WILKINSON MURRAY

Noise Impact Assessment

SIMTA

SYDNEY INTERMODAL TERMINAL ALLIANCE

Impact Assessment Report

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GLOSSARY OF ACOUSTIC TERMS

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 below, 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.

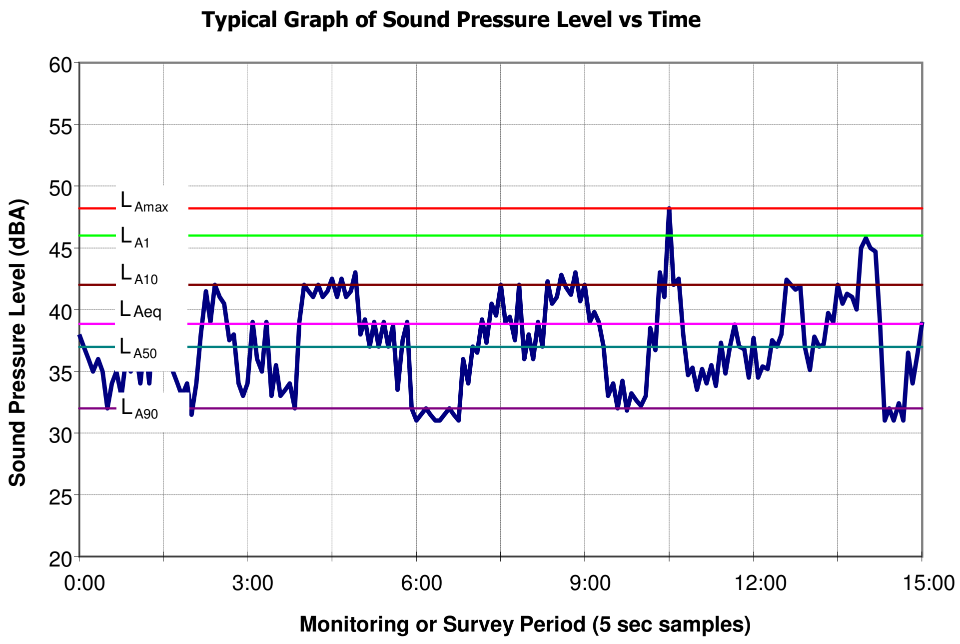
L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

L_{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.

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.

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 10th percentile (lowest 10th 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.



1 INTRODUCTION

The Sydney Intermodal Terminal Alliance (SIMTA) is a consortium of Qube Logistics and Aurizon. The SIMTA Moorebank Intermodal Terminal Facility (SIMTA proposal) is proposed to be located on the land parcel currently occupied by the Defence National Storage and Distribution Centre (DNSDC) on Moorebank Avenue, Moorebank, south west of Sydney. SIMTA proposes to develop the DNSDC occupied site into an intermodal terminal facility and warehouse/distribution facility, which will offer container storage and warehousing solutions with direct rail access to Port Botany. Construction of the rail connection from the SIMTA site to the Southern Sydney Freight Line (SSFL) will be undertaken as part of the first stage of works for the SIMTA proposal.

The SIMTA site is located in the Liverpool Local Government Area. It is 27 kilometres west of the Sydney CBD, 17 kilometres south of the Parramatta CBD, 5 kilometres east of the M5/M7 Interchange, 2 kilometres from the main north-south rail line and future Southern Sydney Freight Line, and 0.6 kilometres from the M5 motorway.

The SIMTA site, approximately 83 hectares in area, is currently operating as a DNSDC. The SIMTA site is legally identified as Lot 1 in DP1048263 and zoned as General Industrial under Liverpool City Council LEP 2008. The parcels of land to the south and south west that would be utilised for the proposed rail link are referred to as the rail corridor. The proposed rail corridor covers approximately 75 hectares and adjoins the Main Southern Railway to the north. The rail line is approximately 3.5 kilometres in length, 20 metres in width (variable width) and includes two connections to the SSFL, one south and one north.

The proposed rail corridor is owned by third parties, including the Commonwealth of Australia, RailCorp, private owners and Crown Land held by the Department of Primary Industries, and would link the SIMTA site with the Southern Sydney Freight Line. Existing uses include vacant land, existing rail corridors (East Hills Railway and Main Southern Railway), extractive industries and a waste disposal facility. The rail corridor is intersected by Moorebank Ave, Georges River and Anzac Creek. Native vegetation cover includes woodland, forest and wetland communities in varying condition. The proposed rail corridor is zoned partly 'SP2 Infrastructure (Defence and Railway)' and partly 'RE1 - Public Recreation'. The surrounding Commonwealth lands are zoned 'SP2 Infrastructure (Defence)'.

Table 1-1 shows the lot and deposited plan number of the land parcels that will be impacted by the SIMTA proposal.

Table 1-1 Land Parcels of the SIMTA Proposal

Lot	Deposited Plan	Property Address/Description
1	1048263	Moorebank Avenue, Moorebank (SIMTA Site)
3001	1125930	Moorebank Avenue, Moorebank (land immediately south and south-west of SIMTA Site, including School of Military Engineering)
1	825352	Railway land and to the north of East Hills Railway Line
2	825348	
1	1061150	
2	1061150	

Lot	Deposited Plan	Property Address/Description
1	712701	
5	833516	Privately owned land north of East Hills Railway Line, east of Cumberland & South Passenger Line and Southern Sydney Freight line and west of Georges River
7	833516	
51	515696	
52	517310	
104	1143827	
103	1143827	
91	1155962	
4	1130937	Land west of the Georges River, north of the above privately owned land
5	833516	Railway land along shared railway line – Cumberland & South Passenger Line and Southern Sydney Freight Line
101	1143827	
102	1143827	
Conveyance Book 76	Number 361	Main Southern Rail Corridor
NA	NA	Georges River (Crown Land)

This report considers the construction and operational impacts of the SIMTA proposal as a whole for the full operational capacity of 1 million twenty-foot equivalent unit (TEU) throughput per annum. This assessment has been undertaken to meet the Director General's Requirements (DGR) for the SIMTA proposal.

The DGR for the SIMTA proposal, and the section of this report in which they addressed are outlined in

Table 1-2 Director General's Requirements

Requirement	Where Addressed
Noise and Vibration – including but not limited to:	
• Noise and vibration from all activities on and sources (on and offsite), and impacts to adjoining receivers (including nearby residential areas of Moorebank, Wattle Grove and Casula and sensitive land uses); and • Taking into account the NSW Industrial Noise Polity (DEC), Assessing Vibration: A Technical Guideline (DECC), Environmental Criteria for Road Traffic Noise (DEC), and the Interim Guideline for the Assessment of Rail Infrastructure Projects (DEC and DoP).	Section 3 Section 4 Section 5 Section 6

The noise assessments within this document have been conducted in accordance with the following NSW Government Guidelines:

- *Industrial Noise Policy (INP).*
- *Road Noise Policy (RNP).*
- *Guideline for the Assessment of Noise from Rail Infrastructure Projects (IGANRIP).*
- *Interim Construction Noise Guideline (ICNG)*.

2 PROJECT DESCRIPTION

2.1 Project Description

The Concept Plan application comprises four key components:

- Rail Corridor.
- Intermodal Terminal.
- Warehouse and Distribution Facilities (including Freight Village).
- Ancillary Terminal Facilities.

Each of these components is described briefly in the sections below.

2.2 Rail Corridor and Rail Link

The proposed rail link is proposed to connect to the Southern SSFL, approximately 500 metres south of Casula railway station. It would then extend south, then east, crossing Georges River from the south-east corner of the Glenfield Waste Disposal Centre. The rail link would then continue east within the East Hills rail corridor, before heading north into the SIMTA Site.

The proposed rail link would be constructed over the following parcels of land:

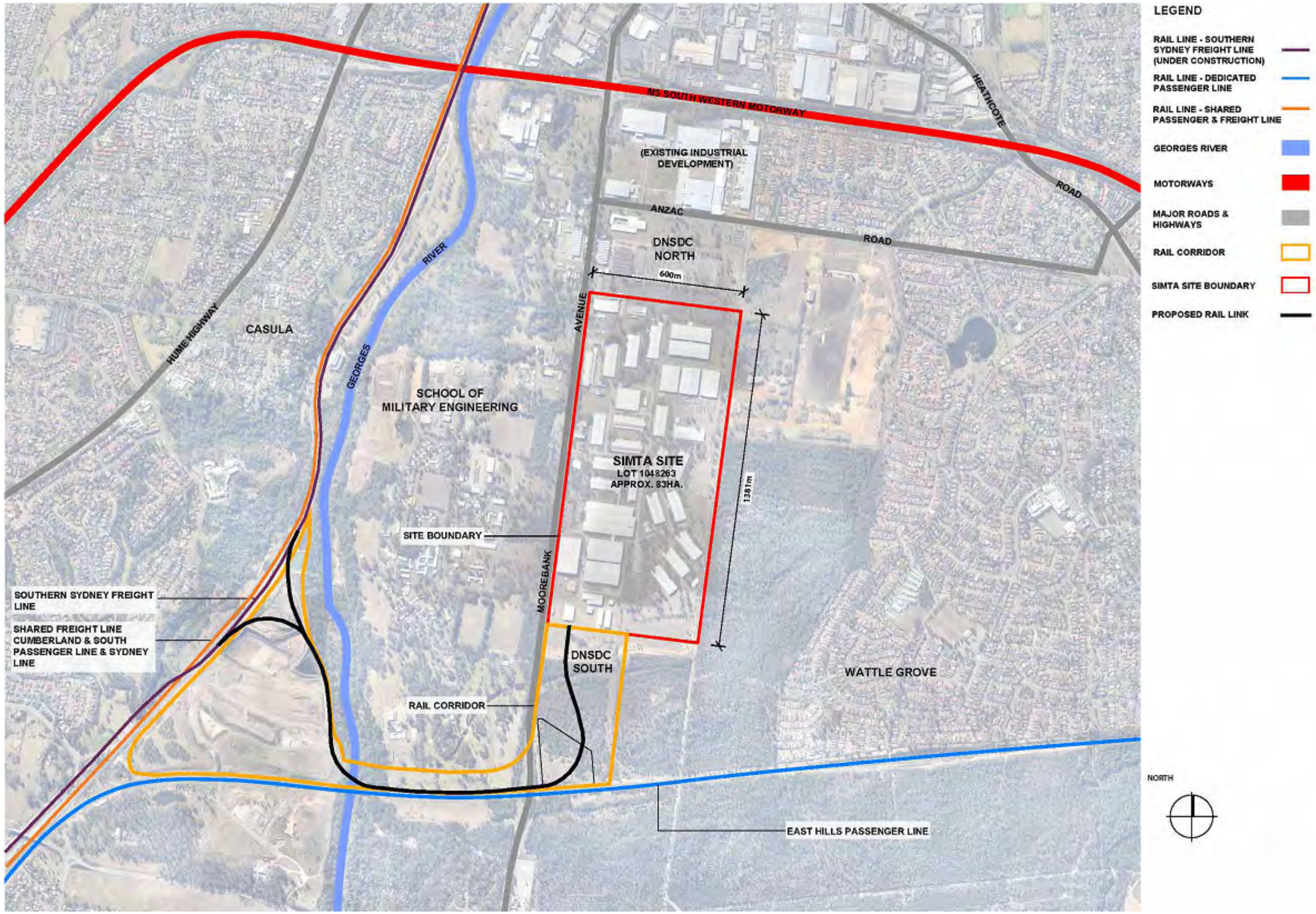
- SSFL rail corridor on the western side of the Georges River.
- Glenfield Waste Disposal Centre on the western side of the Georges River.
- East Hills rail corridor.
- Irregular shaped portion of land owned by RailCorp and located to the east of the intersection between Moorebank Avenue and the East Hills Railway Line.
- Land to the south of the DNSDC site owned by the Commonwealth.

The proposed rail link would include the following infrastructure:

- Culvert crossing of Anzac Creek.
- A crossing under Moorebank Avenue in proximity to the existing grade-separated crossing which supports the existing East Hills Railway Corridor.
- A rail bridge over the Georges River.

The indicative rail link alignment is shown on Figure 2-1.

Figure 2-1 Proposed Rail Link Alignment



2.3 Intermodal Terminal

The intermodal terminal is proposed to be located on the western part of the site, adjacent to Moorebank Avenue and away from the nearest residential properties. Key elements include:

- Five rail tracks of approximately 650 to 1,200 metres in length, including four permanent sidings and one temporary siding.
- Container hardstand of approximately 90,000m^2 located on both sides of the rail tracks to be used for container sorting and storage.
- Terminal administration offices and ancillary operational facilities of approximately 2,100m^2
- The intermodal terminal is proposed to operate 24 hours a day, 7 days a week to enable continuous receipt and dispatch of freight, accommodating a wide range of servicing demands. It will be serviced by world class and leading practice intermodal facilities including:
    - Automatic gantry systems
    - Modern container handling equipment
    - Modern control tower and support facilities
    - State-of-the-art rolling stock

The final selection of mobile and static equipment will be made at the detailed application stage for the intermodal terminal, taking into account compliance with the criteria established by way of the Concept Plan approval, including noise levels, visual impacts and air quality.

2.4 Warehouse and Distribution Facilities

Approximately 300,000m^2 of warehouses with ancillary offices are proposed to be constructed to the east of the intermodal terminal. The proposed warehouses are to be sited and designed to provide a physical barrier between the intermodal terminal and the nearest residential properties to assist with mitigating the potential acoustic and visual impacts of the rail activities. These warehouses include:

- Intermodal Terminal Warehouse and Distribution Facilities (Terminal Warehouses) – approximately 100,000m^2 of warehouse floorspace will be located immediately adjacent to the intermodal terminal. These buildings will be designed for cross-dock operations and are anticipated to be occupied by large logistics operators dispatching goods in short turn-around times and with limited freight break-down.
- Large Format Warehouse and Distribution Facilities - approximately 200,000m^2 of warehouse floorspace will be located on the eastern part of the SIMTA site, east of the Terminal Warehouse facilities. These buildings will have perimeter loading docks and are anticipated to be occupied by logistics operators who require larger areas for operations, hold stock for longer periods and/or undertake larger amounts of freight-breakdown before dispatching.

Each of the warehouses will be serviced by the central internal road system. The road system design and location of the car park to the east of the large format warehouse buildings are proposed to maximise the separation of staff and freight vehicle movements and minimise potential vehicle conflicts.

2.5 Ancillary Terminal Facilities

A range of ancillary support facilities are proposed within the SIMTA Intermodal Terminal Facility to meet the needs of employees and visitors to the site. The final composition of these facilities will be based on demand and will be privately operated by individual tenants, however, it is anticipated that a total floorspace of approximately 8,000m^2 will be provided and the uses are likely to include:

- Site management and security offices.
- Retail and business service centre, potentially including a convenience store, banking facilities and post office.
- Meeting rooms/conference facilities available for hire by individual tenants.
- Sleeping facilities for drivers.
- A café/restaurant.

A centralised staff car parking area provided adjacent to the ancillary facilities will enable separation of heavy vehicle movements from private vehicle movements, particularly around the intermodal terminal warehouses.

2.6 Staging

The SIMTA Moorebank Intermodal Terminal Facility is proposed to be constructed in three stages. The anticipated scope of works and timing for each stage is described in Table 2-1 below.

Table 2-1 Indicative staging plan

Stage	Scope	Timing
Stage 1 – *Construction of the intermodal terminal and rail link*	Stage 1 shall include: Construction of the rail link between the SIMTA site and the SSFL. Construction of hardstand for container storage. Possible construction of a control tower. Construction of a truck maintenance shed. Construction of access driveways, freight truck loading area and internal circulation roads required to service the intermodal terminal. Provision / upgrade of stormwater infrastructure and utility services required to service the intermodal terminal. Landscaping to Moorebank Avenue boundary. Possible construction of some warehousing.*	Construction commencement: End - 2014 Completion: Mid-2015

Stage	Scope	Timing
Stage 2 – *Construction of warehouses and distribution facilities*	Stage 2 shall constructthe central portion of the intermodal terminal warehousing and distribution facilities and the south-eastern portion of the Large Format Warehousing and Distribution Facilities, including: Circulation roads required to service the proposed warehouses. Staff and visitor car parking spaces required to service the proposed warehouses. Landscaping treatments within the development areas. Provision / upgrade of stormwater infrastructure and utility services required to service the Stage 2 warehouses.	Commencement: Subject to market demand Completion: Mid-2019
Stage 3 – *Extension of the intermodal terminal and completion of warehouses and distribution facilities*	Stage 3 (the final stage) shall include: Extension of the intermodal terminal from 650 metres to 1,200 metres in length. Construction of the remaining warehouse and distribution facilities. Construction of the ancillary terminal facilities in the north-east corner of the site. Completion of the circulation roads. Staff and visitor car parking spaces required to service the additional warehouses. Completion of the landscaping treatments. Provision / upgrade of stormwater infrastructure and utility services requires to service the additional warehouses.	Completion: Mid-2022

2.7 Planning approvals

A Concept Plan approval is being sought under the transitional provisions relating to Part 3A assessments under the *Environmental Planning and Assessment Act* 1979 (EP&A Act) for the SIMTA proposal.

3 SENSITIVE RECEIVERS

3.1 Residential Receivers

To assess the any potential noise impacts from operational or construction activities at the SIMTA proposal, the following residential receiver 'catchments' have been identified:

- R1 – 500m to the east, in Wattle Grove.
- R2 – 500m to the north, in Moorebank.
- R3 – 900m to the west, in Casula.
- R4 – 1,600m to the south west, in Glenfield.

The locations of the receiver catchments are shown in Figure 3-1.

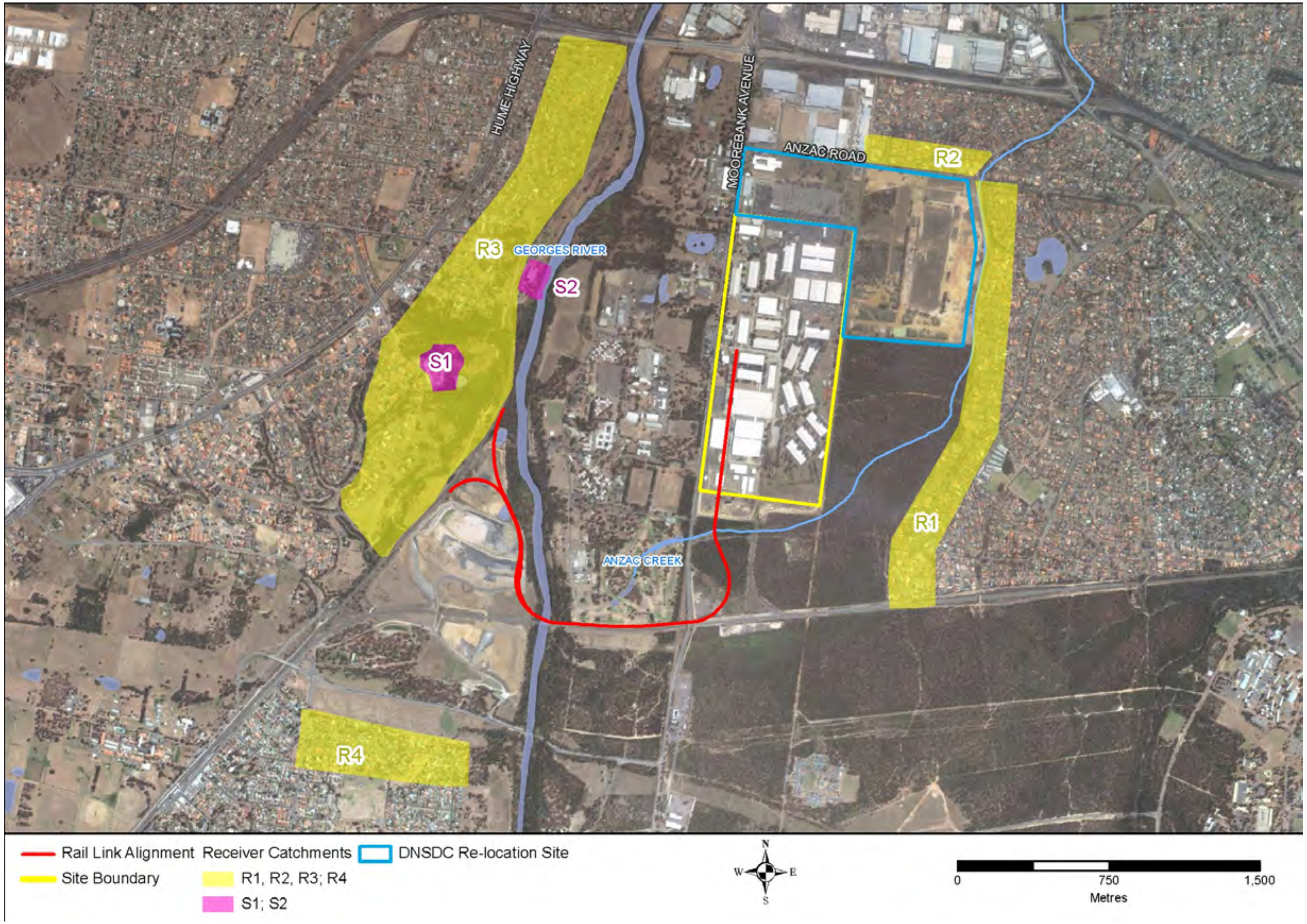
3.2 Other Receivers

In addition to the receivers identified above, several non-residential receivers are situated nearby the SIMTA proposal. Following are the most sensitive non-residential receivers surrounding the site:

- All Saints Senior College (S1)
- Casula Powerhouse (S2)
- DNSDC Re-location Site.

