Planning's SEPP guide can be adopted to minimise the degree of treatment required to residences.

6.4.4 Recommendations

In summary, much of the southern side of the site is potentially affected by the M5 motorway traffic noise and to a lesser degree traffic noise from Campbelltown and Macdonald Roads. It is recommended that the following approach be adopted to manage noise on site.

- Balance a combination of roadside barriers and perimeter buildings to reduced traffic noise intrusion across the site.
- Adopt a "Quiet House" design approach to minimise building treatment and ventilation requirements.
- Implement building facade treatments and ventilation where required.

The assessment of the treatment effects and design provided is indicative only (based on the available data and unknown building layouts). A detailed assessment and design in liaison with the urban designers will be required to facilitate an acceptable acoustic outcome on the site.

7 CONCLUSION

A review of noise and vibration for the proposed Edmondson Park development has been conducted based on current applicable criteria, as stipulated in the Director General's Requirements for the project.

In the case of future rail operations, vibration levels at receivers will be acceptable, whilst noise control measures will be required in housing that bounds the railway and, to a lesser degree the second row of residences on the Northern side of the southern roadway on this site. Options for treatment can consist of upgraded glazing with seals, ventilation and / or the installation of an acoustic barrier on the perimeter of the site.

The proposed school site to the west of Edmondson Station will required mitigation in the form of glazing treatment or a barrier or bund on the southern boundary.

An overall traffic noise model of the site has been created to give an indication of traffic noise impacts across the site. This modelling indicates that much of the site to the south of Campbelltown Road is affected to some extent by traffic noise. Predicted traffic noise levels at residences adjacent to the M5 Motorway and Campbelltown Road are above the levels that would require the provision of ventilation, under criteria in the Infrastructure SEPP.

Measures to mitigate noise have been presented so that at the detailed design stage an acceptable acoustic outcome can be achieved on the site. The assessment of the treatment effects and design provided in this report is indicative only, based on the available data and unknown building types. A detailed assessment and design in liaison with the urban designers will be required to facilitate an acceptable acoustic outcome on the site.

Construction noise objectives have been established to provide guidance on construction noise assessment at project application stages of the project.

Note
All materials specified by Wilkinson Murray (Sydney) Pty Limited have been selected solely on the basis of acoustic performance. Any other properties of these materials, such as fire rating, chemical properties etc. should be checked with the suppliers or other specialised bodies for fitness for a given purpose.

Quality Assurance
We are committed to and have implemented AS/NZS ISO 9001:2008 "Quality Management Systems – Requirements". This management system has been externally certified and Licence No. QEC 13457 has been issued.

AAAC
This firm is a member firm of the Association of Australian Acoustical Consultants and the work here reported has been carried out in accordance with the terms of that membership.

Version	Status	Date	Prepared by	Checked by
A	Final	26 August 2010	Brian Clarke	Rob Bullen

APPENDIX A

GLOSSARY OF TERMS

GLOSSARY

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph overleaf, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

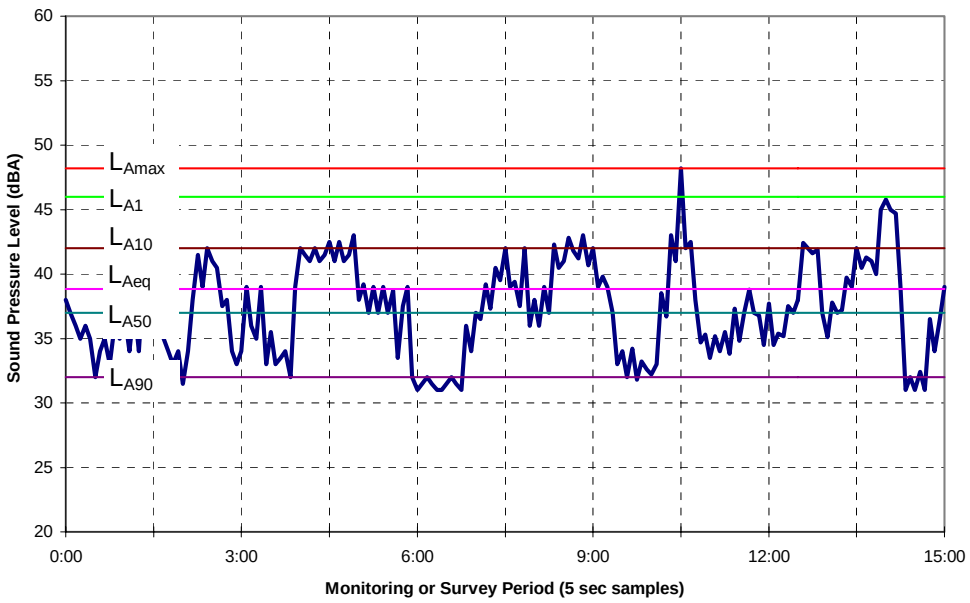
L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

L_{A50} – The L_{A50} level is the noise level which is exceeded for 50% of the sample period. During the sample period, the noise level is below the L_{A50} level for 50% of the time.

L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10^{th} percentile (lowest 10^{th} percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period **–** daytime, evening and night time.



Sound pressure level (SPL) or sound level L_p is a logarithmic measure of the effective sound pressure of a sound relative to a reference value. It is measured in decibels (dB) above a standard reference level.

$$L_p = 10 \log_{10} \left(\frac{{p_{\mathrm{rms}}}^2}{{p_{\mathrm{ref}}}^2} \right)$$

where p_{ref} (20 µPa)is the reference sound pressure and p_{rms} is the rms sound pressure being measured.

Sound power level is a logarithmic measure of the sound power in comparison to a specified reference level. While sound pressure level is given in decibels SPL, or dB SPL, sound power is given in dB SWL. The dimensionless term "SWL" can be thought of as "sound watts level," the acoustic output power measured relative to a very low base level of watts given as 10^{-12} watts.

$$L_{\mathrm{W}} = 10 \log_{10} \left(\frac{W}{W_0} \right) \ \mathrm{dB}$$

APPENDIX B

NOISE MEASUREMENT RESULTS

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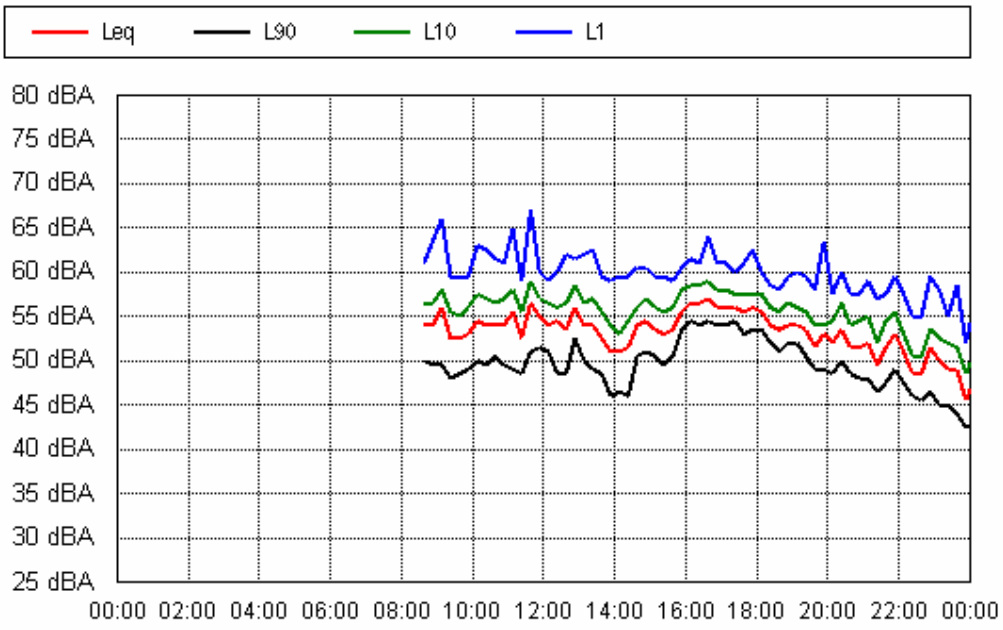

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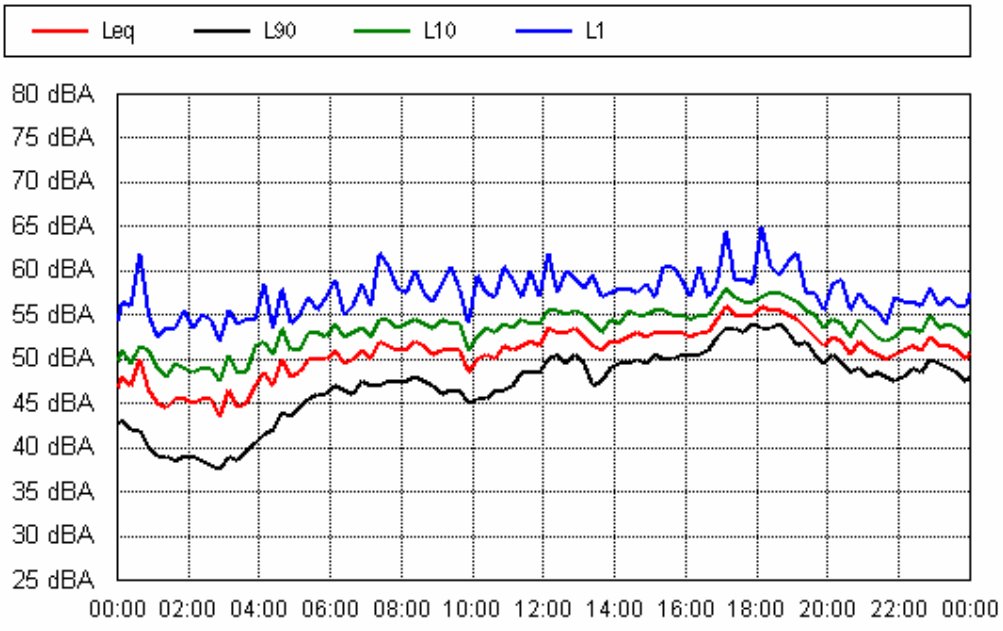

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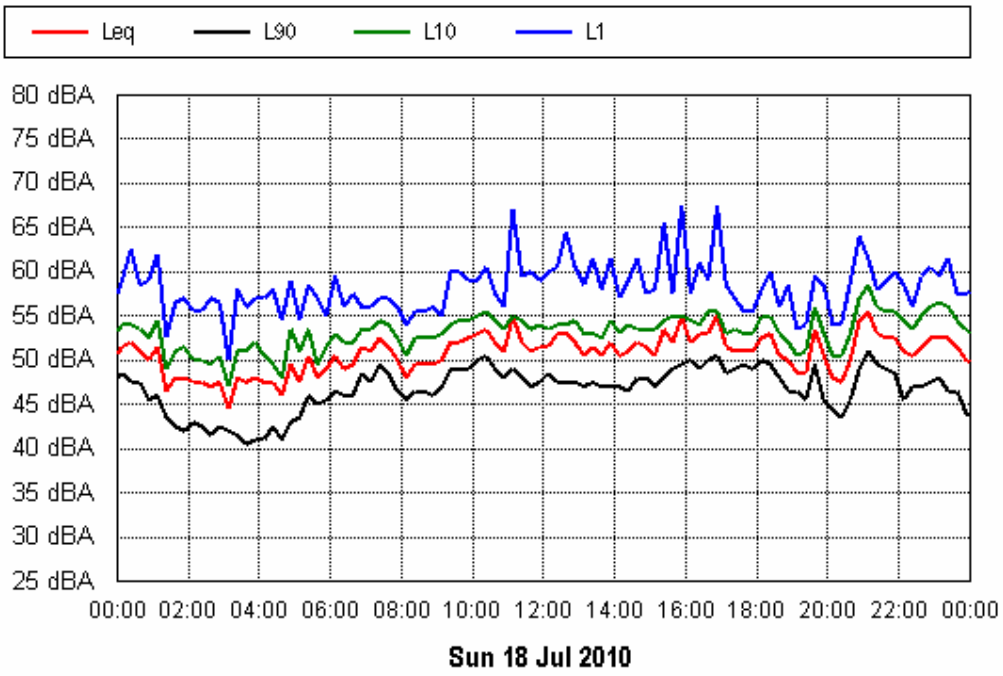

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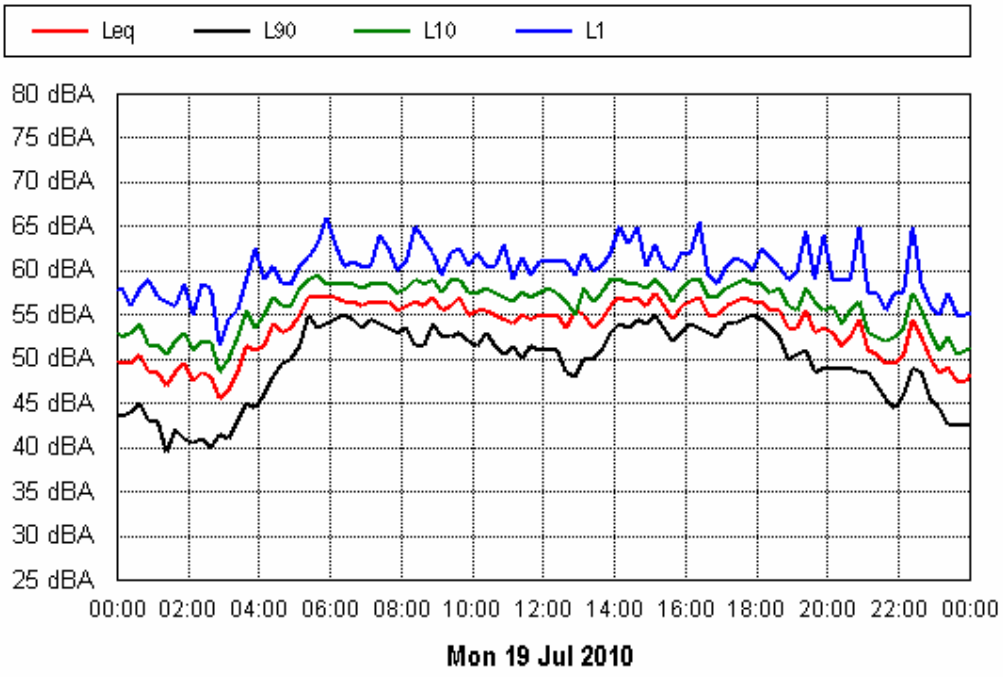