The locations of the identified non-residential receivers are shown in Figure 3-1.

Figure 3-1 Sensitive Receivers



4 EXISTING NOISE LEVELS

To establish the background noise levels at nearby residential receivers, the results of two unattended background monitoring exercises were used.

Unattended background noise monitoring was conducted within receiver catchments R1 and R2 between Tuesday, 31 July and Wednesday, 8 August 2012.

Unattended background monitoring was conducted within receiver catchments R3 and R4 between Wednesday 15 and Wednesday 22 May 2013.

The measurement locations are shown in Figure 4-1.

The noise monitoring equipment used for these measurements consisted of 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 Glossary 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. This is used for the assessment of sleep disturbance. The L_{A90} level is normally taken as the background noise level during the relevant period.

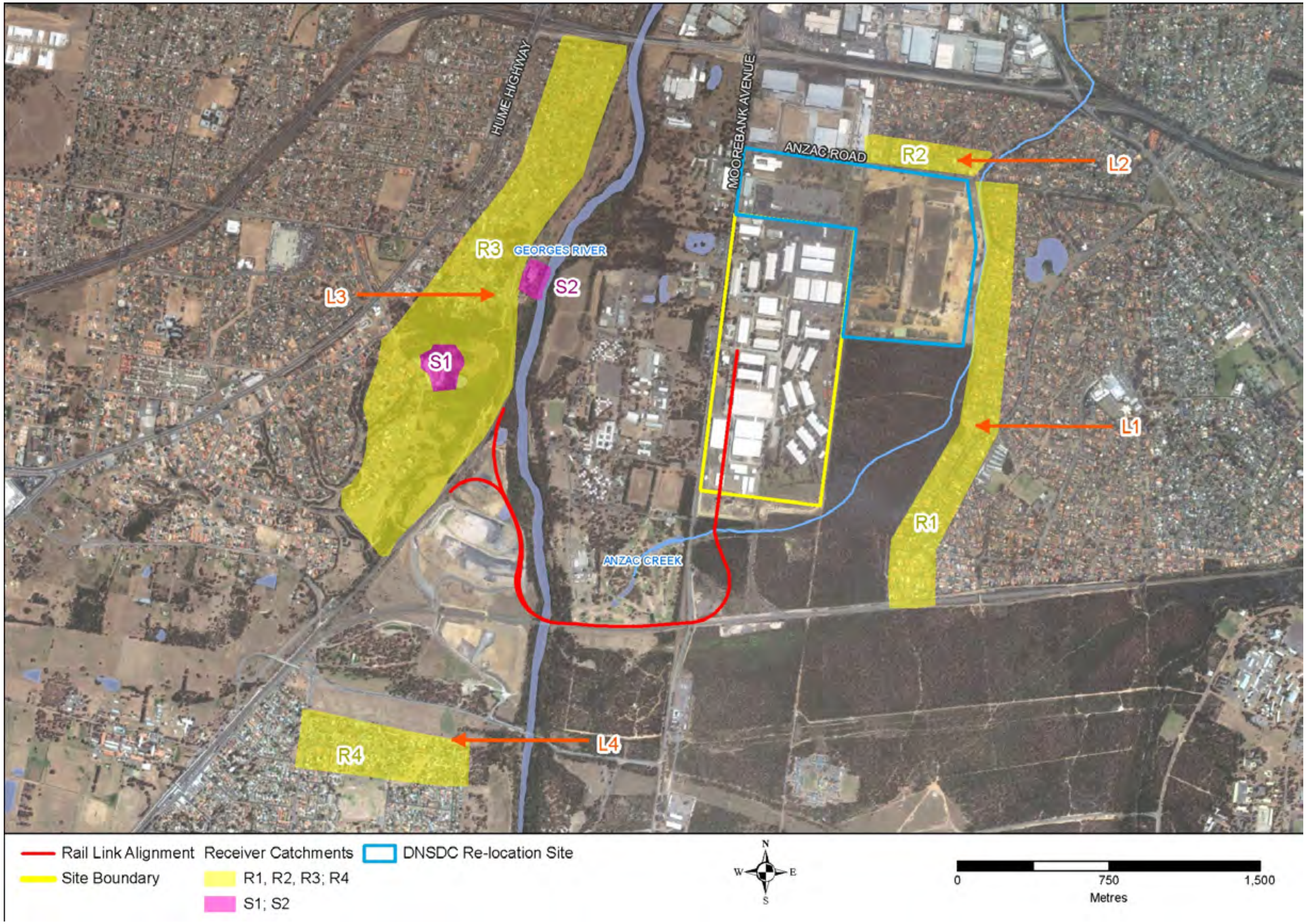
The Rating Background Noise Levels (RBL) for the measurement locations are shown in Table 4-1.

Table 4-1 Rating Background Noise Levels (RBL)

Measurement Location	RBL (dBA)		
	Daytime (7.00am-6.00pm)	Evening (6.00pm-10.00pm)	Night Time (10.00pm-7.00am)
L1: 15 Larra Court, Wattle Grove	42	37	37
L2: 6 Namoi Court, Wattle Grove	36	36	36
L3: 2 Rushton Place, Casula	41	37	34
L4: 14 Goodenough Street, Glenfield	44	44	37

Plots of the logger data are found in Appendix A.

Figure 4-1 Background Noise Measurement Locations



5 NOISE CRITERIA

5.1 Operational Noise Criteria

The *NSW Industrial Noise Policy (INP)* recommends two criteria, "Intrusiveness" and "Amenity", both of which are relevant for the assessment of noise. In most situations, one of these is more stringent than the other and dominates the noise assessment. The criteria are based on the L_{Aeq} descriptor, which is explained in the *Glossary of Acoustic Terms* at the beginning of this report.

5.1.1 Intrusiveness

The intrusiveness criterion, applied to residential receivers, requires that the L_{Aeq} noise level from the source being assessed, when measured over 15 minutes, should not exceed the Rating Background Noise Level (RBL) by more than 5 dBA. The RBL represents the 'background' noise in the area, and is determined from measurement of L_{A90} noise levels, in the absence of noise from the source. The definition of L_{A90} and the procedure for calculating the RBL is given in the *Glossary of Acoustic Terms*.

Where the noise level from the source varies over time due to changes in operating conditions, meteorological conditions or other factors, the upper 10^{th} percentile of 15 minute L_{Aeq} noise levels can be used for comparison with the criterion.

Table 5-1 shows the intrusive noise criteria for nearby residential receivers, based on the measured RBLs in Table 4-1.

Table 5-1 Intrusiveness Criteria

Receiver Catchment	Intrusiveness Criteria (dBA – $L_{Aeq,15min}$)		
	Daytime (7.00am-6.00pm)	Evening (6.00pm-10.00pm)	Night Time (10.00pm-7.00am)
R1	47	42	42
R2	41	41	41
R3	46	42	39
R4	49	49	42

5.1.2 Amenity

The amenity criterion sets a limit on the total noise level from *all industrial noise sources* affecting a receiver. Different criteria apply for different types of receiver (e.g. residence, school classroom); different areas (e.g. rural, suburban); and different time periods, namely daytime (7.00am-6.00pm), evening (6.00pm-10.00pm) and night time (10.00pm-7.00am).

The noise level to be compared with this criterion is the L_{Aeq} noise level, measured over the time period in question, due to all industrial noise sources, but excluding non-industrial sources such as transportation.

Where a new noise source is proposed in an area with negligible existing industrial noise, the amenity criterion for that source may be taken as being equal to the overall amenity criterion. However, if there is significant existing industrial noise, the amenity criterion for any new source must be set at a lower value. If existing industrial noise already exceeds the relevant amenity criterion, noise from any new source must be set well below the overall criterion to ensure that any increase in noise levels is negligible. Methods for determining a source-specific amenity criterion where there is existing industrial noise are set out in the *INP*.

The *INP* amenity criteria are shown in Table 5-2.

Table 5-2 Amenity Criteria

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended $L_{Aeq,Period}$ Noise Level, (dBA)	
			Acceptable	Recommended Maximum
Residence	Rural	Day	50	55
		Evening	45	50
		Night	40	45
	Suburban	Day	55	60
		Evening	45	50
		Night	40	45
	Urban	Day	60	65
		Evening	50	55
		Night	45	50
School classroom – internal	All	Noisiest 1-hour period when in use	35	40
Hospital Ward				
Internal	All	Noisiest 1-hour	35	40
External	All	Noisiest 1-hour	50	55
Place of Worship – internal	All	When in use	40	45
Passive recreation area (e.g. National park)	All	When in use	50	55
Active recreation area (e.g. playground, golf course)	All	When in use	55	60
Commercial premises	All	When in use	65	70
Industrial premises	All	When in use	70	75

In determining the residential area classification, the *INP* makes the following distinctions between 'suburban' and 'urban' areas:

Suburban: an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the following characteristics:

- Decreasing noise levels in the evening period (1800–2200); and/or

- Evening ambient noise levels defined by the natural environment and infrequent human activity.

Urban: an area with an acoustical environment that:

- Is dominated by 'urban hum' or industrial source noise;
- Has through traffic with characteristically heavy and continuous traffic flows during peak periods;
- Is near commercial districts or industrial districts; or
- Has any combination of the above.

Where 'urban hum' means the aggregate sound level of many unidentifiable sound sources which are mostly traffic-related.

For all the receiver catchments identified in this report, the existing levels of industrial noise are negligible; approximately 10dB below the recommended acceptable levels in Table 5-2. Accordingly, the amenity criteria for the SIMTA proposal, in each catchment; will be equal to the overall amenity criteria.

The residential area classifications and resultant amenity criteria for each of the receiver catchments are shown in Table 5-3.

Table 5-3 Project Specific Amenity Criteria – Residential Receivers

Receiver	Indicative Noise Amenity Area	Time Period	Noise Level, $L_{Aeq,Period}$ (dBA)		
			Overall Amenity Criterion	Existing Industrial Noise	Project-Specific Amenity Criterion
R1, R2, R4	Residential Suburban	Daytime (7.00am–6.00pm)	55	inaudible	55
		Evening (6.00–10.00pm)	45	inaudible	45
		Night Time (10.00pm–7.00am)	40	inaudible	40
R2,	Residential Urban	Daytime (7.00am–6.00pm)	60	inaudible	60
		Evening (6.00–10.00pm)	50	inaudible	50
		Night Time (10.00pm–7.00am)	45	inaudible	45

Amenity criteria for non-residential receivers have also been established and are shown in Table 5-4.

The INP does not provide guidance on suitable criteria for a venue such as the Casula Powerhouse (S2). As the Powerhouse is used a great deal for teaching and presentations to the community, Wilkinson Murray Pty Ltd considers the school classroom amenity criteria to be appropriate for such a receiver. The INP school classroom amenity criteria, which are also applicable for S1, are expressed as internal noise levels. For convenience, these recommended internal noise levels have been translated to external noise levels. This has been done by adding 10 dBA to the recommended INP criterion, to account for the attenuation of noise through a partially open window.

It is expected that the current DNSDC will be re-located to a parcel of land immediately to the north of the SIMTA proposal. The existing levels of industrial noise at the DNSDC re-location site are unknown, and accordingly; the project specific amenity criterion for this receiver has been set to 10 dBA below the recommended level. Achieving this noise goal at the DNSDC re-location site will mitigate any likelihood that noise emissions from the SIMTA proposal will affect this receiver.

Table 5-4 Project Specific Amenity Criteria – Non-Residential Receivers

Receiver	Indicative Noise Amenity Area	Time Period	Noise Level, $L_{Aeq,Period}$ (dBA)		
			Overall Amenity Criterion	Existing Industrial Noise	Project-Specific Amenity Criterion
S1, S2	School	Noisiest 1-hour period when in use	45	inaudible	45
DNSDC	Industrial	When in use	70	unknown	60

5.2 Sleep Disturbance Criteria

With respect to operational noise at night time (10.00pm-7.00am), it is possible for events of short duration, but high intensity to cause sleep disturbance; despite complying with the INP criteria.

Transient events such as container handling and horn blowing will occur on site during the night time and therefore should be considered for their likelihood to cause sleep disturbance.

The EPA's *Noise Guide for Local Government (NGLG)* notes that:

> *"Currently, there is no definitive guideline to indicate a noise level that causes sleep disturbance and more research is needed to better define this relationship. Where likely disturbance to sleep is being assessed, a screening test can be applied that indicated the potential for this to occur.*
>
> *For example, this could be where the subject noise exceeds the background noise level by more than 15 dBA. The most appropriate descriptors for a source relating to sleep disturbance would be $L_{A1,\ 1\ minute}$ (the level exceeded for 1% of the specified time period of 1 minute) or L_{Amax} (the maximum level during the specified time period) with measurement outside the bedroom window."*

Based on the above advice, sleep disturbance screening levels have been established for the receiver catchment areas and are shown in Table 5-5.

Table 5-5 Sleep Disturbance Screening Levels

Receiver Catchment	Night Time (10.00pm-7.00am) RBL (dBA)	Sleep Disturbance Screening Level (dBA - $L_{A1,1min}$ / L_{Amax})
R1	37	52
R2	36	51
R3	34	49
R4	37	52

5.3 Road Traffic Noise Criteria

Applicable noise criteria for proposals which have the potential to indefinitely increase traffic on roads are presented in the EPA's *NSW Road Noise Policy (RNP).*

The project will generate additional traffic along the M5 Motorway and Moorebank Avenue. According to the *RNP*, the M5 Motorway is classified as a Freeway, while Moorebank Avenue is classified as a sub-arterial road.

The *RNP* assessment criteria for residential land uses are shown in Table 5-6.

With regard to the permissible increase in road traffic noise from a land use development the *RNP* states:

> "*For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'.*"

Table 5-6 Road Traffic Noise Criteria for Residential Receivers

Road Category	Type of Project/Land Use	Assessment Criteria – dB(A)	
		Day (7.00am–10.00pm)	**Night (10.00pm–7.00am)**
Freeway / arterial / sub-arterial roads	1. Existing residences affected by noise from new freeway / arterial / sub-arterial road corridors	$L_{Aeq,15\ hr}$ 55 (external)	$L_{Aeq,9hr}$ 50 (external)
	2. Existing residences affected by noise from redevelopment of existing freeway / arterial / sub-arterial roads	$L_{Aeq,15\ hr}$ 60 (external)	$L_{Aeq,9hr}$ 55 (external
	3. Existing residences affected by additional traffic on existing freeways / arterial / sub-arterial roads generated by land use developments		
Local roads	4. Existing residences affected by noise from new local road corridors	$L_{Aeq,1hr}$ 55 (external)	$L_{Aeq,1hr}$ 50 (external)
	5. Existing residences affected by noise from redevelopment of existing local roads		
	6. Existing residences affected by additional traffic on existing local roads generated by land use developments		

5.4 Rail Traffic Noise Criteria

The EPA's *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects* [IGANRIP] (2007) provides guidance for assessment rail infrastructure. *IGANRIP* specifies 'trigger levels', which are "non mandatory targets that can be used to initiate an assessment of noise impacts and consideration of feasible and reasonable mitigation measures".

The EPA will soon replace IGARNIP with the *Rail Infrastructure Noise Guideline (RING)*. The outcomes of a rail noise assessment for, the SIMTA proposal, in accordance with RING would be the same for those arrived at through an IGANRIP assessment.

Rail traffic noise assessments accompanying the detailed applications of relevant stages of the SIMTA proposal should be carried out in accordance with the new guideline.

For residential receivers the noise trigger levels for absolute levels of rail noise have two components, L_{Aeq} and L_{Amax}. The L_{Aeq} contribution level of rail noise is assessed over both day and night periods. The application of the L_{Amax} descriptor for residential land uses recognises that rail events are not adequately described solely by the L_{Aeq} descriptor in terms of their effect on residential amenity and wellbeing. The *IGANRIP* trigger levels for rail traffic noise are shown in Table 5-7.

Table 5-7 Rail Traffic Noise Trigger Levels for Residential Receivers

Type of Development	Day (7.00am–10.00pm)	Night (10.00pm–7.00am)	Comment
New rail line development	Development increases existing rail noise levels **and** resulting rail noise levels exceed:		These numbers represent external levels of noise that trigger the need for an assessment of the potential noise impacts from a rail infrastructure project.
	$L_{Aeq,15hr}$ 60 L_{Amax} 80	$L_{Aeq,9hr}$ 55 L_{Amax} 80	
Redevelopment of existing rail line	Development increases existing rail noise levels **and** resulting rail noise levels exceed:		An 'increase' in existing rail noise levels is taken to be an increase of 2 dBA or more in L_{Aeq} in any hour or an increase of 3 dBA or more in L_{Amax}.
	$L_{Aeq,15hr}$ 65 L_{Amax} 85	$L_{Aeq,9hr}$ 60 L_{Amax} 85	

IGANRIP states that the trigger levels apply to the time immediately after opening and also at a time up to 10 years in the future.

The rail link between the SIMTA proposal and SSFL is considered a 'new rail line development'.

5.5 Construction Noise Criteria

The NSW EPA's *Interim Construction Noise Guidelines (ICNG)* recommends noise management levels (NML) to reduce the likelihood of noise impacts arising from construction activities.

The *ICNG* NML for residential receivers are shown in Table 5-8.

Table 5-8 Construction NML for Residential Receivers

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 + 10 dBA	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq,15min}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • 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.
	Highly noise affected 75 dBA	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 relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences; 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
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.

Within the DNSDC there are a number of offices and warehouses, some of which may be sensitive to construction noise. The *ICNG* NML for commercial and industrial receivers are shown in Table 5-9.

Table 5-9 Construction NML for Non-Residential Receivers

Receiver Type	NML $L_{Aeq, 15min}$
Industrial	75
Classroom	45 (internal)

Similar to the establishment of external amenity criteria for S1 and S2, the construction noise NML for S1 and S2 are set to 10 dBA above the internal NML.

The majority of the construction is expected to occur during standard construction hours. Table 5-10 shows relevant construction noise goals, based on the measured RBL values shown in Table 4-1.

Table 5-10 Construction Noise Management Levels

Receivers	Acceptable $L_{Aeq, 15 min}$ Noise Level			
	Standard Construction Hours RBL + 10 (dBA)	Outside Standard Construction Hours RBL + 5 (dBA)		
		Day	Evening	Night
R1	52	47	42	42
R2	46	41	41	41
R3	51	46	42	39
R4	54	49	49	42
S1, S2	55	55	55	55
DNSDC	75	75	75	75

5.6 Construction Vibration Criteria

When assessing the effects of vibration from construction activities; both human exposure to vibration and the potential for building damage from vibration should be considered.

5.6.1 Human Exposure to Vibration

The EPA's *Assessing Vibration: A Technical Guideline* provides guidance for assessing human exposure to vibration. The publication is based on British Standard BS6472:1992, which sets 'preferred' and 'maximum' vibration levels for human comfort.

Acceptable values of human exposure to continuous vibration, such as that associated with underground drilling, are dependent on the time of day and the activity taking place in the occupied space (e.g. workshop, office, residence, or a vibration-critical area). Guidance on preferred values for continuous vibration is set out in Table 5-11.

Table 5-11 Criteria for Exposure to Continuous Vibration

Location	Time	Peak Particle Velocity (mm/s)	
		Preferred	Maximum
Critical working areas (e.g. operating theatres, laboratories)	Day or Night Time	0.14	0.28
Residences	Day	0.28	0.56
	Night	0.20	0.4
Offices	Day or Night Time	0.56	1.1
Workshops	Day or Night Time	1.1	2.2

In the case of intermittent vibration, which is caused by plant such as rock breakers; the criteria are expressed as a Vibration Dose Value (VDV) and are shown in Table 5-12.

Table 5-12 Acceptable Vibration Dose Values for Intermittent Vibration ($m/s^{1.75}$)

Location	Daytime		Night Time	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
Critical areas	0.1	0.2	0.1	0.2
Residences	0.2	0.4	0.13	0.26
Offices, schools, educational institutions and places of worship	0.4	0.8	0.4	0.8
Workshops	.08	1.6	0.8	1.6

5.6.2 Building Damage from Vibration

There are currently no Australian Standards or guidelines to provide guidance on assessing the potential for building damage from vibration. It is common practice to derive goal levels from international standards. British Standard BS 7385:1993 and German Standard DIN 4150:1999 both provide goal levels, below which vibration is considered insufficient to cause building damage. Of these DIN 4150 is the more stringent. Table 5-13 summarises the goal levels specified in DIN 4150.