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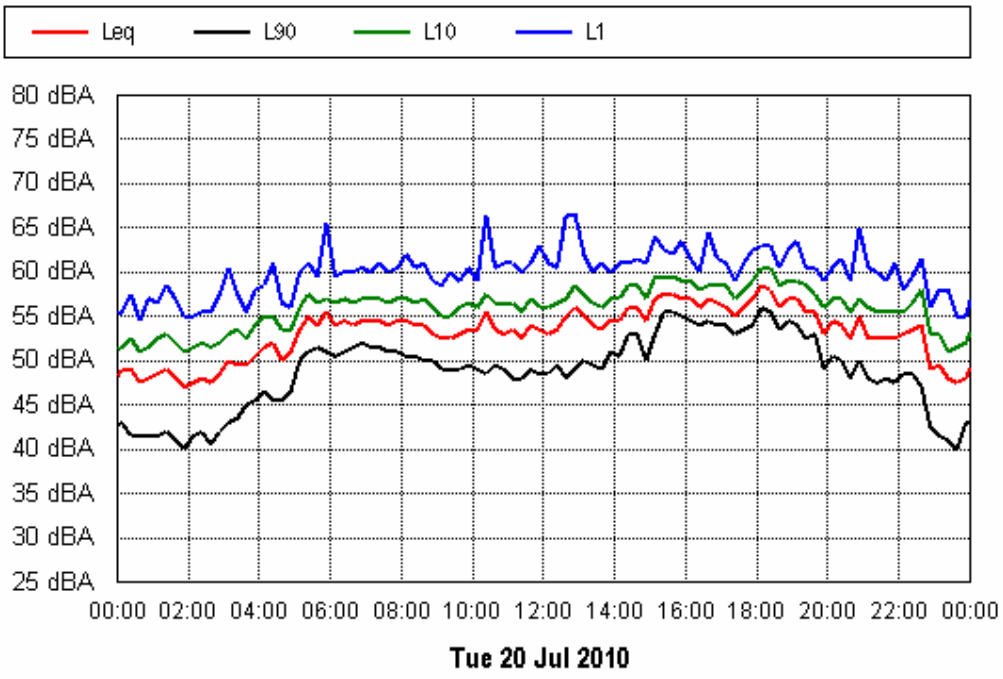
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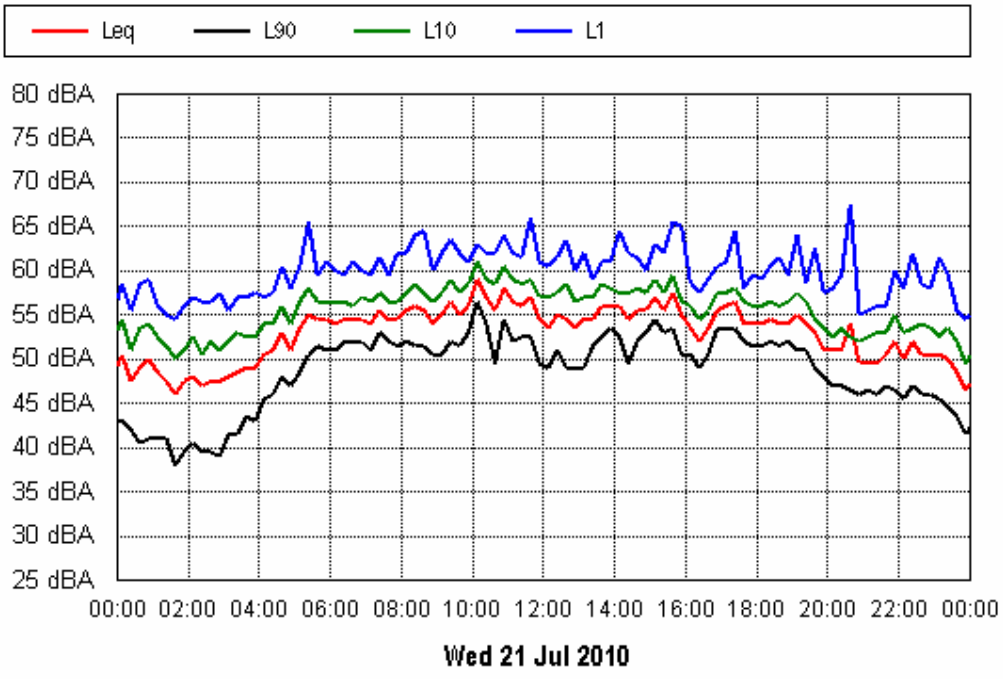
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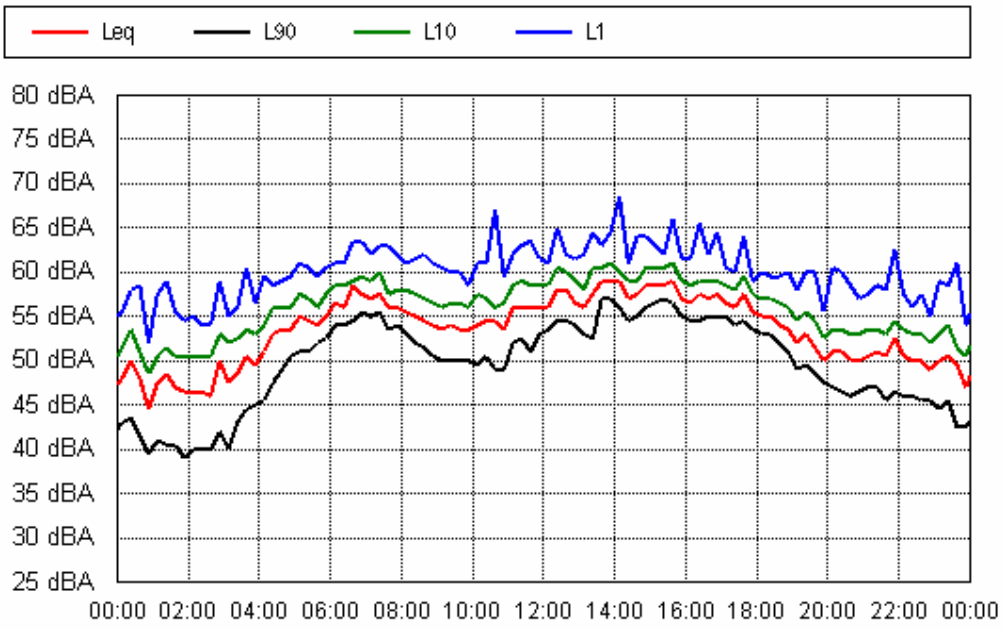

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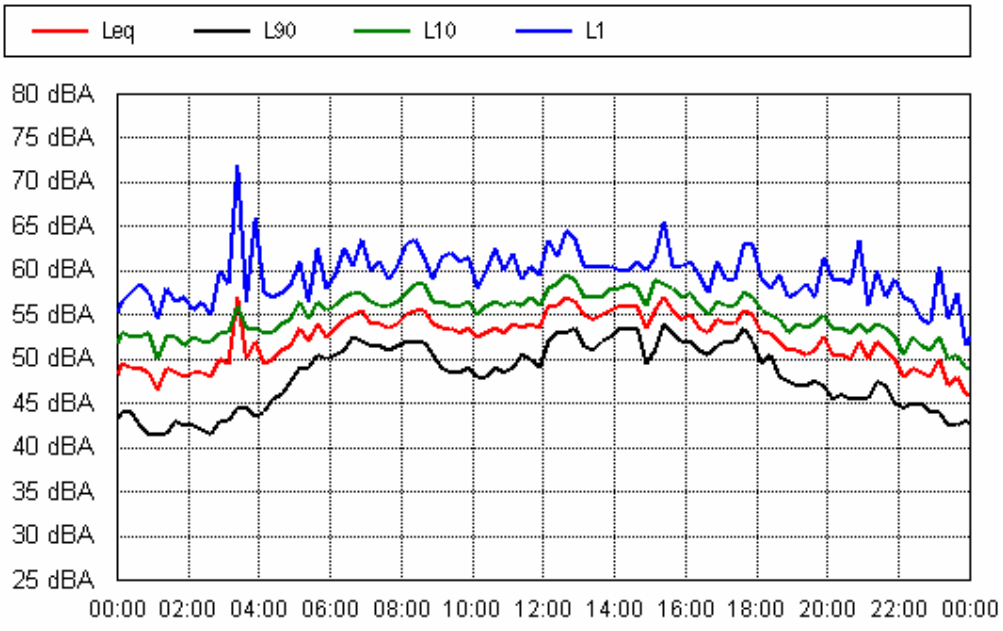

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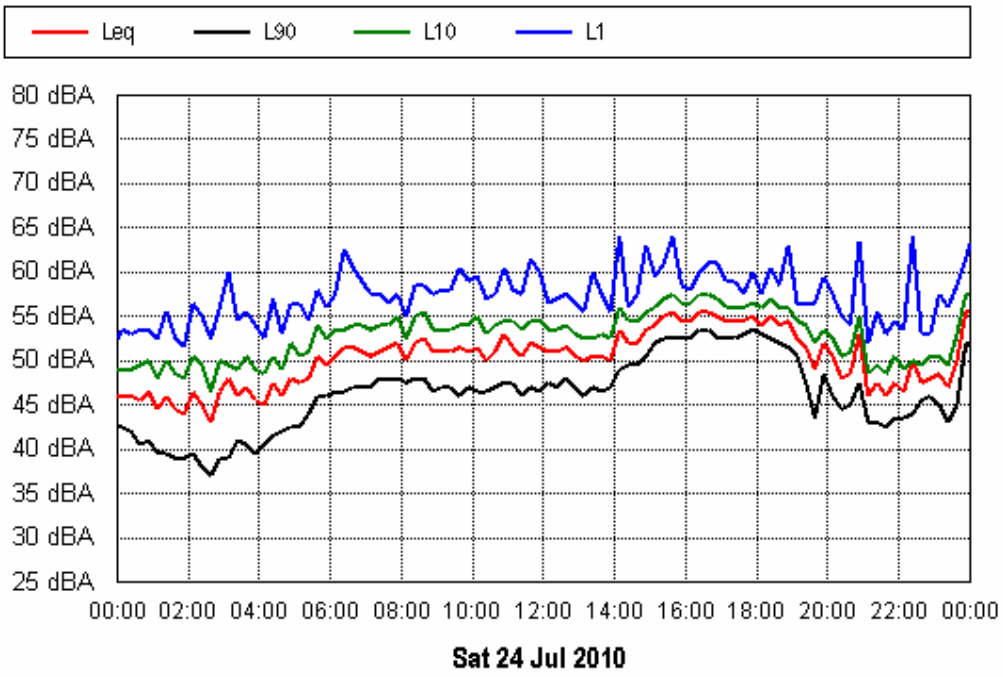
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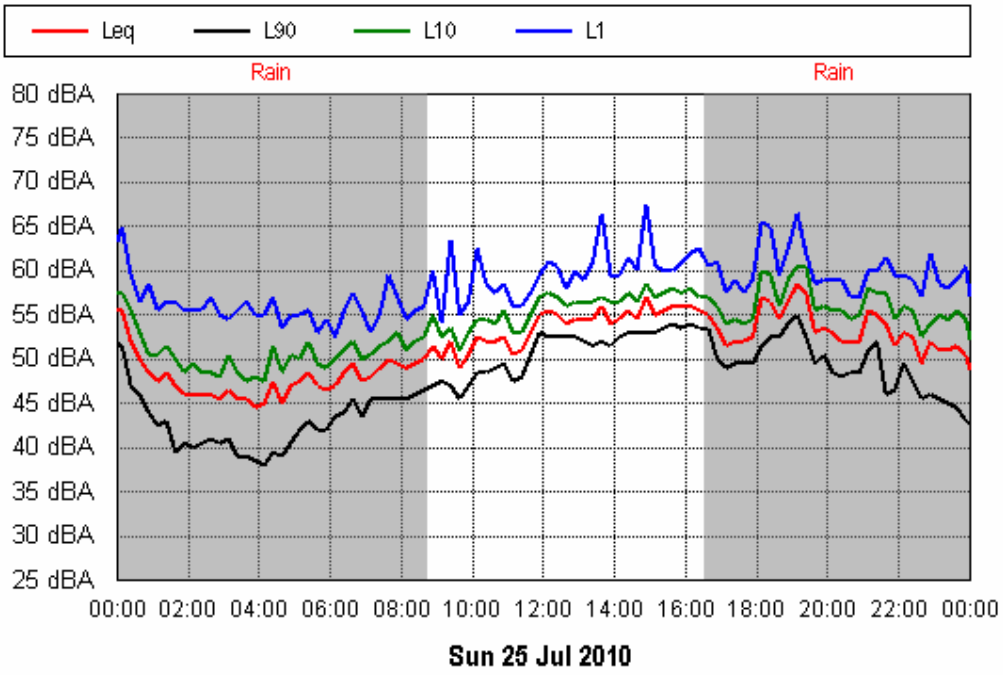
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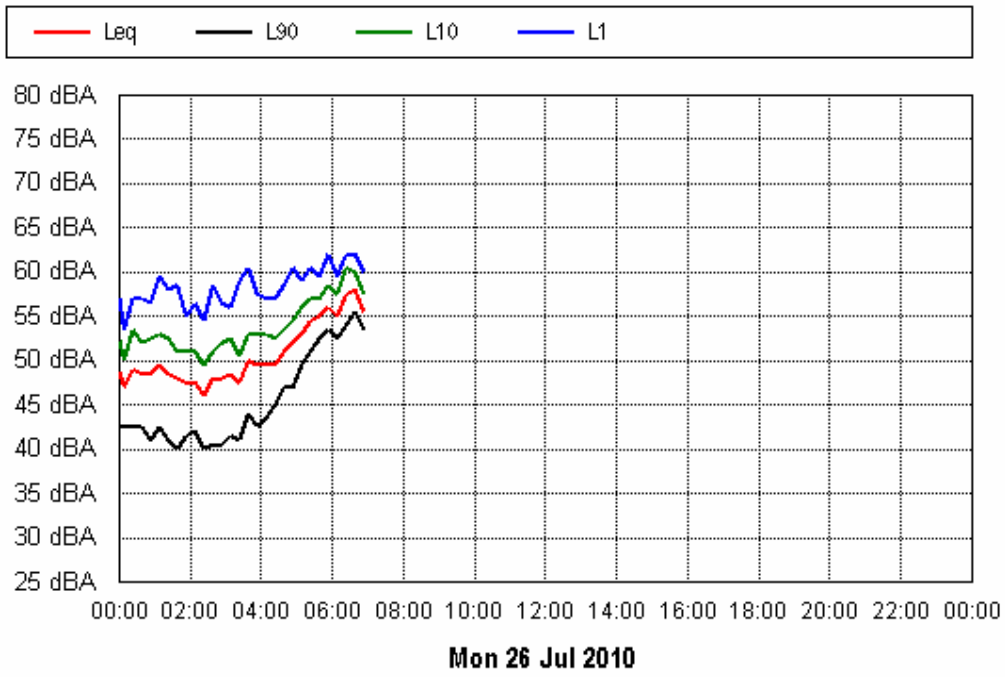
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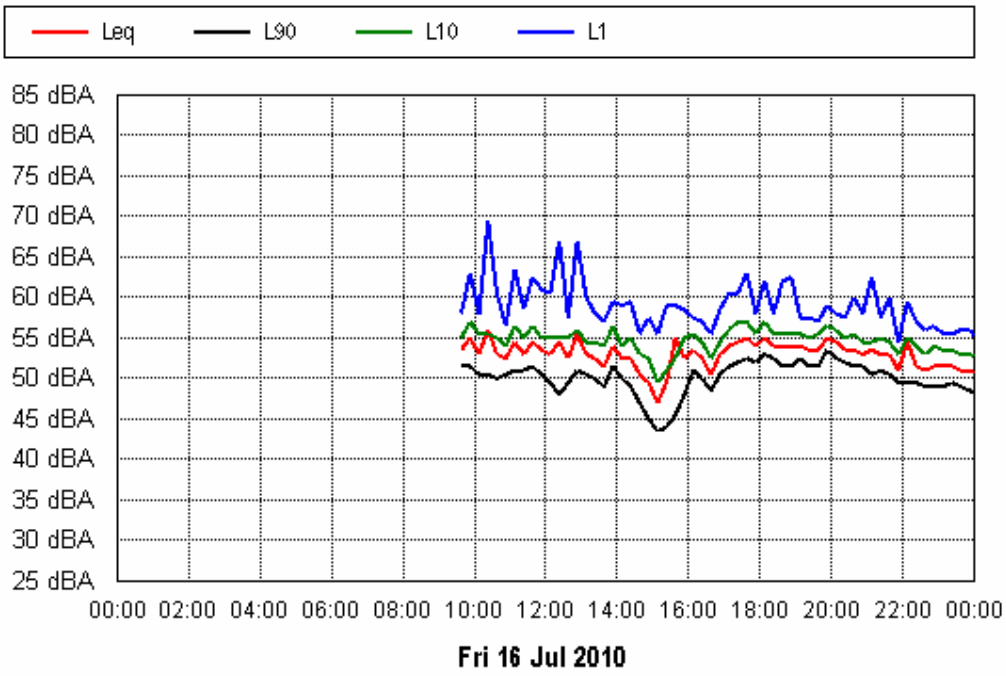
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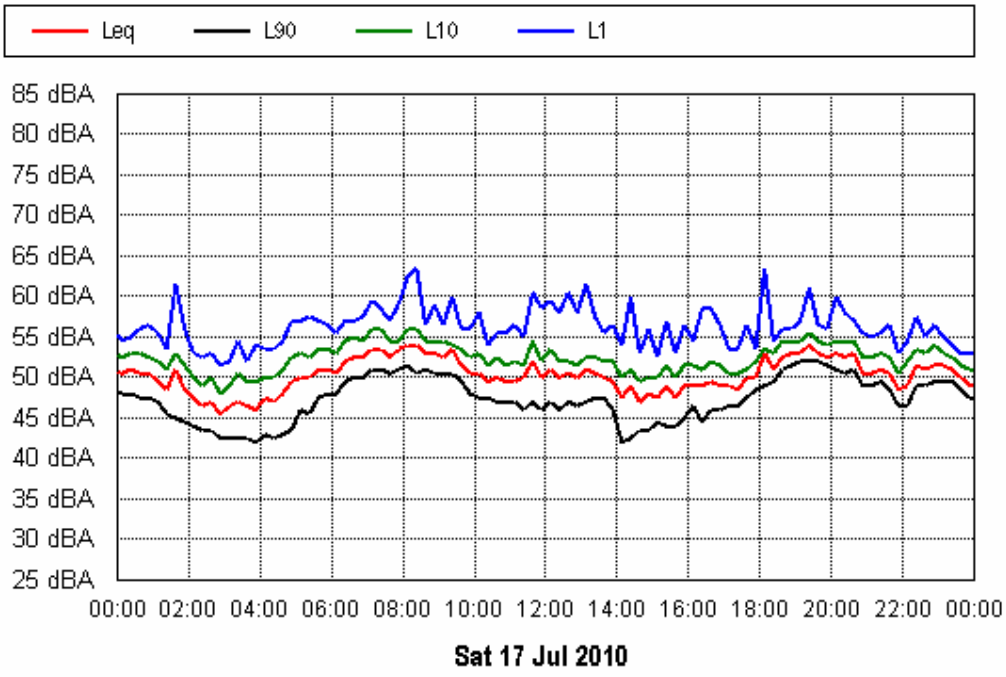
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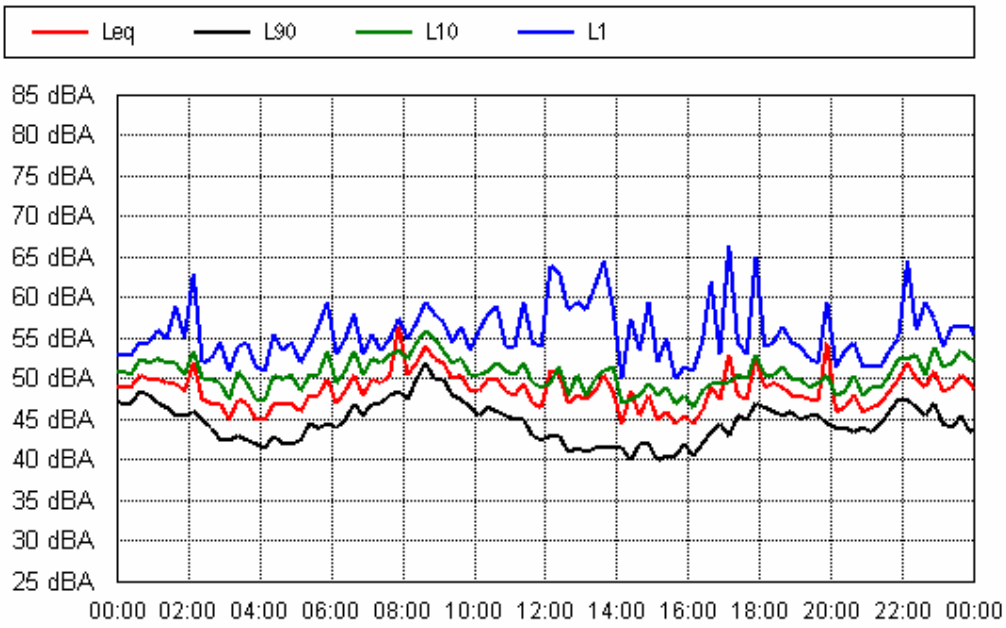