With regard to these levels DIN 4150 states:

> *"Experience has shown that if these values are complied with, damage that reduces the serviceability of the building will not occur. If damage nevertheless occurs, it is to be assumed that other causes are responsible. Exceeding* [these] *values does not necessarily lead to damage; should they be significantly exceeded, however, further investigations are necessary."*

Table 5-13 Guideline Values for Vibration Velocity to be used when Evaluating the Effects of Short-Term Vibration on Structures [Source: Table 1, DIN 4150-3:1999]

Type of Structure	Guideline Values for Velocity – PPV (mm/s)		
	1 Hz to 10 Hz	**10 Hz to 50 Hz**	**50 Hz to 100 Hz**
Buildings used for commercial purposes, industrial buildings, and buildings of similar design	20	20 to 40	40 to 50
Dwellings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20
Structures that, because of their particular sensitivity to vibration, cannot be classified under either of the other classifications and are of great intrinsic value (e.g. listed buildings under preservation order)	3	3 to 8	8 to 10

5.7 The Effect of Noise on Health

According to the NSW EPA:

> *"Noise can be annoying, interfere with speech, disturb sleep or interfere with work. Prolonged exposure to loud noise can also result in increased heart rate, anxiety, hearing loss and other health effects. The impact of noise depend both on the noise level and its characteristics and how it is perceived by the person affected."*

To reduce the likelihood of noise to impact the community, the EPA recommends the application of the following:

- The *Industrial Noise Policy (INP)*, which seeks to prevent and minimise industrial noise.
- The *Road Noise Policy (RNP)*, providing guidance on managing the impacts from road traffic noise.
- *Interim Guidelines for the Assessment of Noise from Rail Infrastructure Projects (IGANRIP)*, addressing noise and vibration from new rail infrastructure projects; and,
- The *Interim Construction Noise Guidelines (ICNG)*, which provides guidance on assessing and minimising noise from construction.

The policies and guidelines above were established with a view to preserving amenity and avoiding any community annoyance from noise.

Noise levels which result in direct negative health impacts are, in general, much higher than those which result in annoyance. This can be seen from the NSW OHS Act 2000 and the NSW OHS Regulation 2001 that requires no employee or other persons be exposed to noise levels greater than the legal maximum levels. The maximum legally-acceptable levels of exposure to noise in the workplace are:

- No more than the equivalent of eight hours exposure to steady sound pressure levels of 85 dB(A) per day.
- Peak sound pressure levels of 140 dB(A).

Hence, complying with the noise and vibration criteria established by the NSW EPA will minimise the likelihood of any effect on health from noise and vibration as they are preserving amenity and avoiding any community annoyance from noise.

6 NOISE ASSESSMENT

6.1 Operational Noise Assessment

6.1.1 Operational Noise Sources

Immediately apparent sources of operational noise for the project are the various machines used for moving containers to and from trucks, trains and stacks. In addition to the noise emissions from these machines, the operational noise assessment includes noise from trucks and trains operating on the site and within those sections of the rail link that are on privately owned land.

Noise emissions from trains operating within the East Hills Railway corridor and the SSFL corridor, and trucks travelling on public roads are assessed in the Rail Noise Assessment and Road Traffic Noise Assessment sub-sections of this report respectively.

In addition to machinery associated with the intermodal operations of the SIMTA proposal, the warehousing facilities on site will include numerous small LPG powered forklifts for use inside the warehouses. The warehouse buildings are also expected to be fitted with Heating, Ventilation and Air Conditioning (HVAC) systems with a sound power level (SWL) of approximately 100 dBA per building.

Based on information from the client regarding the machines expected to operate at the facility, and a capacity of 1,000,000 TEU per annum; the operational noise sources and their respective SWL for the Project are shown in Table 6-1.

Table 6-1 Operational Noise Sources

Item	SWL – Individual (dBA – $L_{Aeq,15\ min}$)	Quantity	SWL – Total (dBA – $L_{Aeq,15\ min}$)
Electric Rail Mounted Gantry	96	15	108
Hybrid/Electric Reach Stacker	95	6	103
Hybrid/Electric Container Forklift	95	6	103
LPG Forklift (inside warehouses)	90	40	106
Trucks (idling and moving)	97	30	112
Train Locomotive	94	4	100
Warehouse HVAC	100	12	111

The noise sources in Table 6-1 represent a worst case 15 minute operating period. The LPG forklifts are intended to only operate inside warehouses, and will therefore have a negligible impact on the operational noise emissions from the site. The quoted SWL for trucks has been modified to reflect that they are expected to only be in motion for approximately 35% of their time on site, and will be otherwise idling. It is proposed to establish four rail sidings on the site and accordingly, it has been assumed for the assessment of a worst case 15 minute operating period that there are a total of four trains operating on the site.

For a throughput of 1,000,000 TEU per annum, it is expected that the facility will rely solely on electric rail mounted gantries for container handling. Nonetheless, the assessment has allowed for the presence of a small number of mobile container handling equipment; specifically reach stackers and container forklifts. This accounts for the scenario where there is some overlap between the operating strategy for 1,000,000 TEU and the previous operating strategy.

6.1.2 Predicted Operational Noise Levels

Receiver noise levels were calculated using the computer noise modelling software CadnaA. This software accounts for attenuation due to distance, air absorption, ground absorption, terrain and shielding.

The SIMTA proposal will operate 24 hours per day and therefore, a conservative approach has been taken whereby the worst case 15 minute noise levels are compared to the most stringent criteria. This involved predicting noise levels for the facility operating at its peak throughput, and comparing them to then intrusive criterion during the night time.

Whole of site operational noise levels for the SIMTA proposal, at a throughput of 1,000,000 TEU have been predicted using the following assumptions:

- A number of large warehouses will exist on site, with a height of 21 meters.
- The rail siding will run for approximately the entire length of the site.
- The 15 electric rail mounted gantries will be distributed along the length of the rail siding and will be approximately 32 metres in height.
- Six reach stackers and six container forklifts will be evenly distributed along the length of the rail siding.
- Reach stackers and container forklifts will be hybrid/electric powered.
- Trucks will travel in a forward direction while on site and will not need to reverse, except in the case of an emergency.
- Mobile equipment for both intermodal and warehousing operations will be fitted with broadband reversing alarms, rather than the traditional tonal alarms.
- The predicted noise levels within the residential receiver catchments are calculated at the most affected receiver within each catchment.
- Container stacks have not been modelled as they can provide shielding effects which cannot be relied upon as the size of the stack can vary considerably.
- Large structures on nearby sites that may provide significant shielding effects have not been modelled as it is not certain that they will exist in the future.

It has been determined that the area surrounding the site is subject to temperature inversions. Temperature inversions have the potential to increase noise levels through the refraction of sound waves, focusing sound propagation paths at a single point. Accordingly, the effect of a 3 degree per hundred metre (F Class Pasquil Stability) has been assessed.

With respect to the effect of meteorological conditions, the INP states the following:

> *"In carrying out noise impact predictions for a particular development, predicted noise levels for calm conditions as well as any significant adverse weather conditions should generally be provided. It is particularly useful to provide predicted noise impacts for calm weather conditions where predicted noise impacts under adverse weather conditions exceed the project-specific noise levels. This allows for a better understanding of potential noise impacts from the development."*

Accordingly, noise levels have also been predicted for favourable meteorological conditions, i.e. no temperature inversion.

Finally, for the assessment of operational noise during adverse meteorological conditions; the predicted $L_{Aeq,\ period}$ levels at the receivers have been reduced by 3 dBA from the corresponding $L_{Aeq,\ 15min}$ levels. This correction conservatively accounts for the fact that the temperature inversion is unlikely to exist for the entire period. Also, since a number of the operational noise sources are somewhat transient; their SWL will be lower using the $L_{Aeq,\ period}$ noise descriptor than those using the $L_{Aeq,\ 15min}$ noise descriptor.

The predicted operational noise levels at residential receivers are shown in Table 6-2.

Table 6-2 Predicted Operational Noise Levels at Residential Receivers

Receiver Catchment	Calm Meteorological Conditions	Adverse Meteorological Conditions (3°C/100 m Inversion Strength)		Criteria (dBA) Night Time (10.00pm-7.00am)		Exceedence dBA
	Predicted Level (dBA) $L_{Aeq,\ 15min}$	Predicted Level (dBA) $L_{Aeq,\ 15min}$	Predicted Level (dBA) $L_{Aeq,\ period}$	Intrusiveness $L_{Aeq,15min}$	Amenity $L_{Aeq,Period}$	
R1	34	39	36	42	40	0
R2	35	39	36	41	45	0
R3	38	43	40	39	40	**4 (Exceedance of intrusive noise criterion)**
R4	25	31	28	42	40	0

Review of Table 6-2 shows that the presence of a temperature inversion leads to an increase in noise levels at nearby receivers.

Whole of site operational noise levels from the SIMTA proposal are predicted to exceed the INP criteria at R3 by up to 4 dBA during adverse meteorological conditions.

Operational $L_{Aeq,15min}$ noise contours are presented in Appendix B.

The predicted operational noise levels at non-residential receivers are shown in Table 6-3. The INP criteria for these receivers are expressed only in terms of the $L_{Aeq, perdiod}$ noise descriptor.

Table 6-3 Predicted Operational Noise Levels at Non-Residential Receivers

Receiver	Predicted Level (dBA) $L_{Aeq, period}$		Criteria (dBA) $L_{Aeq, period}$	Exceedance (dBA)
	Calm Meteorological Conditions	Adverse Meteorological Conditions (3°C/100 m Inversion Strength)		
S1	36	41	45	0
S2	36	41	45	0
DNSDC	54	55	60	0

Review of Table 6-3 shows that the predicted operational noise levels at all non-residential receivers comply with the INP criteria, regardless of the prevalent meteorological conditions.

6.1.3 Mitigation of Operational Noise Levels at R3

The predicted operational noise levels in receiver catchment R3, presented in Section 6.1.2, exceed the INP criteria by up to 4 dBA.

Detailed review of the predicted noise levels at R3 shows that the operation of trucks within the SIMTA proposal is the major contributor to the levels at R3. Accordingly, the effect of a noise barrier has been modelled and shown to reduce operational noise levels by 4 dBA within the R3 catchment.

It is recommended that provisions be made, which allow for the future development of a noise barrier that runs close to and parallel with the western boundary of the site. The design of such a barrier should be conducted at a future detailed design stage, when sufficient details are available to facilitate the design.

The preceding assessment of operational noise is based on a number of assumptions that are conservative – that is, they result in higher predicted noise levels at receivers than those that are likely to occur. It is foreseeable that in the timeframe that the SIMTA proposal reaches full-scale capacity of 1,000,000 TEU; large structures will be established on nearby sites which will attenuate noise levels at receivers due to shielding effects.

Accordingly, the actual requirement for any noise mitigation should be determined during future development stages.

To facilitate the development of mitigation where required, the noise model should be validated in subsequent detailed assessments using measurements of operational noise levels at receivers. At such time, the modelling assumptions should also be confirmed. If, for instance, it is determined that an appreciable number of trucks are reversing during the normal operation of the site, the model should be refined to capture such detail.

Details of recommended operational noise monitoring are outlined in Section 8.2.

6.2 Sleep Disturbance Assessment

Transient noise events associated with the operation of the site, with the potential to cause sleep disturbance include rail shunting, horns, tonal reversing alarms and containers banging.

The most likely source of transient noise, with the potential to cause sleep disturbance is rail shunting or containers banging, with L_{Amax} SWL of up to 118 dBA.

The predicted L_{Amax} noise levels at nearby receivers due to rail shunting and containers bangs are shown in Table 6-4.

Table 6-4 Predicted L_{Amax} Noise Levels

Receiver	Predicted Level due to Transient Events (dBA – L_{Amax})	Sleep Disturbance Screening Level (dBA – L_{Amax})	Exceedence dBA
R1	41	52	0
R2	41	51	0
R3*	47	49	0
R4	33	52	0

* Barrier not included in the calculations.

Review of Table 6-4 shows that the predicted L_{Amax} levels at all receivers are less than the sleep disturbance screening levels, and therefore; no further assessment of sleep disturbance is warranted.

6.3 Road Traffic Noise Assessment

It was confirmed through attended traffic noise measurements that the existing levels of traffic noise along Moorebank Avenue, in the vicinity of the SIMTA proposal, are above the RNP assessment levels. Therefore, the RNP recommends that any increase in traffic noise levels, at residential receivers, due to the SIMTA proposal should not exceed 2 dBA.

6.3.1 Road Traffic Volume and Mix

It has been determined by the client that the operational traffic flow to and from SIMTA will be primarily along the M5 Motorway in both the east and west directions, and along Moorebank Avenue between the site and the M5 Motorway. It is expected that a small volume of traffic travelling to and from the site will do so along Moorebank Avenue, to the north of the M5 Interchange.

Based on throughput of 1,000,000 TEU per annum, the current and predicted traffic volume and percentage heavy vehicles (mix) along the identified routes are shown in Table 6-5.

Table 6-5 Traffic Volume and Mix

Location	Time	Current (no Development)		Future (with Development)	
		Volume	Mix	Volume	Mix
M5 Motorway – East of Moorebank Avenue	Day (7.00am–10.00pm)	91,500	10%	92,400	10%
	Night (10.00pm–7.00am)	17,900	11%	18,200	10%
M5 Motorway – West of Moorebank Avenue	Day (7.00am–10.00pm)	107,200	10%	110,300	12%
	Night (10.00pm–7.00am)	21,100	11%	21,700	12%
Moorebank Avenue – North of M5 Motorway	Day (7.00am–10.00pm)	26,700	10%	27,800	12%
	Night (10.00pm–7.00am)	6,250	10%	6,410	10%
Moorebank Avenue – South of M5 Motorway	Day (7.00am–10.00pm)	14,400	6%	19,300	16%
	Night (10.00pm–7.00am)	3,000	4%	4,100	10%

Using the data in Table 6-5, the increase in traffic noise levels along the M5 Motorway and Moorebank Avenue has been calculated. The calculations have been conducted using the *Calculation of Road Traffic Noise (CORTN)* algorithm, and are based upon the following assumptions:

- Vehicle speeds are 100 km/h and 60 km/h along the M5 Motorway and Moorebank Avenue respectively.
- Typical receiver setbacks are approximately 50 metres along the M5 Motorway and approximately 20 metres along Moorebank Avenue. It is important to highlight that while receiver setbacks are important when calculating absolute traffic noise levels, however setbacks are not important when calculating increases in traffic noise levels due to changes in traffic volume and mix.

The predicted increases in traffic noise levels are shown in Table 6-6.

Table 6-6 Increases in Traffic Noise Levels

Location	Time	Difference dBA
M5 Motorway – East of Moorebank Avenue	Day (7.00am–10.00pm)	0.0
	Night (10.00pm–7.00am)	0.0
M5 Motorway – West of Moorebank Avenue	Day (7.00am–10.00pm)	0.4
	Night (10.00pm–7.00am)	0.7
Moorebank Avenue – North of M5 Motorway	Day (7.00am–10.00pm)	0.5
	Night (10.00pm–7.00am)	0.1
Moorebank Avenue – South of M5 Motorway	Day (7.00am–10.00pm)	3.2
	Night (10.00pm–7.00am)	2.7

Review of Table 6-6 shows that increases in road traffic noise levels along the M5 Motorway and along Moorebank Avenue, north of the M5 Interchange are less than 2 dBA and therefore comply with the relevant RNP criteria.

It is expected that road traffic noise levels along Moorebank Avenue, south of the M5 Interchange will increase by approximately 3 dBA. There are no residential receivers in this area and, as a result, no noise impact is expected.

6.4 Rail Noise Assessment

While trains servicing the SIMTA proposal are operating along the section of track within the rail corridor, their noise emissions should comply with *IGANRIP*. As outlined in Section 4, *IGANRIP* specifies 'Trigger Levels' that, if exceeded, necessitate a detailed assessment of rail noise levels due to new rail developments.

The existing levels of rail traffic noise at receivers which may experience increased rail traffic noise levels, due to the SIMTA proposal, have not been measured. If it can be shown that the rail noise levels from the SIMTA proposal are well below (>10 dBA) the *IGANRIP* trigger levels, it can be concluded that the trigger levels will not be exceeded by the development, regardless of the existing rail noise levels.

6.4.1 Rail Noise Sources

Freight trains servicing the site will each be driven by two 81 Class locomotives; and will be approximately 650m in length. Based on a capacity of 1,000,000 TEU per annum, there will be 21 trains servicing the site per day. This equals 42 train movements, and is it assumed that these are evenly distributed throughout the day.

6.4.2 Predicted Rail Noise Levels

Using data from the RailCorp rail noise database, rail noise levels have been predicted at nearby receivers and are shown in Table 6-7 and Table 6-8.

Table 6-7 Predicted L_{Aeq} Rail Noise Levels

Receiver	Rail Noise				Trigger Level Exceeded
	Day (7.00am–10.00pm)		Night (10.00pm–7.00am)		
	Predicted Level $L_{Aeq,15hr}$	Trigger Level $L_{Aeq,15hr}$	Predicted Level $L_{Aeq,9hr}$	Trigger Level $L_{Aeq,9hr}$	
R1	30	60	30	55	No
R2	21	60	22	55	No
R3	40	60	40	55	No
R4	39	60	39	55	No

Table 6-8 Predicted L_{max} Rail Noise Levels

Receiver	Rail Noise				Trigger Level Exceeded
	Day		Night		
	Predicted Level L_{max}	Trigger Level L_{max}	Predicted Level L_{max}	Trigger Level L_{max}	
R1	53	80	53	80	No
R2	44	80	44	80	No
R3	63	80	63	80	No
R4	62	80	62	80	No

Review of Table 6-7 and Table 6-8 show that the predicted rail noise levels are more than 10 dBA below the *IGANRIP* trigger levels in all instances. Regardless of the existing levels of rail traffic noise, the additional rail traffic noise from the SIMTA proposal will not exceed the *IGNARIP* trigger levels. Accordingly, no further assessment of rail traffic noise is warranted.

6.5 Construction Noise Assessment

The activities for construction of the intermodal terminal on the SIMTA site can be separated into a number of discrete phases. These construction 'scenarios' are summarised in Table 6-9, along with a brief description of the activity and the machinery required.

Table 6-9 Construction Scenarios

Scenario	Description	Equipment
Site Preparation	• Establishment of a compound with portable offices and amenities and connection to utility services • Demolish existing structures and pavements • Separating and stockpiling material for disposal or reuse • Treatment of materials for reuse such as a crushing plant for concrete • Disposal of materials not for reuse on-site to an authorised disposal or recycling facility • Removal of grass and trees and grubbing of roots and stumps • Disposal of organic matter to authorised disposal facility • Removal of decommissioned underground services • Stripping of topsoil and stockpiling for on-site	• 20 tonne trucks • Loader • Static & vibratory roller • Mobile cranes and delivery trucks • Tracked excavators with hydraulic hammers • Truck floats to and from the site • Backhoes • Concrete crushing plant • Air compressor and jackhammer • Dozers • 20–40 tonne a

Scenario	Description	Equipment
	reuse or disposal to an authorised disposal facility	• rticulated tippers
Earthworks, Drainage & Utilities	• Excavation and filling of land on-site to create the bulk earthworks platforms • Excavation of trenches for the construction of open stormwater channels, pipes and structures • Laying of stormwater pipes • Construction of stormwater drainage structures • Backfilling of trenches and behind structures • Excavation of trenches for the construction of utility services pipes, conduits and structures • Laying of pipes and conduits and construction of utility services structures • Backfilling of trenches and behind structures	• Dozers • Scrapers • Tracked excavators • Graders • 20–40 tonne articulated tip / trucks • Water trucks • Vibratory and static rollers or compactors • Truck floats to and from the site • Backhoes or small excavators • Delivery trucks (sand backfill, pipes etc) • Concrete agitator trucks • Air compressor • Compaction equipment
Granular Base Construction	• Establish detailed construction platform • Place under slab base course	• Backhoes or small excavators • Static and vibratory rollers • 20 tonne tip / trucks (road) • Delivery trucks (materials and equipment)
Pavement Construction	• Construct sub base slab • Construct kerbs and gutters and concrete barriers etc • Construct base slab including the building of formwork and placing of reinforcement • Linemarking and signposting • Lighting standard installation • Guard rail installation	• Backhoes or small excavators • Static and vibratory rollers • 20 tonne tip / trucks (road) • Delivery trucks (materials and equipment) • Concrete agitator trucks • Concrete pumping equipment

Scenario	Description	Equipment
		• Air compressor • Concrete vibrators • Concrete saws • Excavator with hammer • Mobile crane
Buildings	• Establishment of building platform through detailed excavations and placing of under slab base course • Construction of building slabs including building of formwork, placing of reinforcement and post tensioned cables and pouring of concrete • Erection of steel building frames • Roof and wall cladding • Internal fit-outs including office construction and racking	• Backhoes or small excavators • Static roller • Piling rig • 20 tonne tip / trucks (road) • Delivery trucks (materials and equipment) • Concrete agitator trucks • Concrete pumping equipment • Mobile cranes • Air compressor
Rail Construction	• Establish detailed construction platform • Place piling • Place under rail base course • Construct base slab beams including the building of formwork and placing of reinforcement • Install rails • Construct final slab	• Backhoes or small excavators • Static roller • Piling rig • 20 tonne tip / trucks (road) • Delivery trucks (materials and equipment) • Concrete agitator trucks • Concrete pumping equipment • Mobile cranes • Air compressor

6.5.1 Construction Noise Sources

The typical L_{Aeq} SWL of the most noise intensive plant likely to be used at various stages of works is identified in Table 6-10. These SWLs have been recently measured at other similar construction sites.