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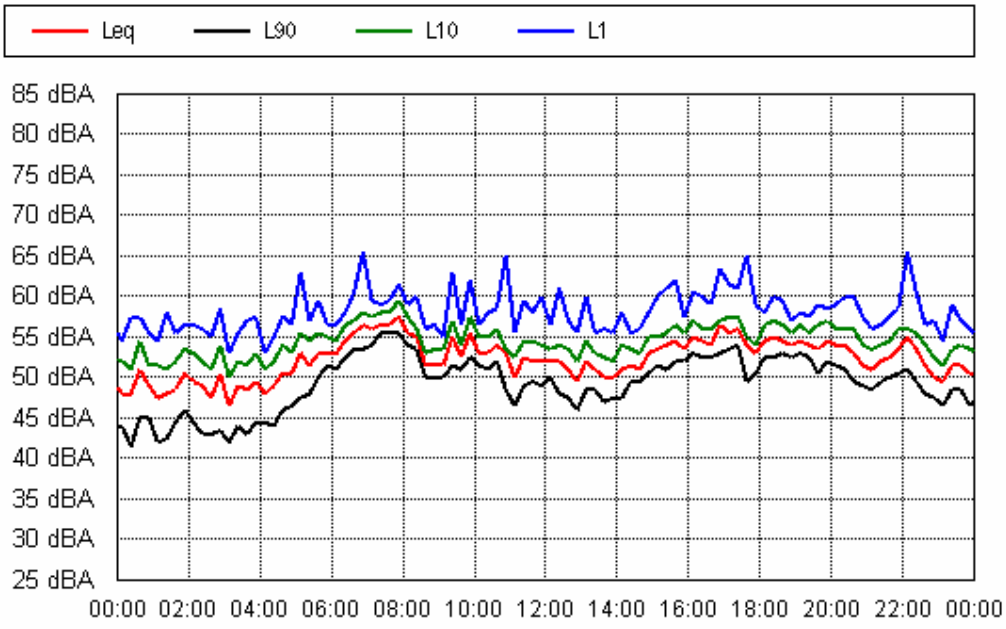

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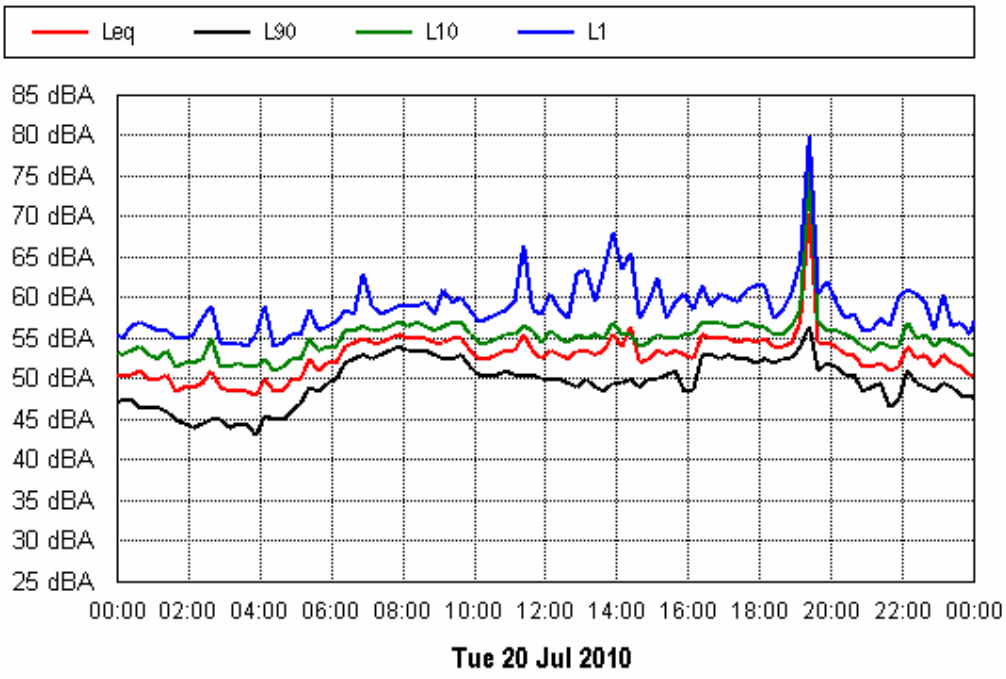
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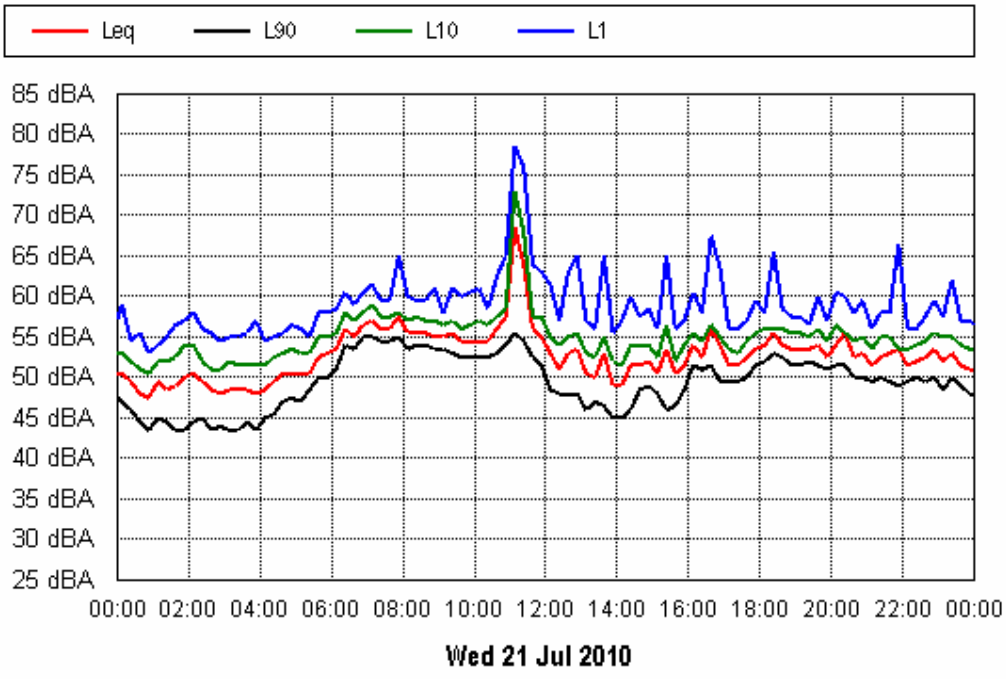
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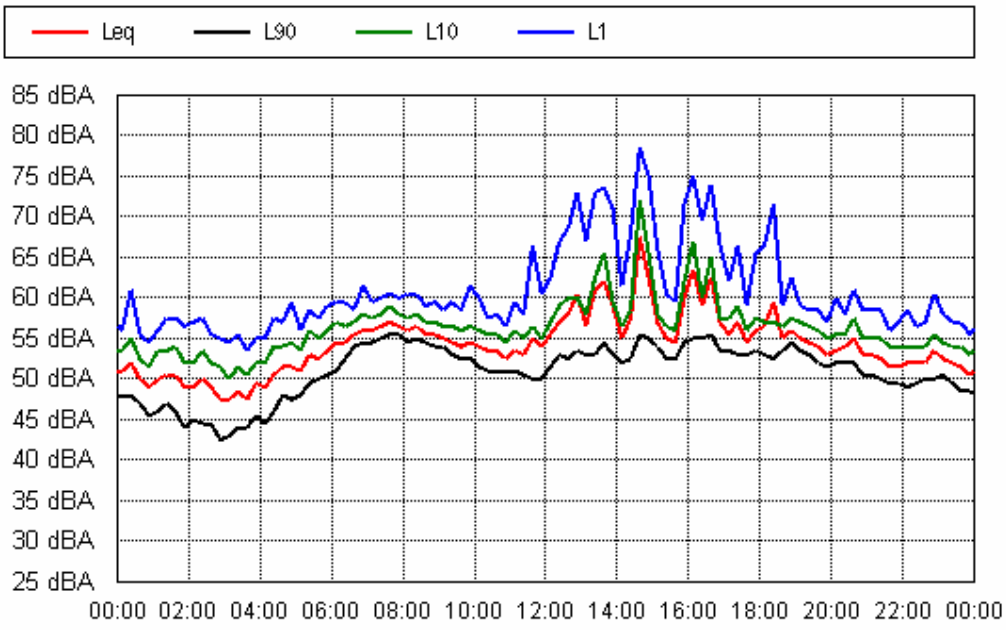

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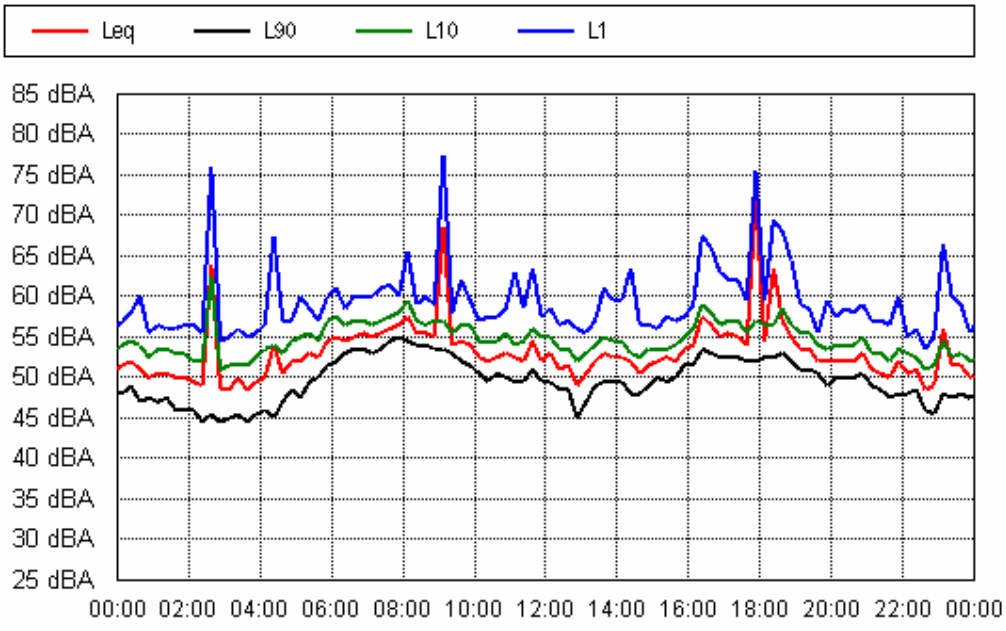