Table 6-10 Typical Construction Plant Sound Power Levels

Plant	L_{Aeq} SWL (dBA)	$L_{A1,1min}$ SWL (dBA)
Concrete Saw	112	118
Concrete Truck	107	114
Concrete Pump	103	110
Concrete Adgi/Vibro	105	112
Excavators	100-110	116
Hydraulic Hammer – Excavator Mounted	115-118	123
Backhoe	105	112
Generators	90	92
Pumps	90-100	100
Front End Loader	111	116
Plant	**L_{Aeq} SWL (dBA)**	**$L_{A1,1min}$ SWL (dBA)**
Grader	107	114
Vibratory Roller	101	110
Cranes	105-111	118
Truck	105	114
Dump Truck	105	114
Welding Torch	90	95
Dozer	115	120
Hand Tools	90	95
Bobcat	95	100
Excavator with Trencher	105	110
Power Tools	114	119
Jack Hammer	113	118

6.5.2 Predicted Construction Noise Levels at Residential Receivers

To predict noise levels due to construction activities at receivers that are at least 500 m from the construction site, the total SWL of all plant operating during a given scenario was calculated. This SWL was then modelled as an average SWL, acting over the entire area of the construction site.

Table 6-11 shows the total SWL for each scenario, along with the predicted levels at each receiver catchment, and a comparison against the relevant criteria.

Table 6-11 Predicted Construction Noise Levels at Residential Receivers

Scenario	Total SWL	Level / Goal $L_{Aeq,15min}$				Exceedances
		R1 (52 dBA)	R2 (46 dBA)	R3 (51 dBA)	R4 (54 dBA)	
Site Preparation	122	48	45	46	34	None
Earthworks, Drainage & Utilities	118	44	41	42	30	None
Granular Base Construction	110	36	33	34	22	None
Pavement Construction	121	47	44	45	33	None
Buildings	119	45	42	43	31	None
Rail Siding	119	46	42	**60**	46	**9 dBA**

Review of Table 6-11 shows that construction noise levels are not predicted to exceed the *ICNG* noise affected level most receivers, during any the construction scenarios.

It has been predicted that during the construction of the rail link, the resultant noise levels in receiver catchment R3 will be up to 9 dBA above the NML. This level is predicted when the construction activities are occurring in the area where the rail link joins the SSFL.

Accordingly, a Construction Noise and Vibration Management Plan should be developed prior to the commencement of construction activities to help minimise any impact on nearby residents due to construction noise.

6.5.3 Predicted Construction Noise Levels at Non-Residential Receivers

Construction noise levels have been predicted at non-residential receivers and are shown in Table 6-12.

Table 6-12 Predicted Construction Noise Levels at Non-Residential Receivers

Scenario	Total SWL	Level / Goal $L_{Aeq,15min}$			Exceedances
		S1 (55 dBA)	S2 (55 dBA)	DNSDC (75 dBA)	
Site Preparation	122	46	55	72	None
Earthworks, Drainage & Utilities	118	42	51	68	None
Granular Base Construction	110	34	33	60	None
Pavement Construction	121	45	44	71	None
Buildings	119	43	42	69	None
Rail Construction	119	45	42	69	None

The results in Table 6-12 show that construction noise levels at non-residential receivers are predicted to comply with the noise management levels.

Since there are few details available regarding the layout of the DNSDC re-location site, it is difficult to perform a thorough assessment of construction noise impacts for this receiver. Such an assessment should be carried out in association with the detailed applications for each stage of the SIMTA proposal.

6.6 Construction Vibration Assessment

During the various construction phases of the project, the activities most likely to generate significant vibration levels are the use of rock hammers and / or vibratory rollers.

Table 6-13 shows typical vibration levels at varying distances from rock hammers and vibratory rollers.

Table 6-13 Plant Vibration Levels versus Distance

Plant Item	PPV Vibration Level (mm/s) at Given Distance					
	5m	10m	20m	30m	40m	50m
Heavy Rock Hammer (1500kg)	4.5	1.3	0.4	0.2	0.15	0.02
Medium Rock Hammer (600kg)	0.2	0.06	0.02	0.01	-	-
Vibratory Roller	7.0	4.5	3.0	2.3	2.0	1.7

Inspection of Table 6-13 shows that the greatest vibration levels will be from vibratory rollers.

There are no vibration sensitive receivers within several hundred metres of the site, and therefore, no human comfort impacts are likely to occur as a result of construction vibration.

Vibration levels which result in building damage are greater than those that impact on human comfort. Accordingly, building damage due to vibration is not expected to occur at residential receivers.

During the construction phases of various stages of the SIMTA proposal, vibration generating equipment may be operated in close proximity to existing buildings on the SIMTA site.

From Table 5-13, the appropriate vibration criterion for these buildings is a limit of 3mm/s. A review of Table 6-13 suggests that, in order to ensure that construction vibration levels at buildings are within the criterion; the vibratory roller should not be operated within 20m of any building.

If it is absolutely necessary to operate a vibratory roller within 20m of any buildings, vibration levels should be monitored during the operation of the roller. If vibration levels are found to exceed those set out in Table 5-13, the operation of the vibratory roller should cease and an alternative method for compacting the ground near these buildings should be employed.

7 CUMULATIVE OPERATIONAL NOISE ASSESSMENT

The Commonwealth Government is proposing to establish an intermodal terminal (IMT) on a parcel of land along Moorebank Avenue, immediately opposite the SIMTA proposal. This project is referred to the Moorebank IMT Project, and is being overseen by the Moorebank Intermodal Company Ltd (MICL).

The location of the Moorebank IMT Project is shown in Figure 7-1.

As the MICL proposal will likely operate concurrently with the SIMTA proposal, it is appropriate to conduct an assessment of the cumulative impact of operational noise from both intermodal facilities.

The model previously developed to assess the operational noise of the SIMTA proposal was updated to assess the cumulative impact of both projects, at a combined throughput of 1,000,000 TEU.

Few details are publicly available regarding the operation of the MICL proposal, and therefore, a number of assumptions have been made to facilitate the assessment:

- The model was configured to calculate the night time $L_{Aeq,\ period}$ operational noise levels at nearby receivers.
- An intermodal throughput of 1,000,000 TEU was split evenly between the MICL and SIMTA proposals
- The total SWL of the operational noise sources at the SIMTA proposal was reduced half (ie 3 dBA) to reflect the reduction of throughput from 1,000,000 to 500,000 TEU.
- The total SWL of the operational noise sources at the MICL proposal was assumed the same as that at the SIMTA proposal.
- The operational noise emissions from the MICL proposal accounts for train locomotives idling on site; however does not consider trains moving on the Moorebank IMT Project site since there is insufficient publicly available information to properly model the internal rail link,
- The cumulative assessment does not take into account any rail traffic operating outside of the site boundary of either the MICL or SIMTA proposal.

The predicted noise levels at nearby receivers due to the concurrent operation of the SIMTA proposal and the Moorebank IMT are shown in Table 7-1.

Table 7-1 Cumulative Noise Levels at Receivers

Receiver	Predicted Level (dBA) $L_{Aeq,\ night}$	Criteria (dBA) $L_{Aeq,\ night}$	Exceedance (dBA)
R1	33	40	0
R2	34	45	0
R3	37	40	0
R4	25	40	0
S1	36	45	0
S2	37	45	0
DSNDC	49	70	0

Review of Table 7-1 shows that the predicted cumulative noise levels at nearby receivers comply with the INP amenity criteria.

Figure 7-1 Moorebank IMT Project Site Location

8 NOISE AND VIBRATION MONITORING

This section provides recommendations for the ongoing monitoring of construction and operational noise monitoring.

8.1 Construction Noise and Vibration Monitoring

Recommendations have been made regarding regular monitoring of noise and vibration due to construction activities.

Details of these monitoring activities should be developed and included in a construction noise and vibration management plan.

Construction noise levels should be monitored in each of the four receiver catchment areas. The precise monitoring location within each catchment should be developed in the construction noise and vibration management plan and should be regularly reviewed to ensure that monitoring is taking place at the most affected location within the catchments.

The receiver catchment locations R1, R2, R3 and R4 are shown in Figure 8-1.

8.2 Operational Noise Monitoring

In addition to monitoring construction noise and vibration, it is recommended that monitoring of operational noise levels is conducted.

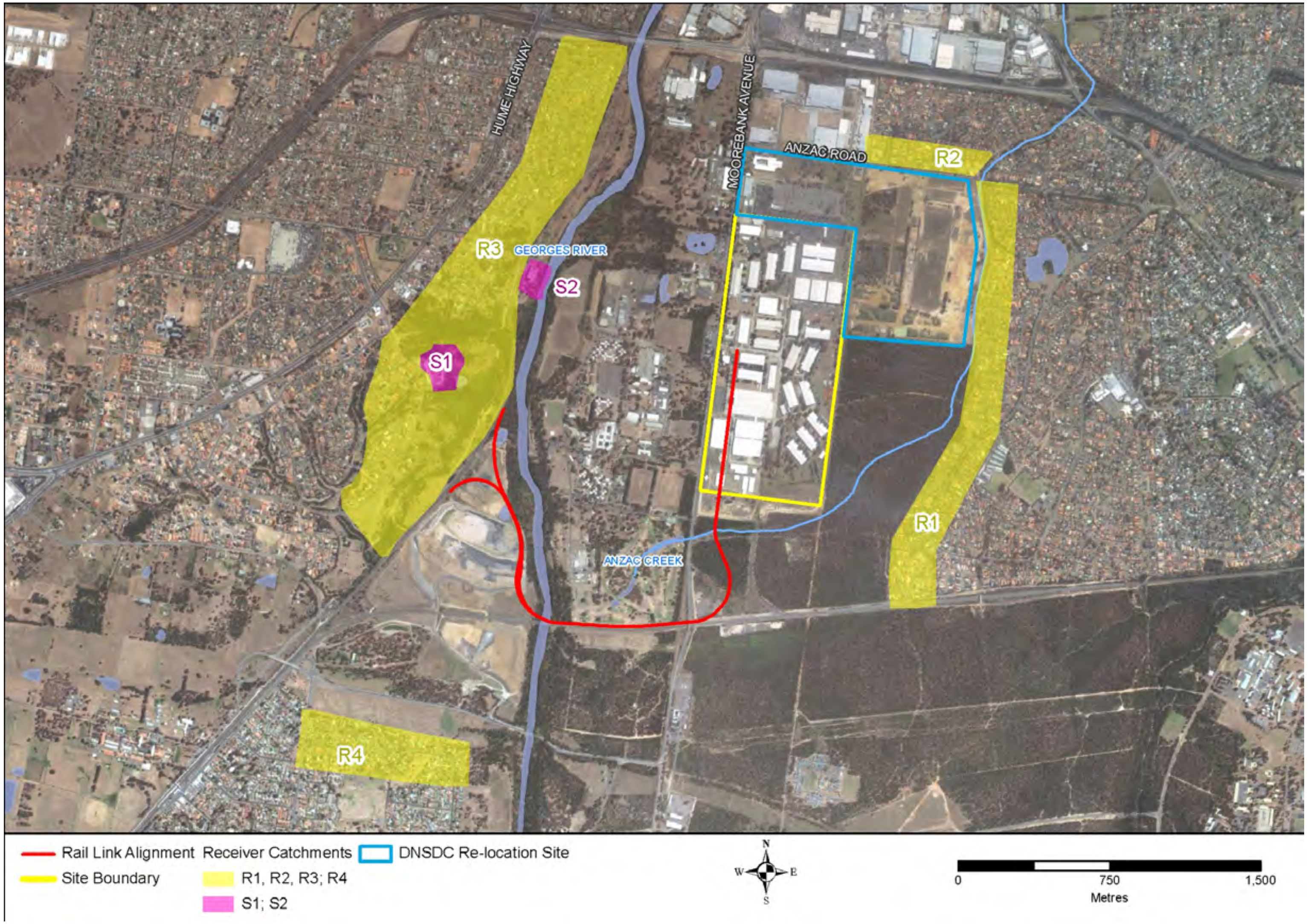
Details of operational noise monitoring should be developed as part of an operational noise management plan.

Since the SIMTA proposal is a staged development, the results from regular operational noise monitoring will support the confirmation of assumptions adopted in the noise model and validation of noise models. This will increase the accuracy of noise predictions and assist in conducting thorough noise assessments for future stages of the SIMTA proposal.

Operational noise levels should be monitored in each of the four receiver catchment areas. The precise monitoring location within each catchment should be developed in the operational noise management plan and should be regularly reviewed to ensure that monitoring is taking place at the most affected location within the catchments.

The receiver catchment locations R1, R2, R3 and R4 are shown in Figure 8-1.

Figure 8-1 Noise Monitoring Areas



9 RECOMMENDATIONS

In summary, the recommendations of the preceding noise assessment are as follows:

- Further detailed assessments to be undertaken at each development application stage after the Concept Plan Approval to provide input to planning and confirm the need for and degree of noise mitigation if required. This should be undertaken based on the most detailed information available at that stage of works.
- These subsequent assessments should address the DGR requirements for the SIMTA proposal as a minimum.
- Detailed assessments carried out when the SIMTA proposal is operational should include monitoring of operational noise levels at nearby receivers. The monitoring data should be used to validate noise models used in these assessments.
- During the planning process, consideration should be given to locating buildings at or near the north-eastern and south-eastern boundaries of the site. This would provide beneficial acoustic shielding to the nearest residences.
- During the planning process, consideration should be given to locating less noise-intensive activities and operations at the north-eastern and south-eastern corners of the site where residences are closest.
- Provision should be made for the establishment of a noise barrier along the western boundary of the SIMTA site. The requirement for the barrier should be determined during detailed assessments at each development application stage after the Concept Plan Approval.
- Detailed assessments carried out for the subsequent development application stages and when the SIMTA proposal is operational should include monitoring of operational noise levels at nearby receivers. The monitoring data should be used to validate noise models used in these assessments. The subsequent assessments should address the environmental assessment requirements, as determined by the approval authority, as a minimum.
- Prior to undertaking demolition and construction on site, a Construction Noise and Vibration Management Plan should be prepared based on details of the proposed construction methodology, activities and equipment. This should identify potential noise and vibration impacts and reasonable and feasible noise mitigation measures (such as those identified in this report) that may be implemented to minimise any potential impacts, including engineering and management controls

10 CONCLUSION

A noise assessment has been conducted for the SIMTA proposal.

Operational, road traffic, rail traffic, and construction noise levels have been predicted and assessed in accordance with relevant NSW EPA policies and guidelines.

The predicted levels of operational, road traffic and rail traffic noise are all within the established criteria at nearby receivers.

The predicted operational noise levels at all receivers apart from R3 comply with INP noise criteria. In receiver catchment R3, presented in Section 6.1.2, the INP criterion is exceeded by up to 4 dBA when the terminal is operating at a throughput of 1,000,000 TEU. Detailed review of the predicted noise levels at R3 shows that the operation of trucks within the SIMTA proposal is the major contributor to the levels at R3. Accordingly, the effect of a noise barrier has been modelled and shown to reduce operational noise levels by 4 dBA within the R3 catchment.

At full-capacity operations, with the appropriate mitigation measures applied, the SIMTA proposal is predicted to comply with all relevant noise and vibration criteria.

It is unlikely that any direct negative health impacts will arise from the noise emissions of the SIMTA proposal, since the applicable criteria for operational, road traffic and rail traffic noise are predicted to be met.

Construction noise levels at nearby receivers are predicted to meet the established noise management levels, except for some residences within R3 where noise levels due to the construction of the rail link are predicted to be up to 9 dBA above the NML. Accordingly, a construction noise management plan should be developed to identify and apply all reasonable and feasible construction noise mitigation measures. The construction noise management plan should include recommendations for monitoring of construction noise at regular intervals.

Vibration levels due to the operation of vibratory rollers during the construction phase have been assessed against building damage criteria. An appropriate exclusion zone has been recommended for the case where rollers are expected to be operated in close proximity to sensitive buildings.

An assessment has been carried out on the cumulative impact of the concurrent operation of the SIMTA proposal and the Moorebank IMT, handling a total intermodal throughput of 1,000,000 TEU. The predicted cumulative noise levels at nearby receivers comply with the INP amenity criteria.

APPENDIX A

NOISE MEASUREMENT RESULTS

Project: SIMTA
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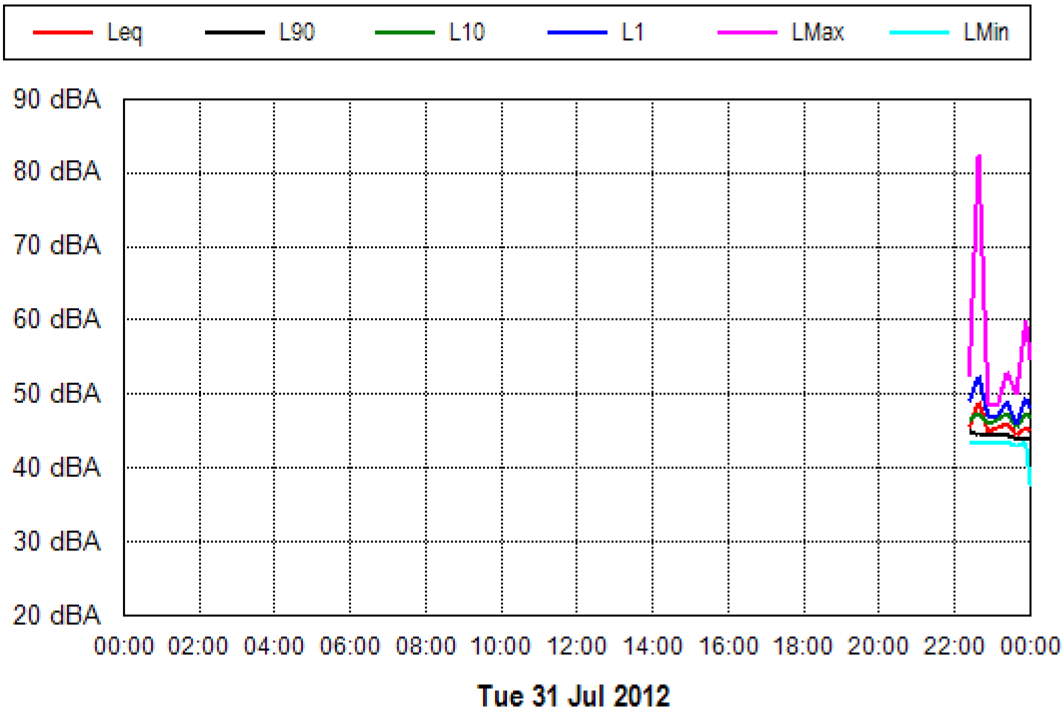
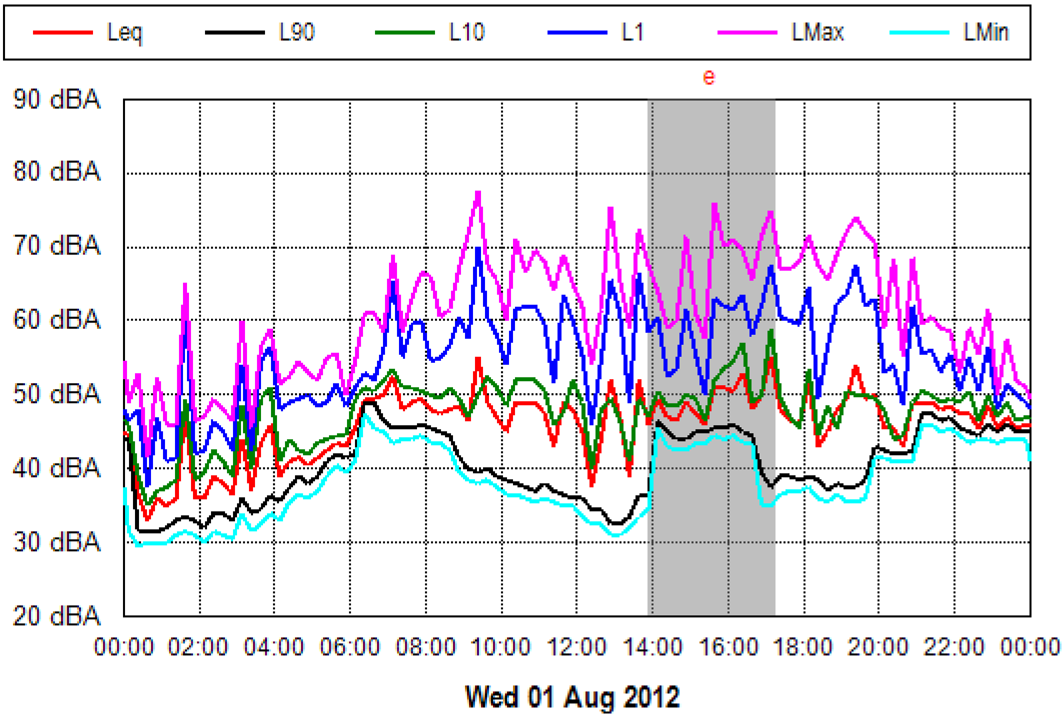
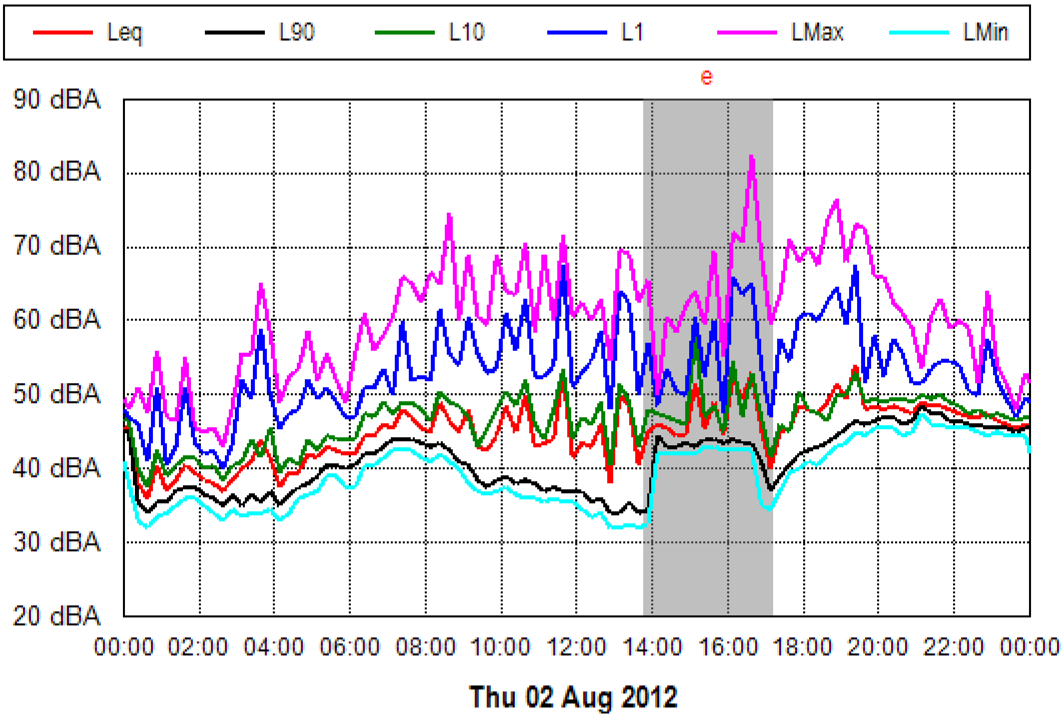
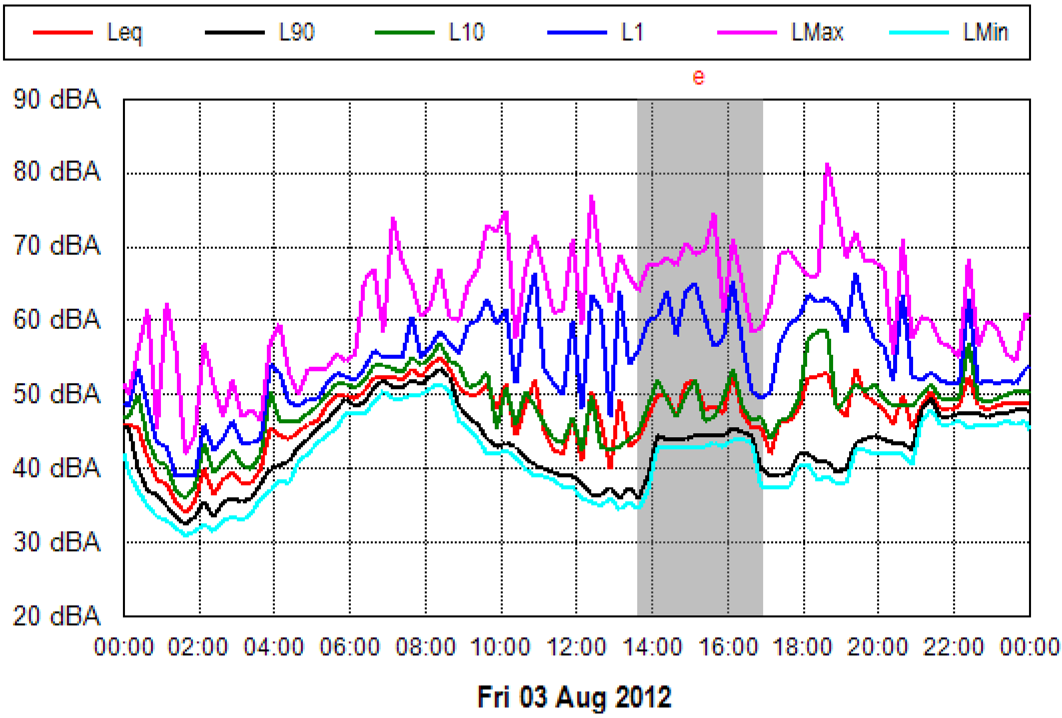


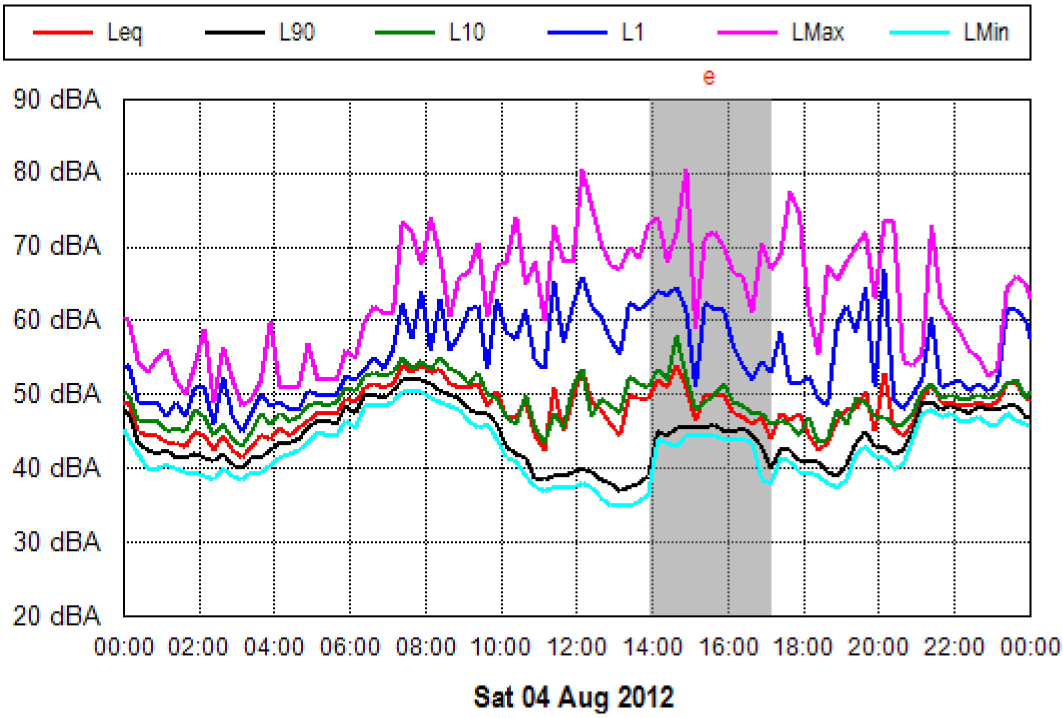


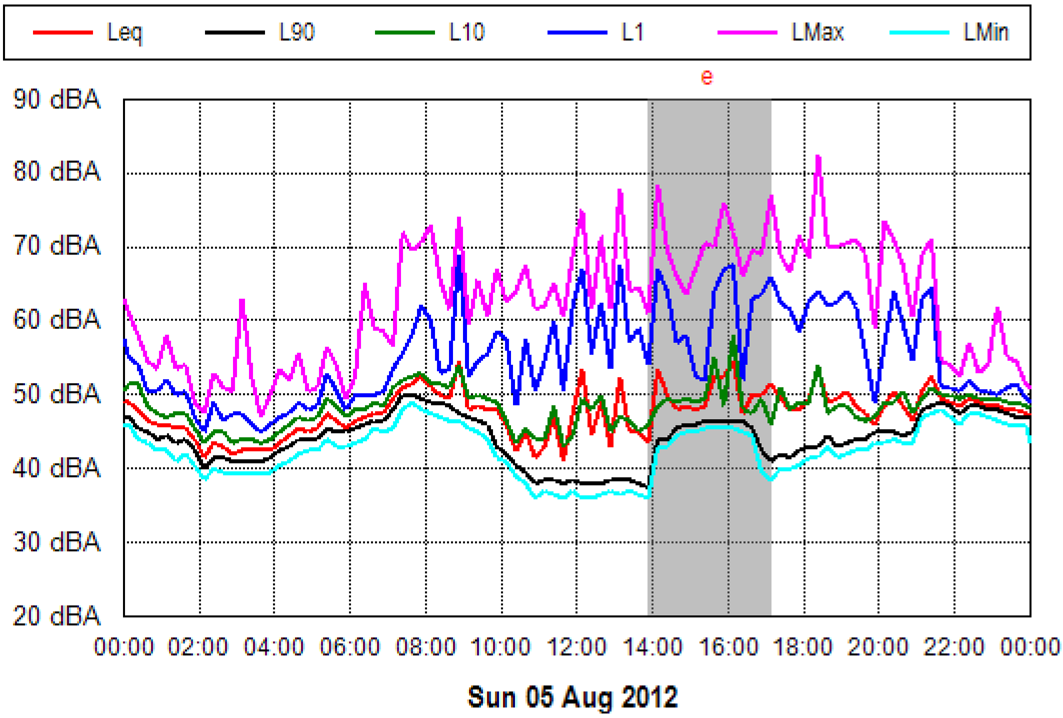
Project: SIMTA
Location: 15 Larra Court, Wattle Grove





Project: SIMTA
Location: 15 Larra Court, Wattle Grove





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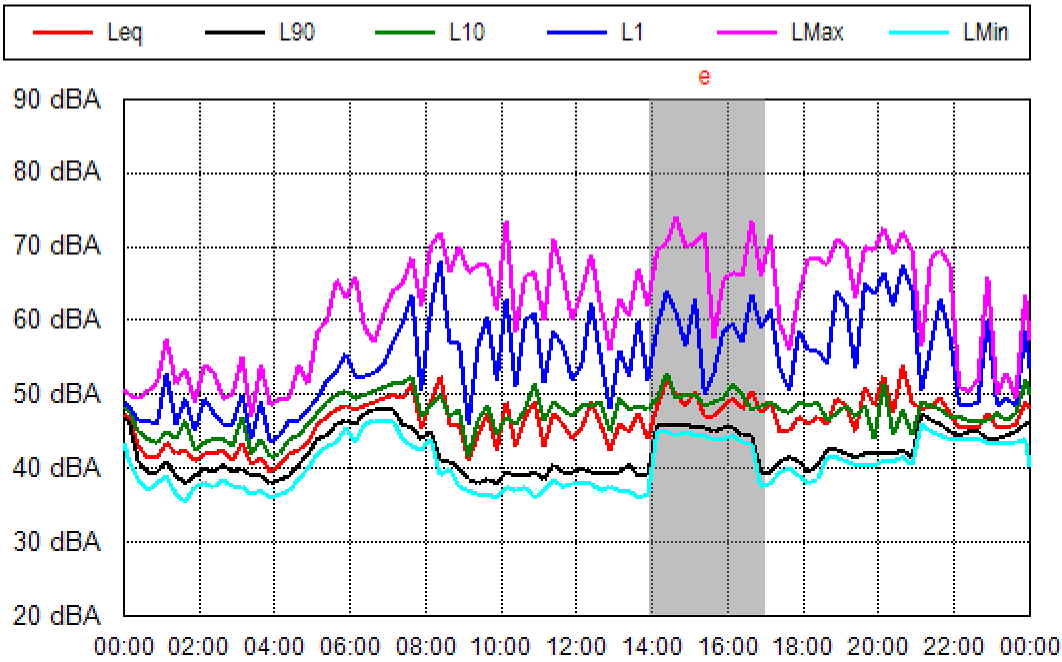

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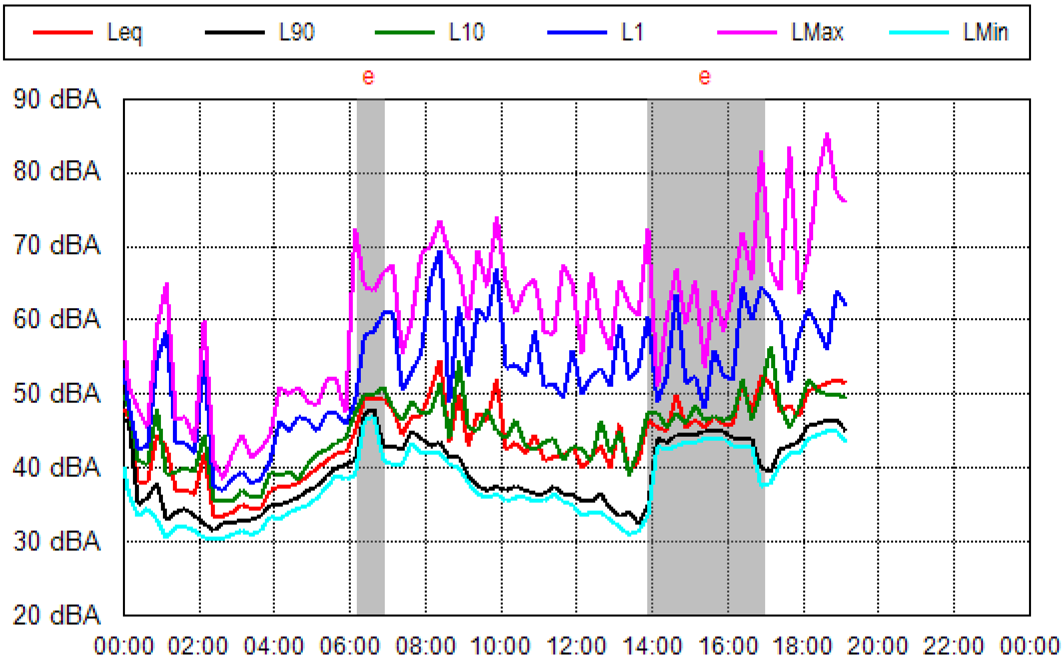

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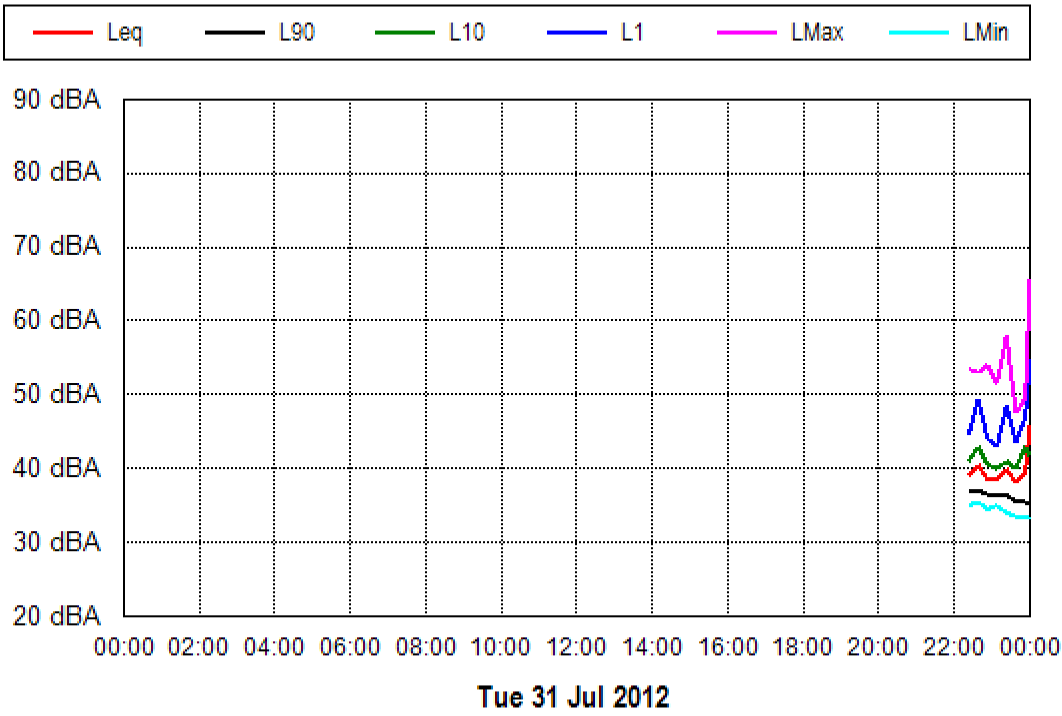
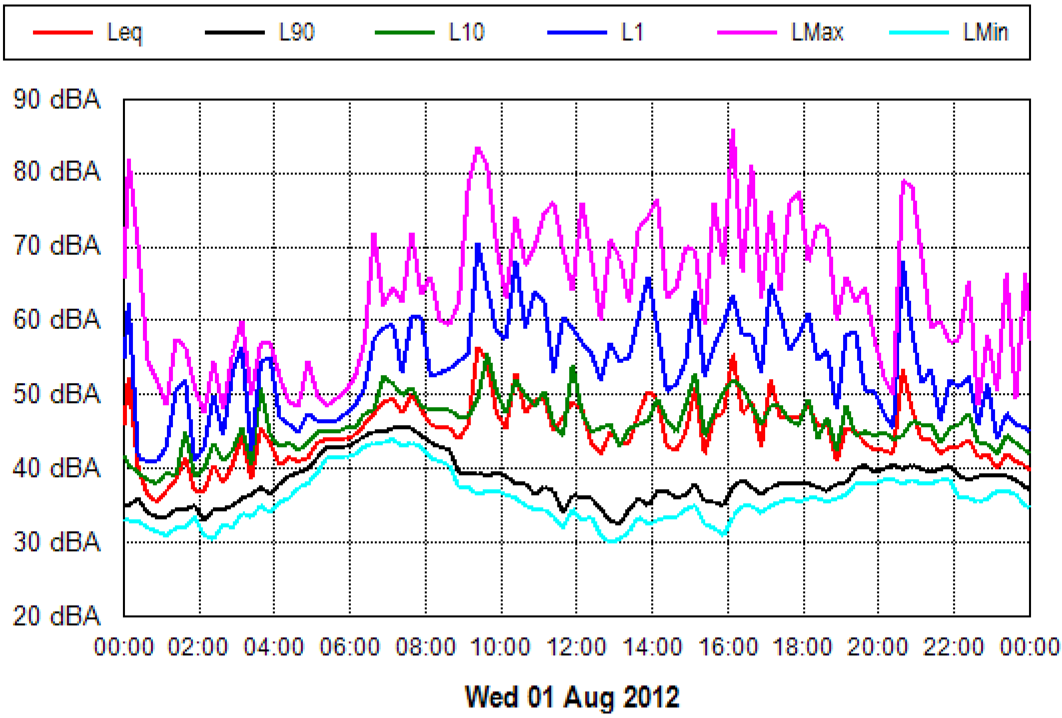
Project: SIMTA
Location: 6 Namoi Court, Wattle Grove





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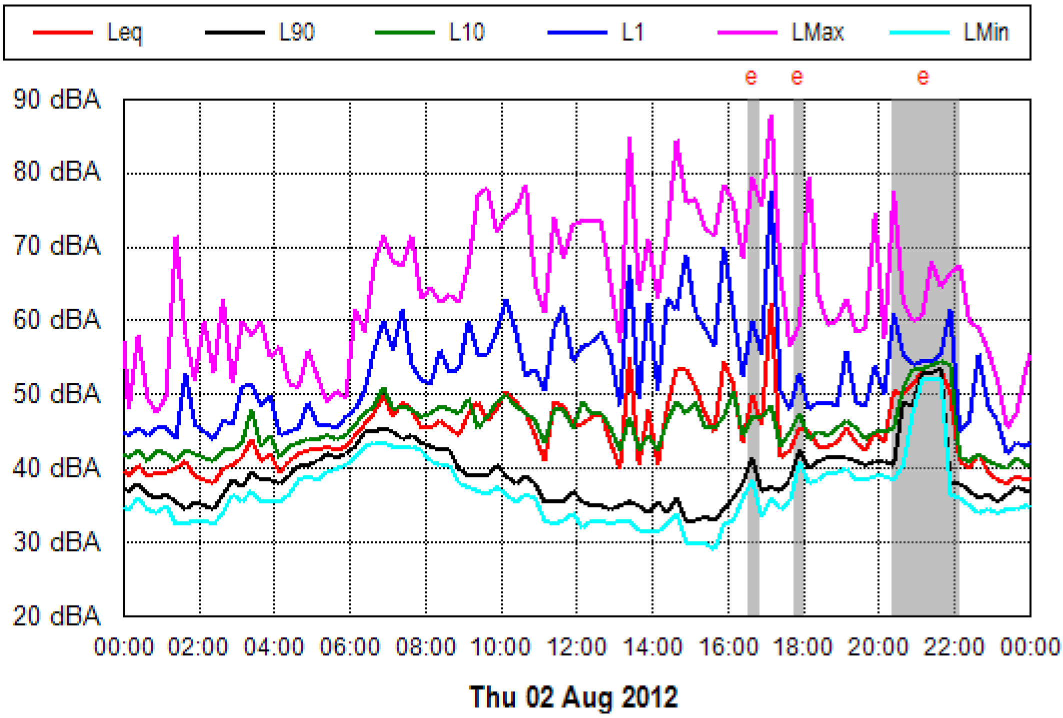