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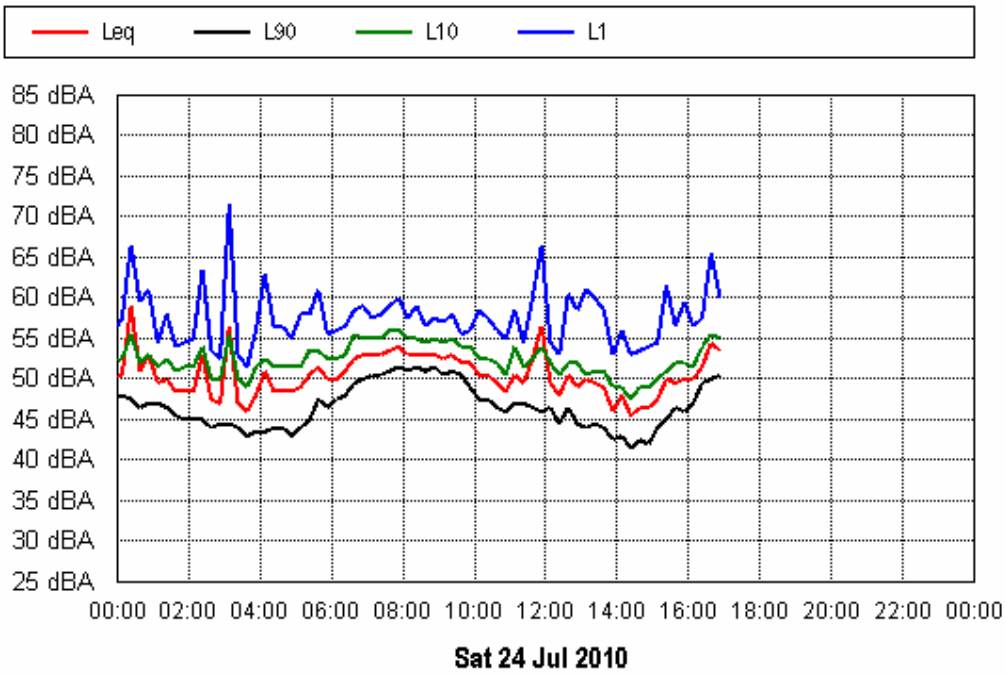
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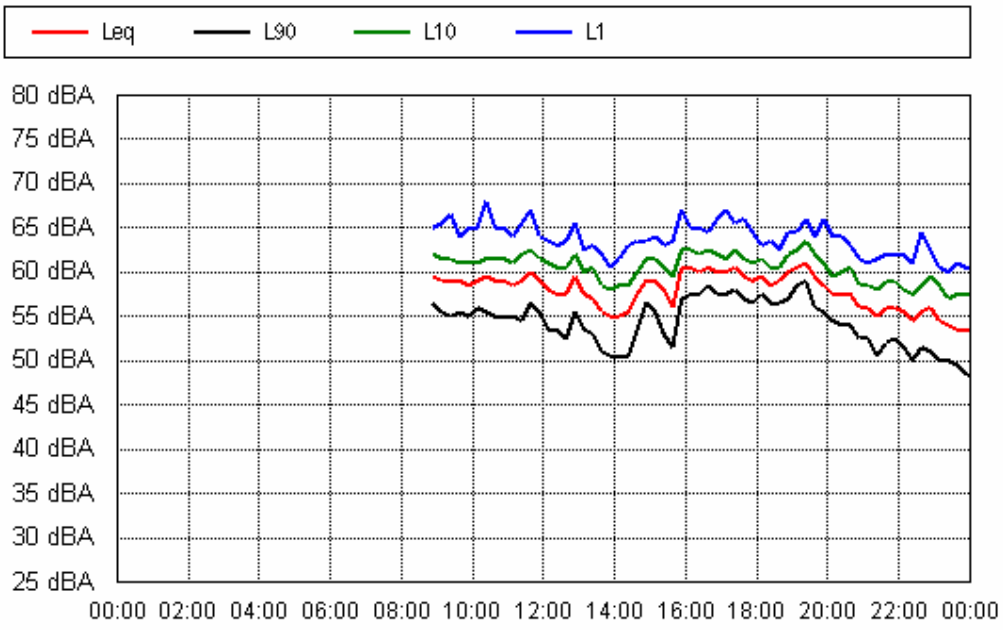

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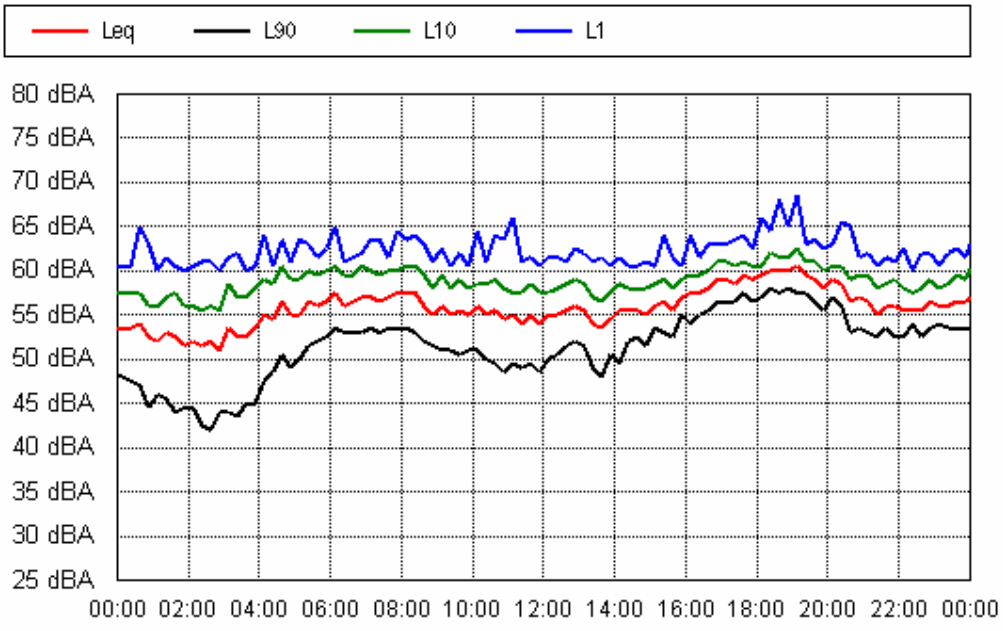

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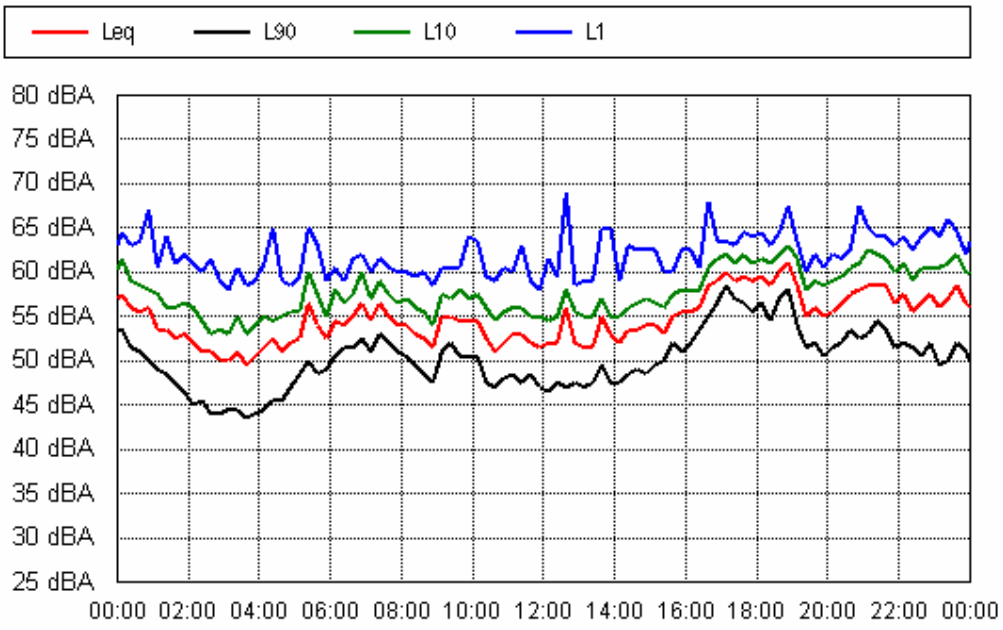