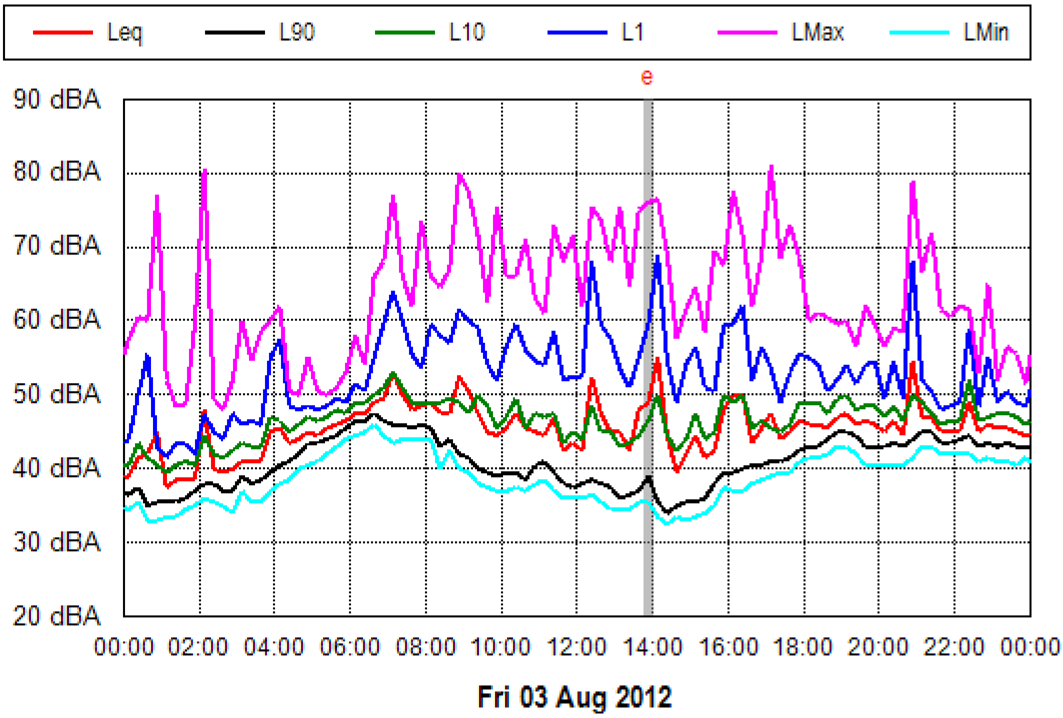

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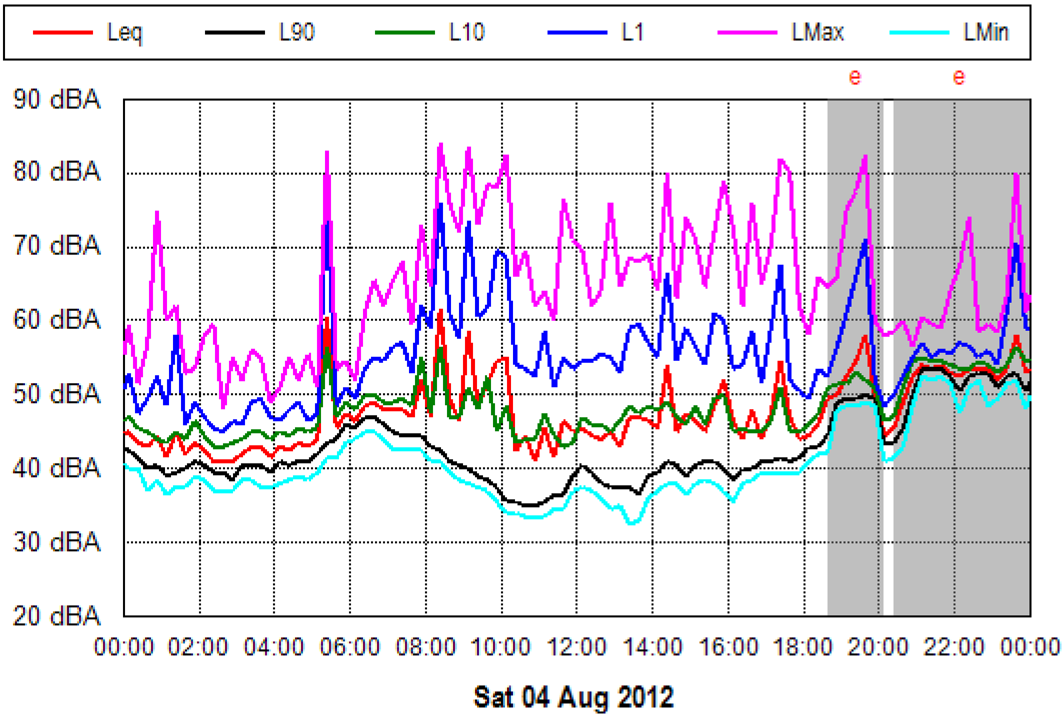

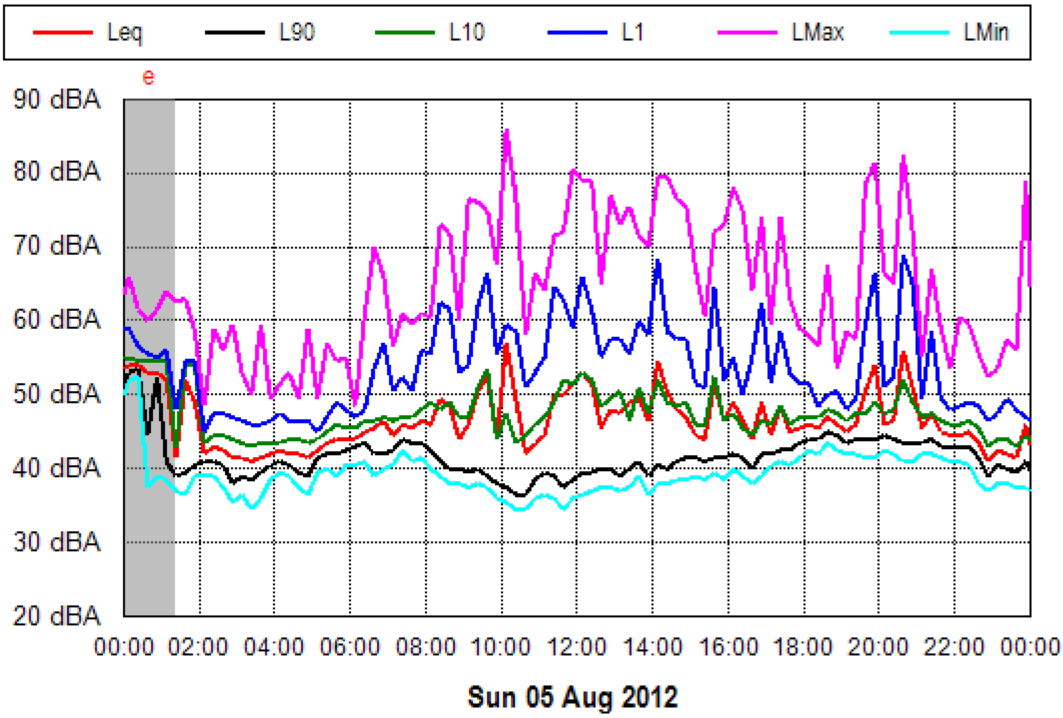

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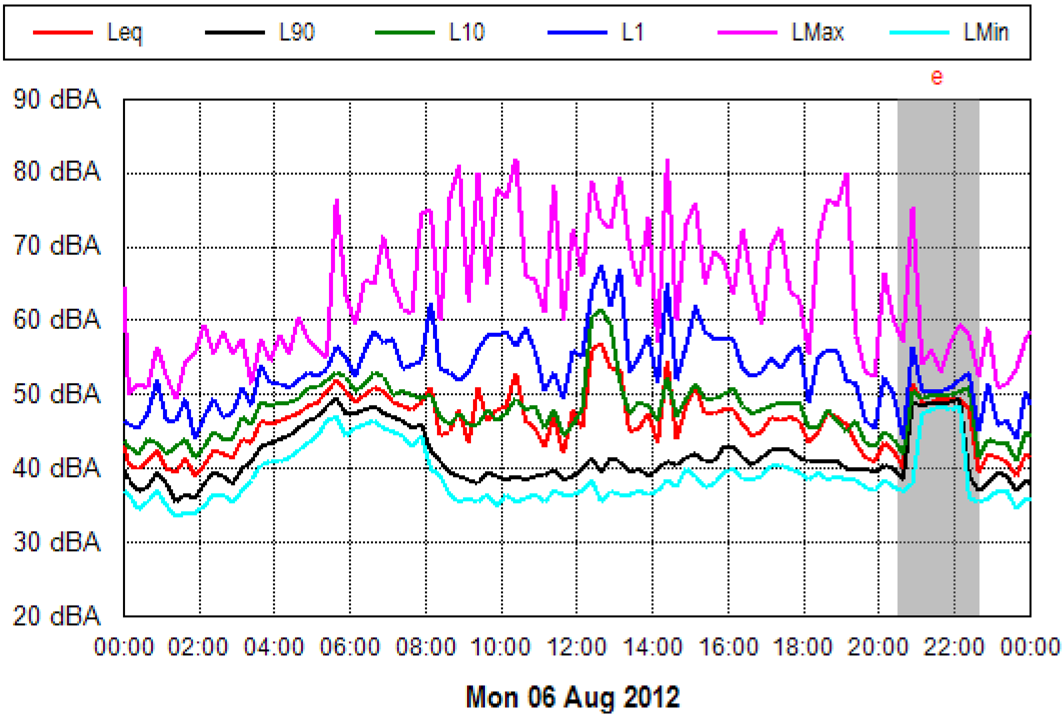
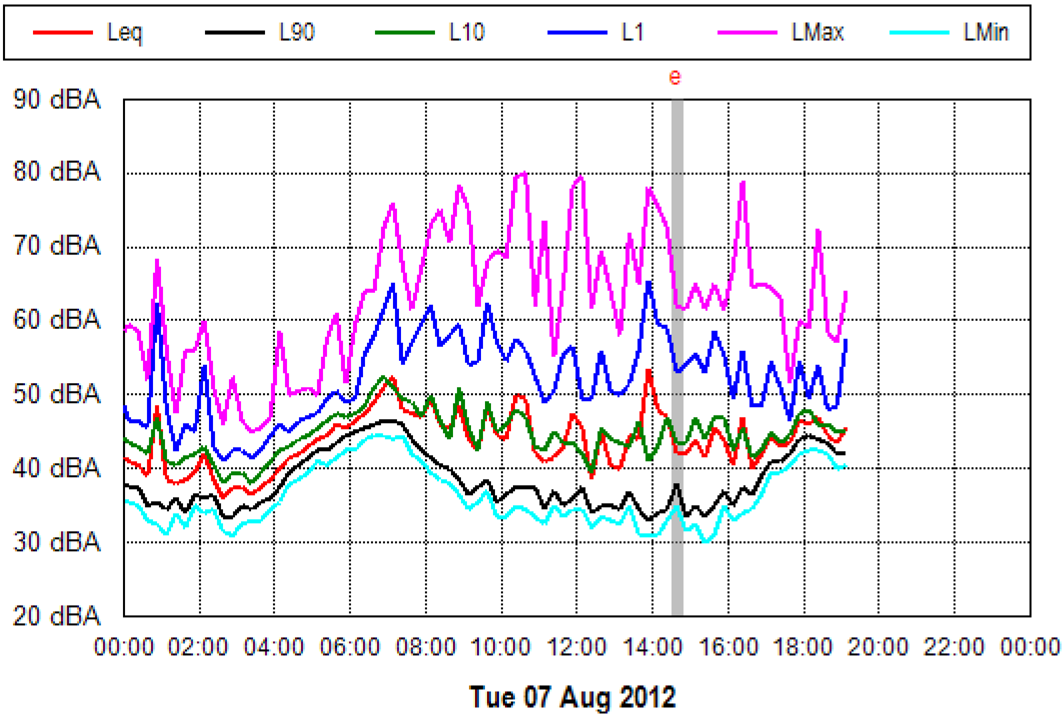
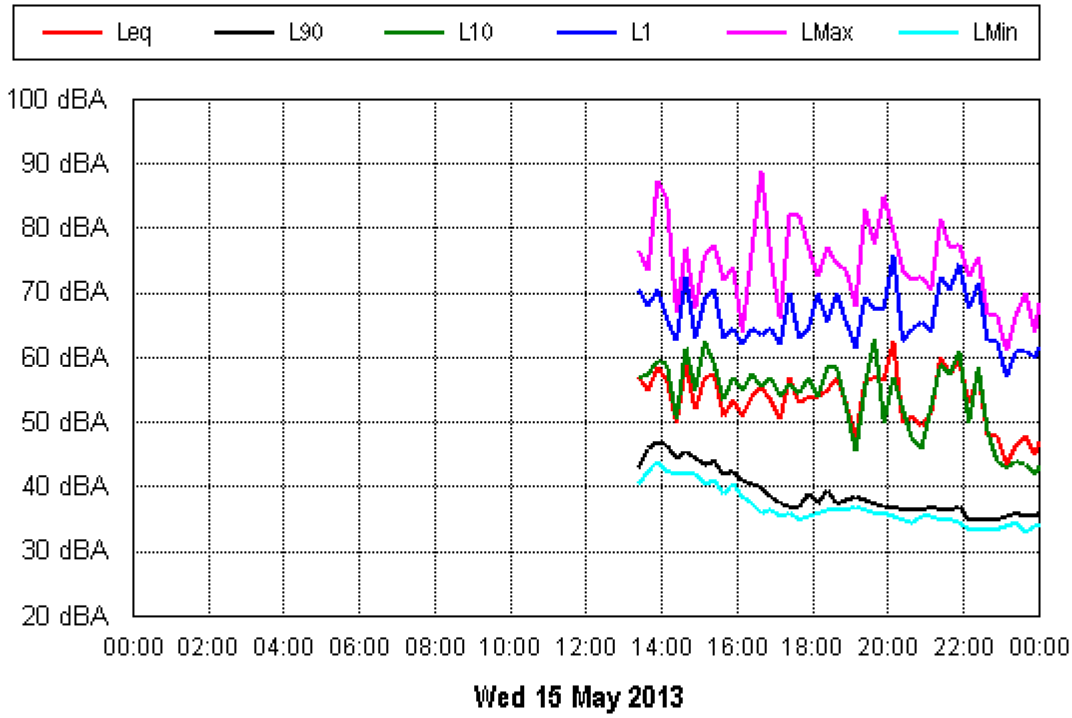
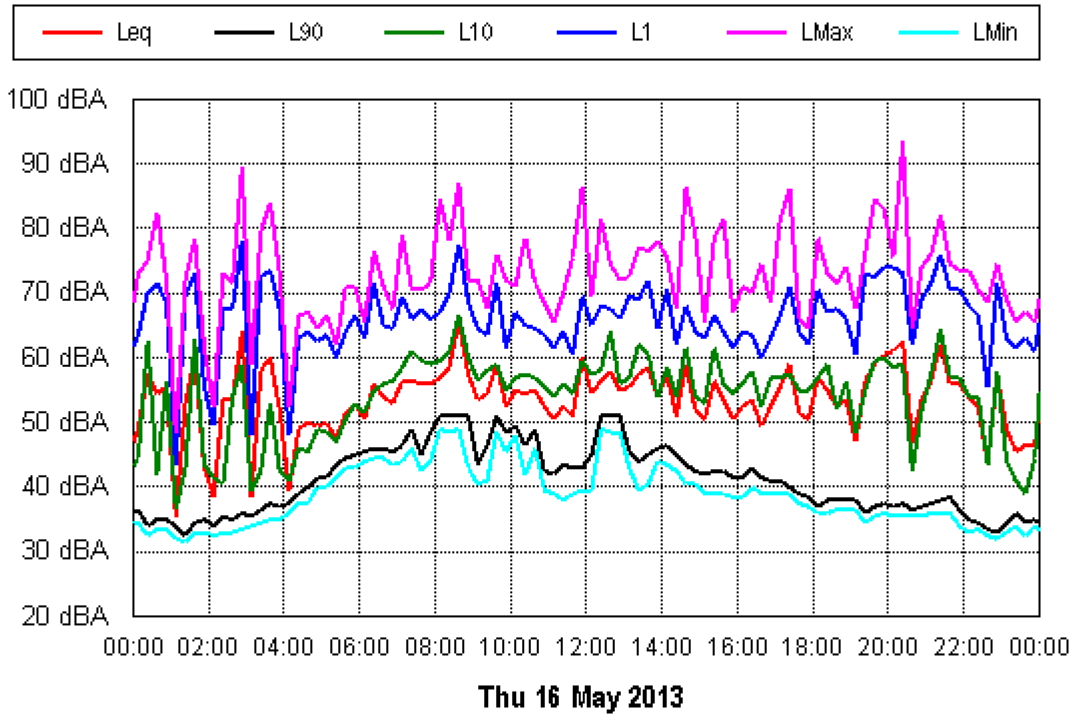
Location: 6 Namoi Court, Wattle Grove





Project: SIMTA
Location: 2 Rushton Place Casula





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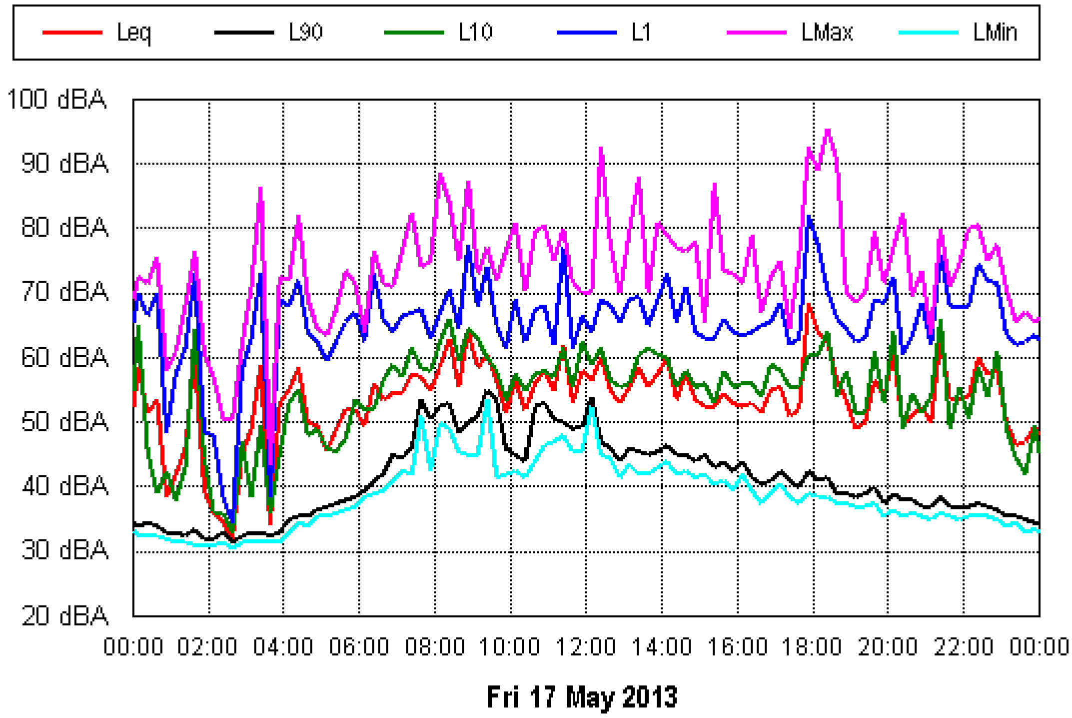