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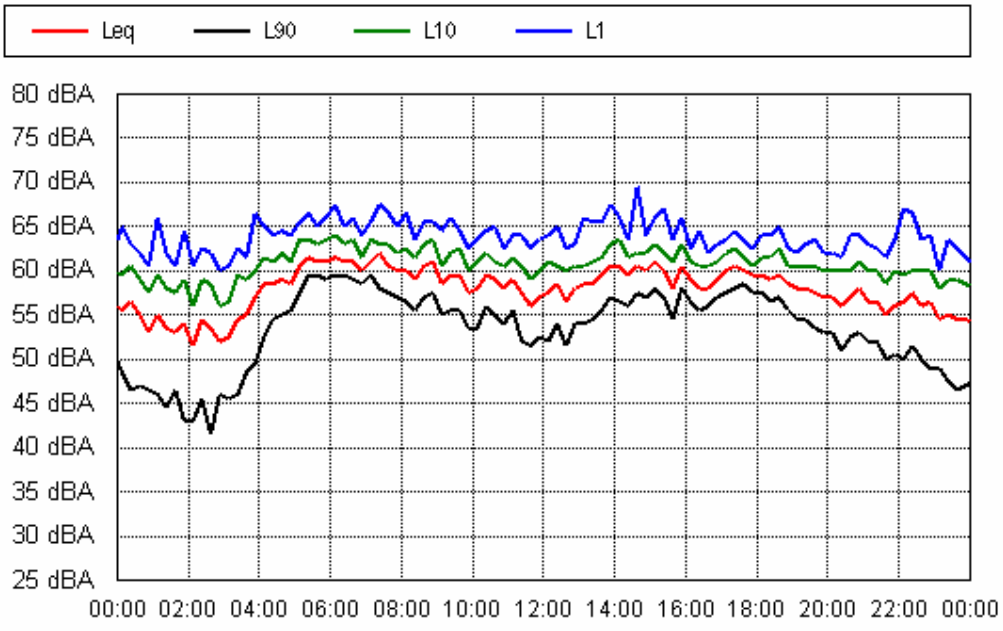

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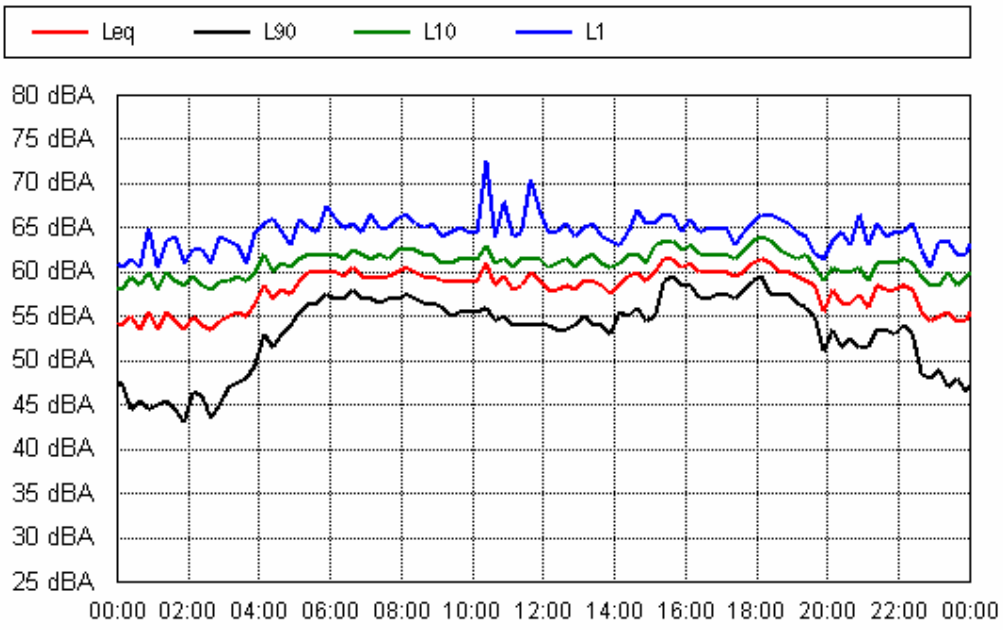

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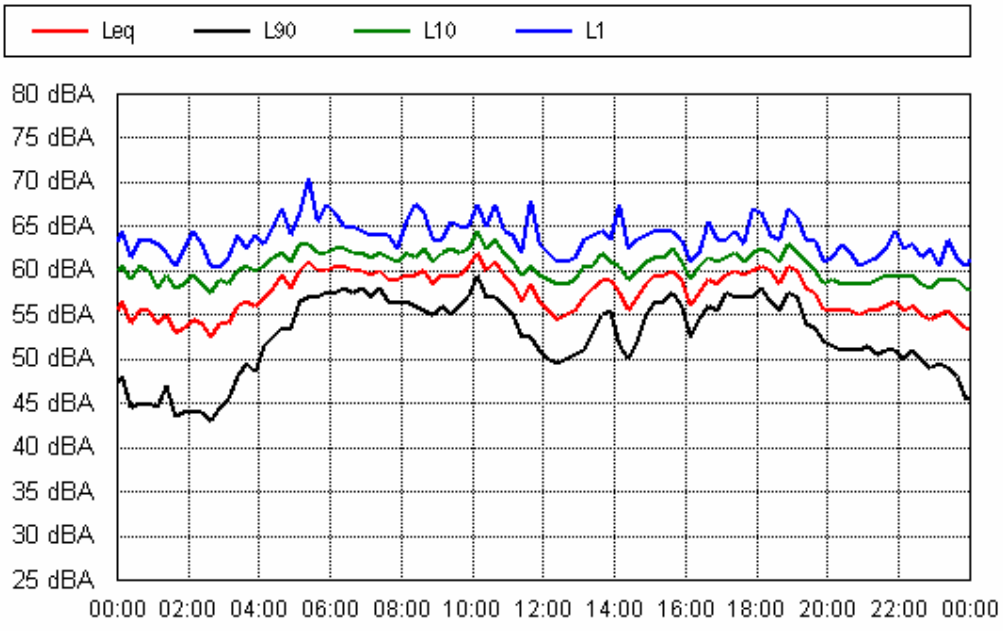

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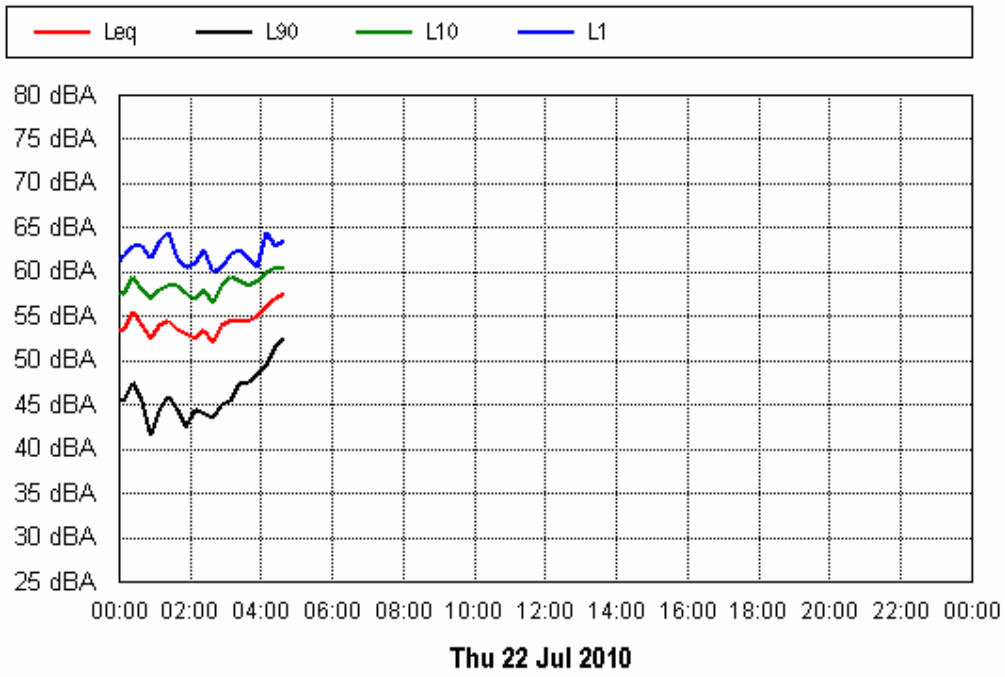
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60 dBA
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00:00 02:00 04:00 06:00 08:00 10:00 12:00 14:00 16:00 18:00 20:00 22:00 00:00
Thu 22 Jul 2010