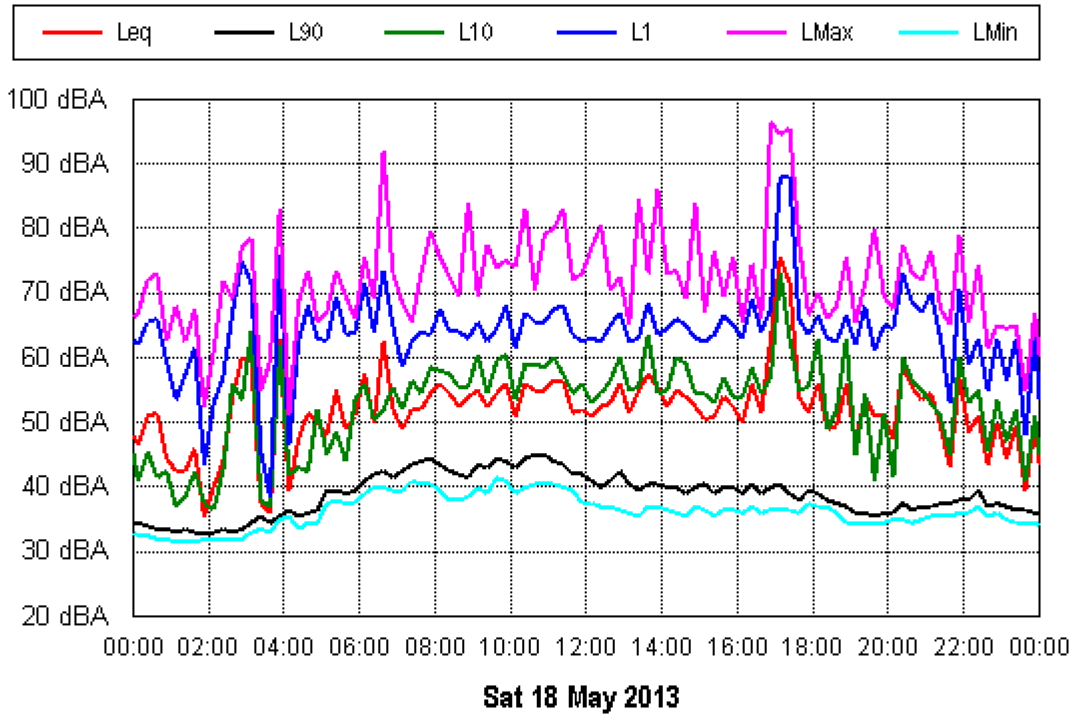

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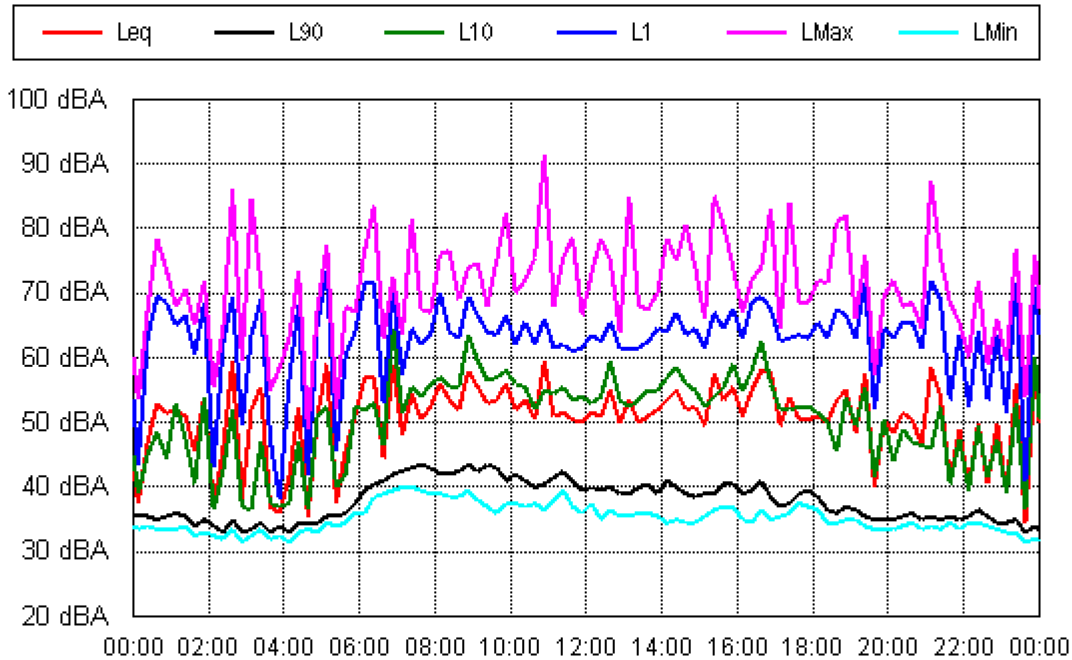
Location: 2 Rushton Place Casula



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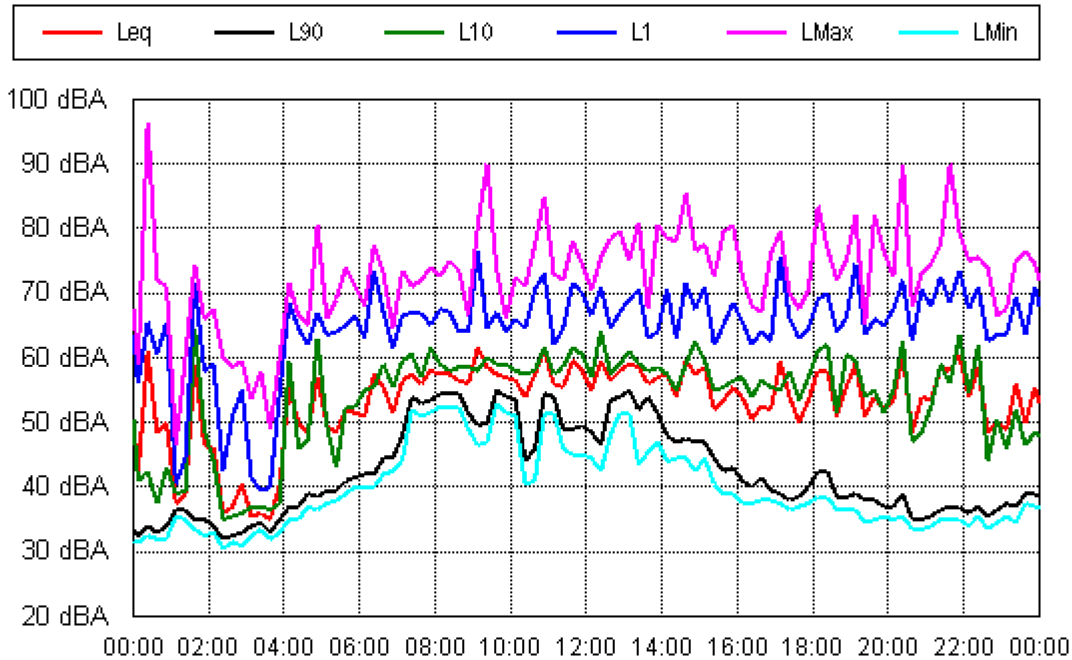

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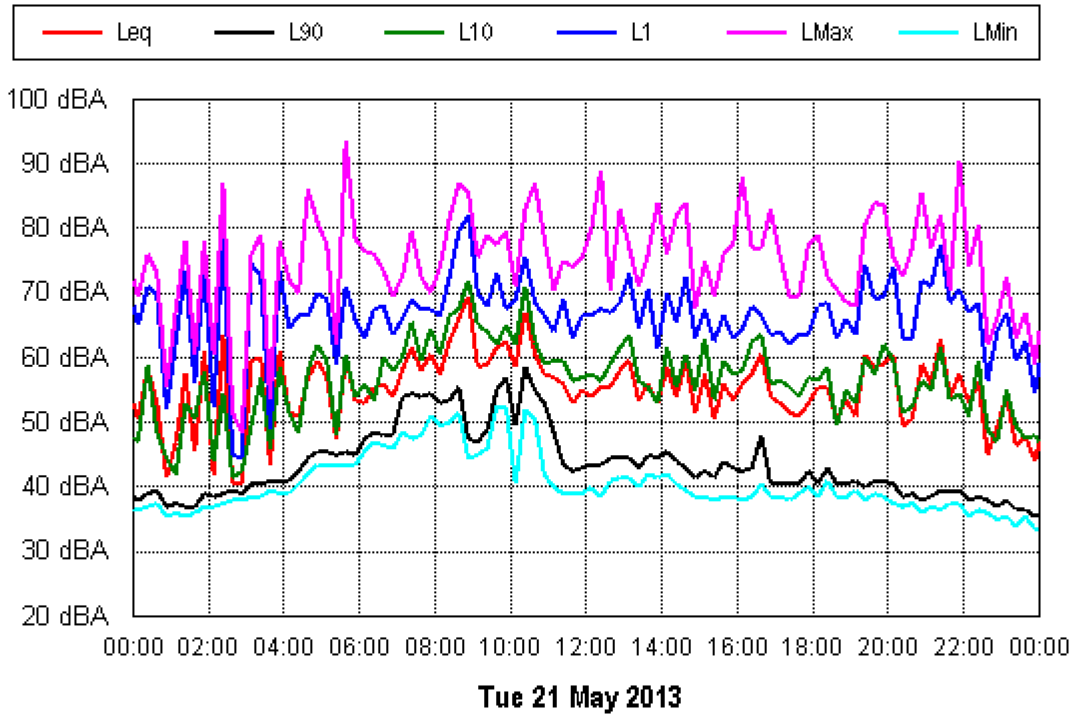
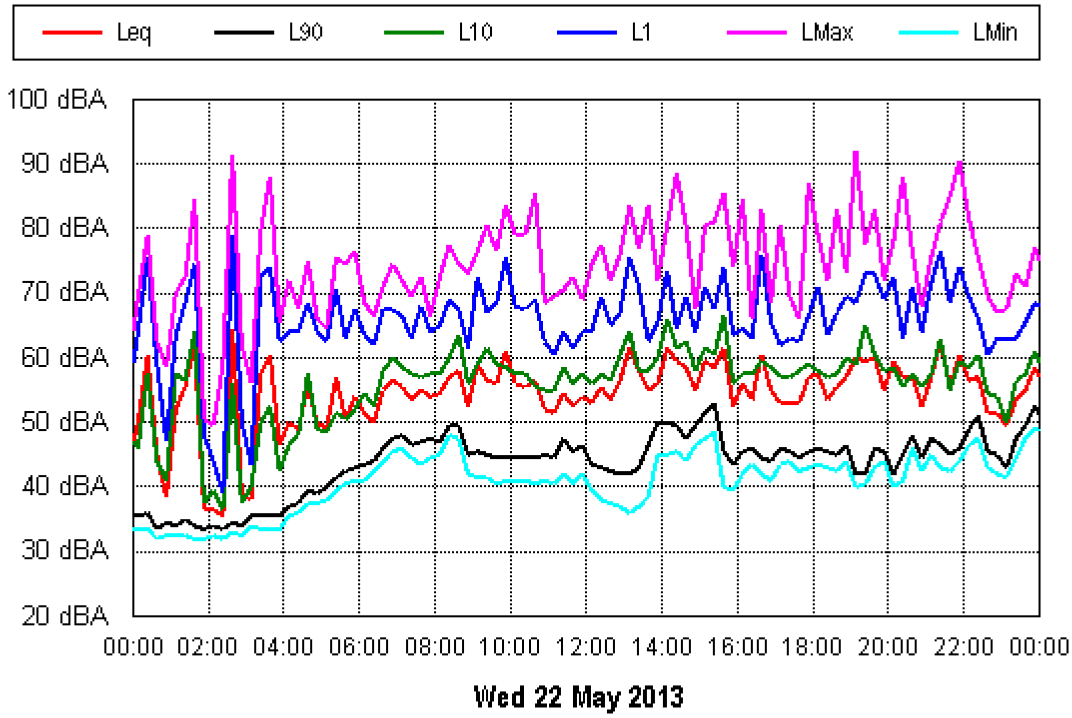
Location: 2 Rushton Place Casula





Project: SIMTA
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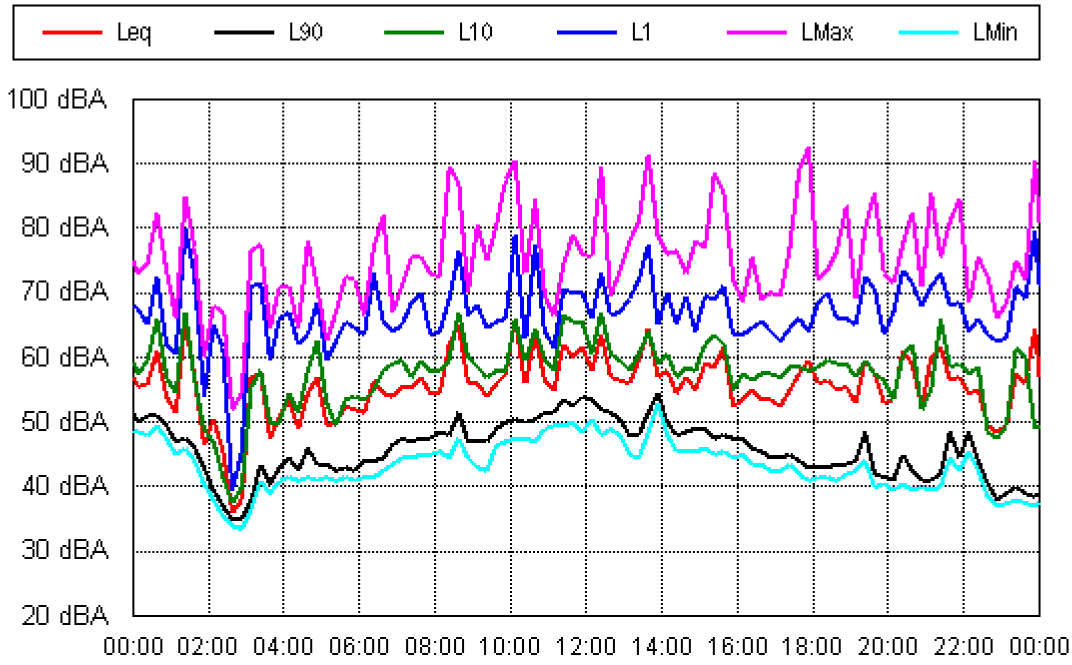

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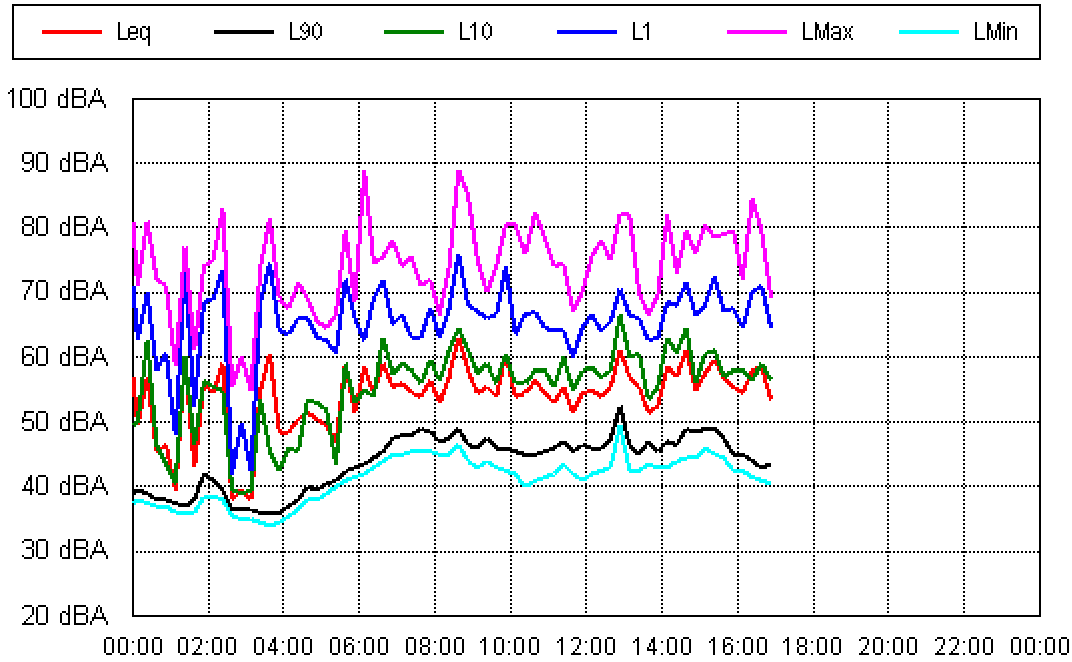

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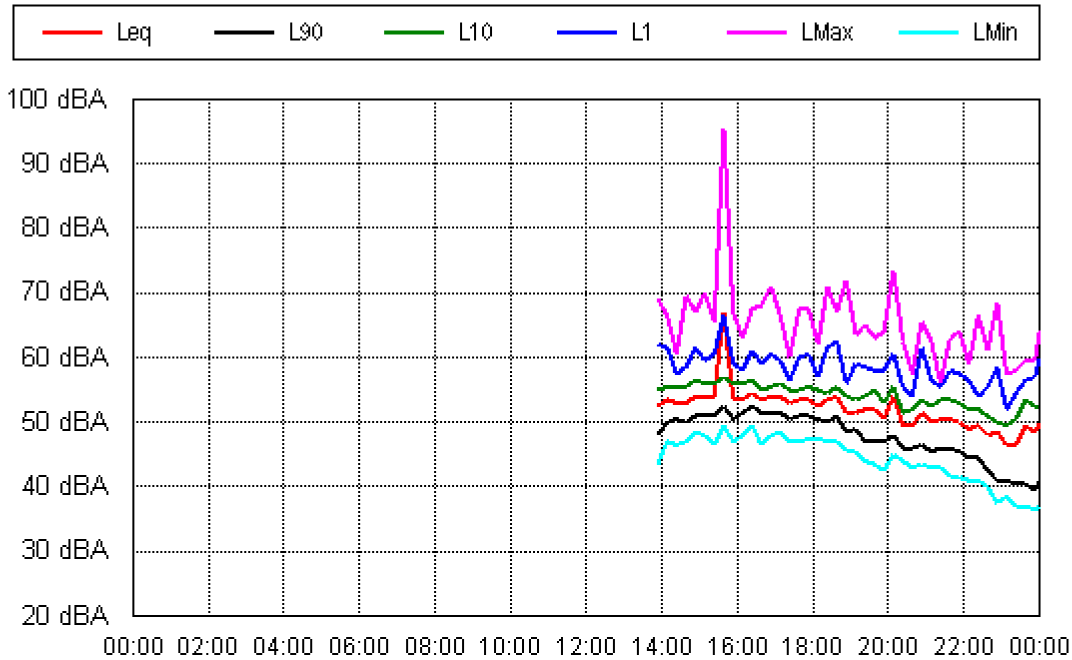
Project: SIMTA
Location: 14 Goodenough Street, Glenfield



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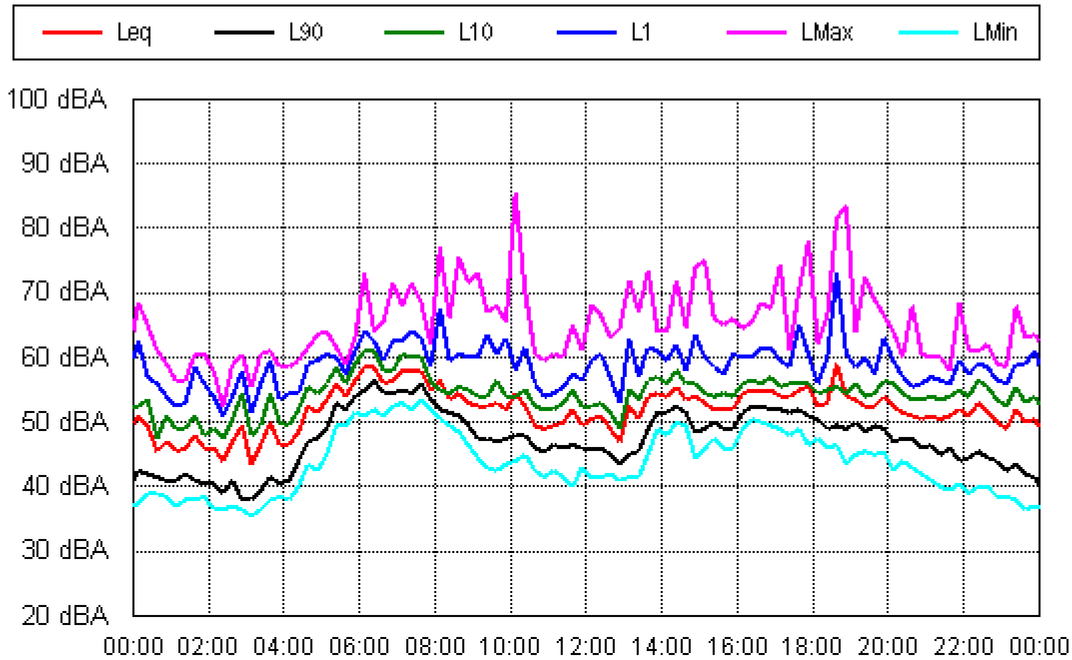

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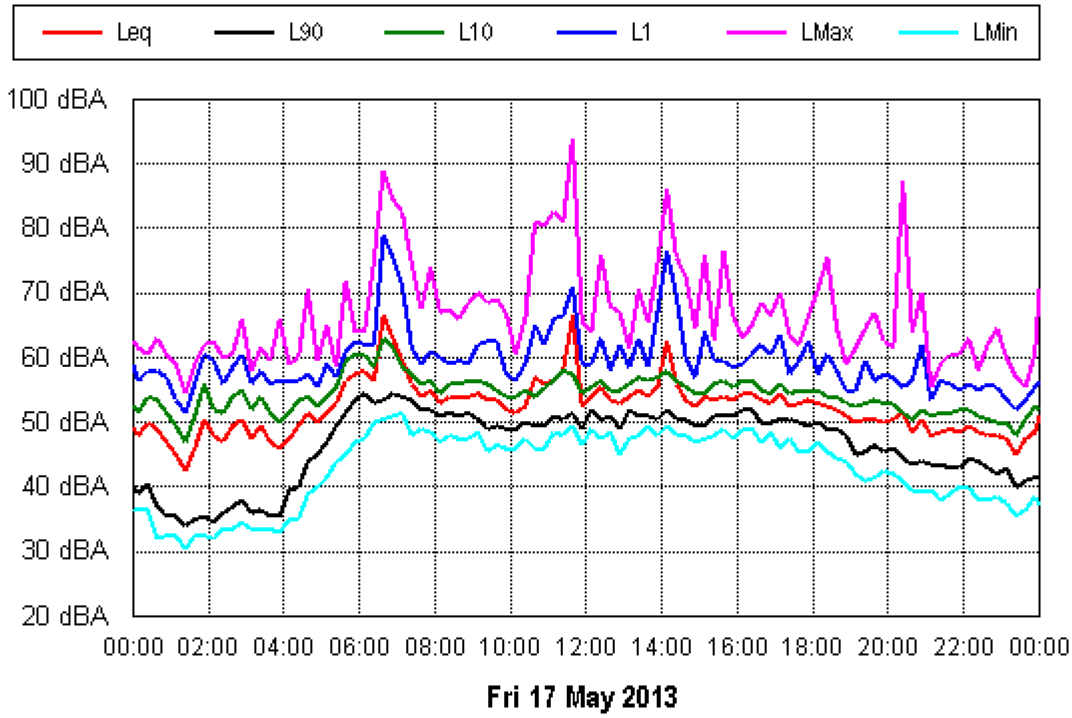

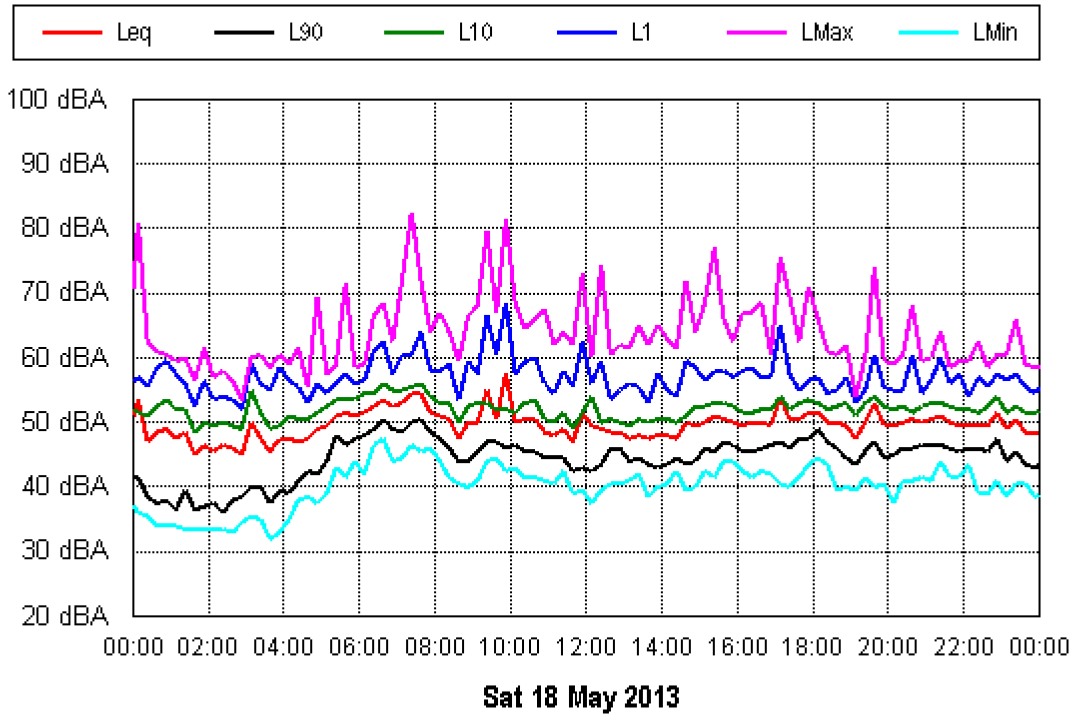

Project: SIMTA
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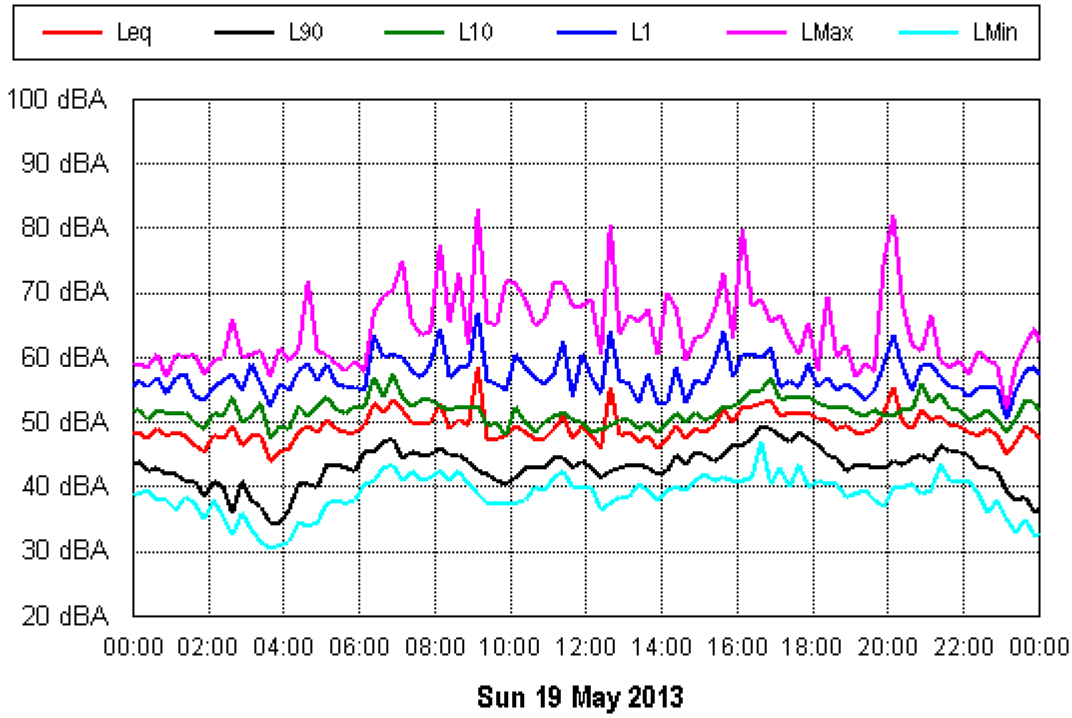

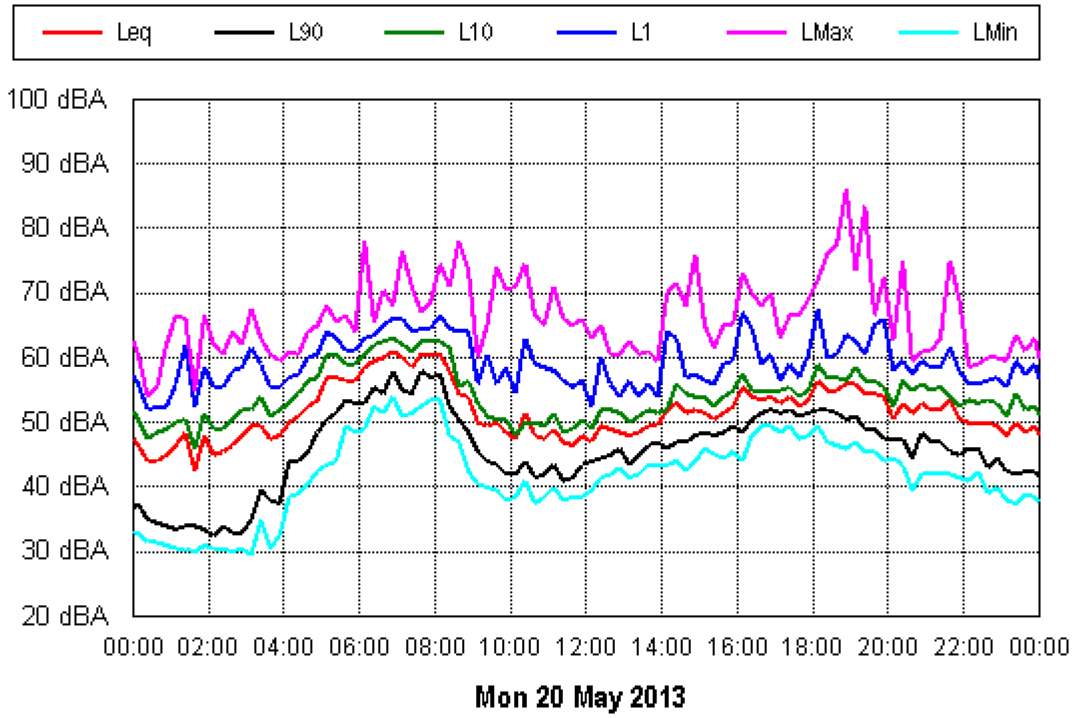

Project: SIMTA
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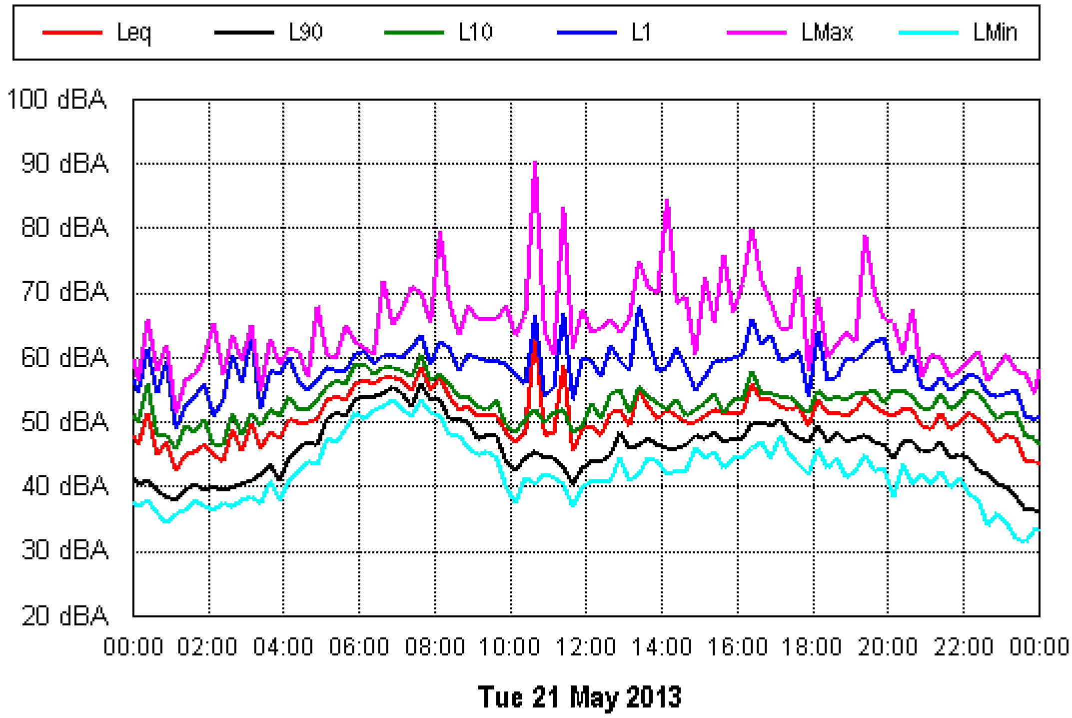
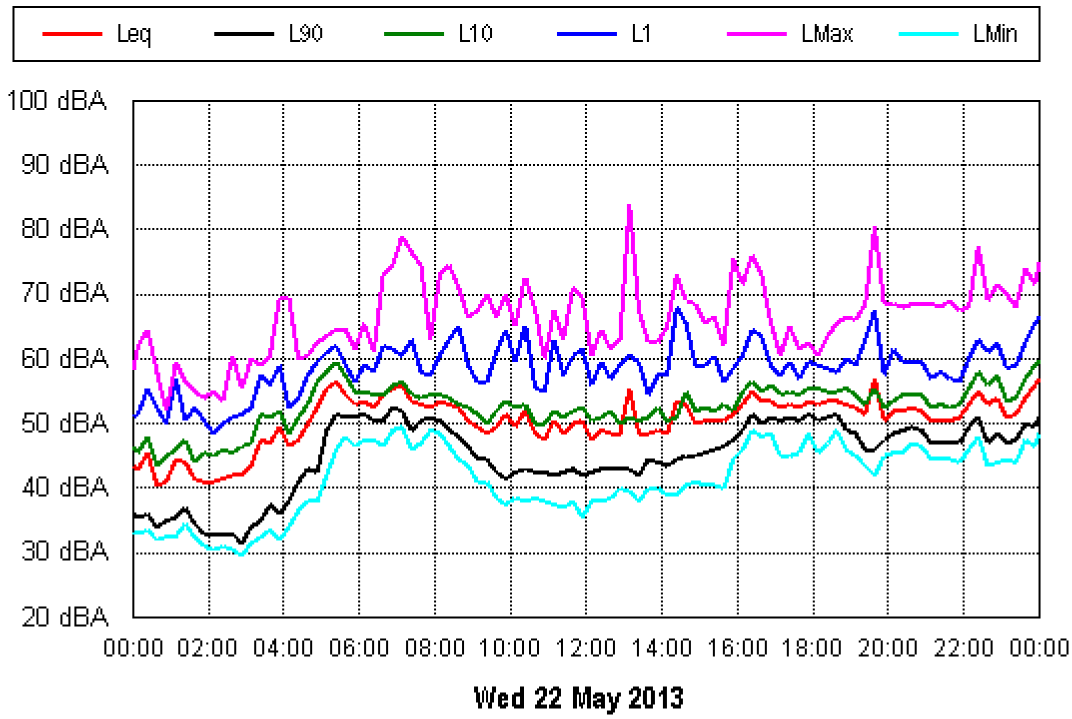
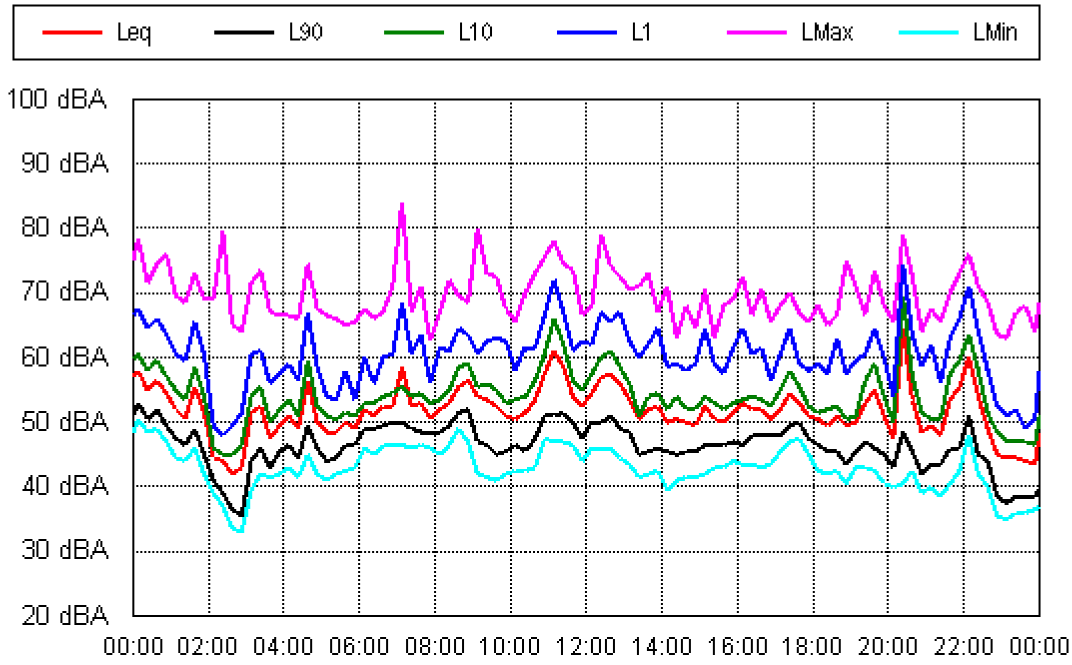




Project: SIMTA
Location: 14 Goodenough Street, Glenfield



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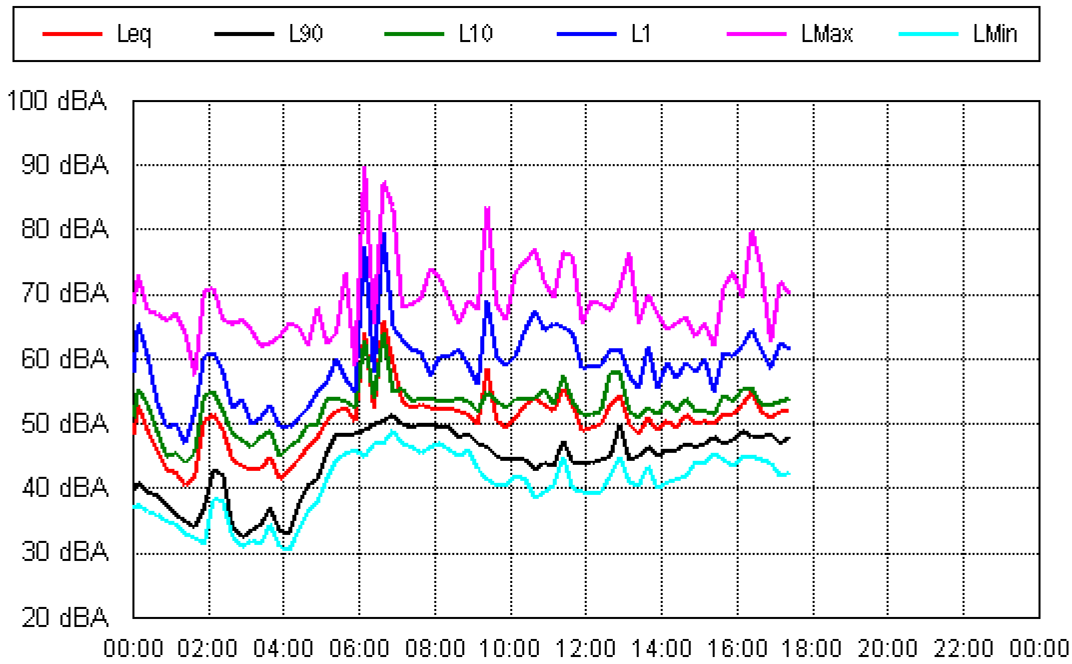

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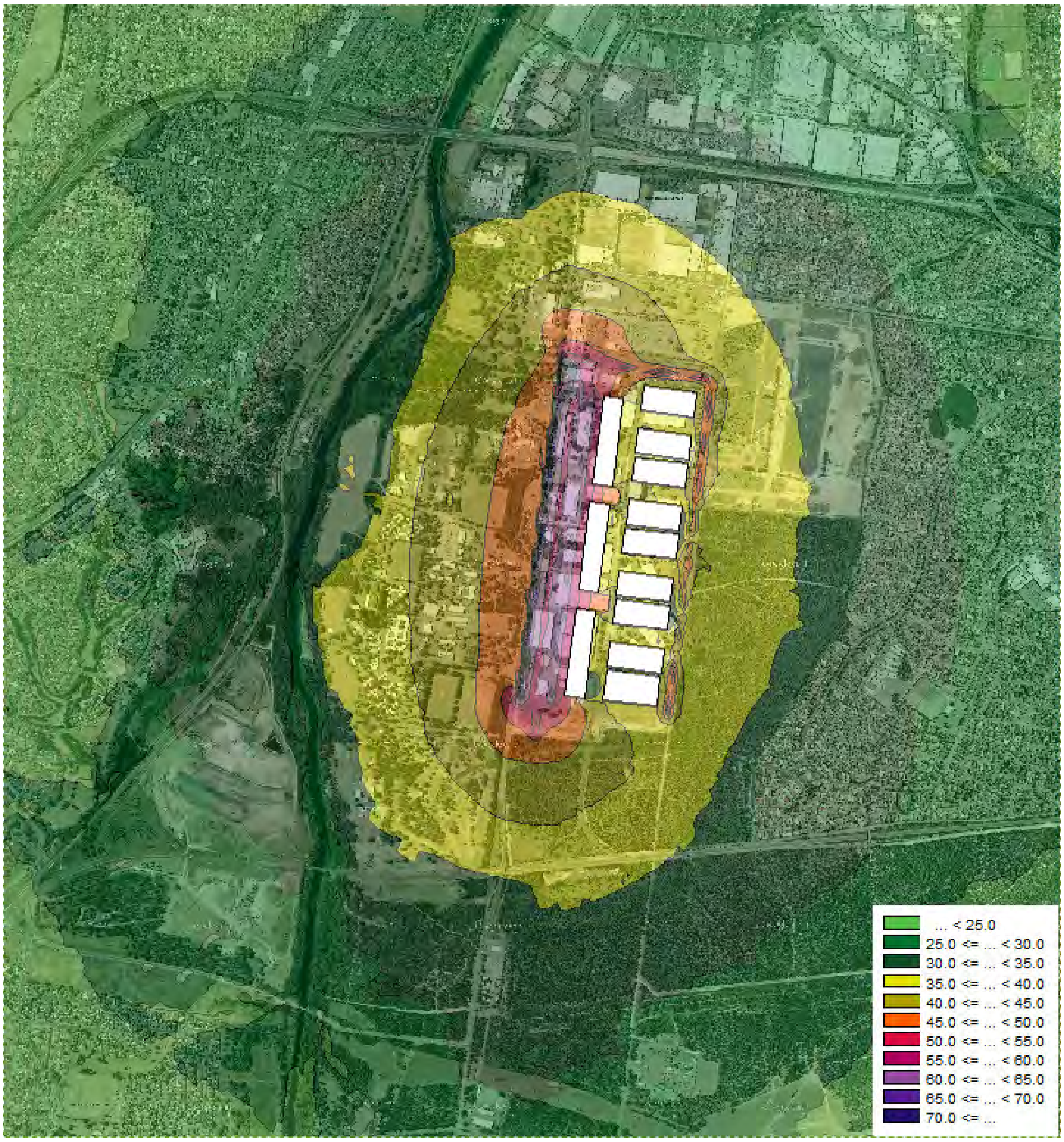
APPENDIX B

NOISE CONTOURS

Daytime Operational Noise Contours



Night Time Operational Noise Contours