Appendices

Appendix A
Photographs

View south along Kingsgrove Road

View north across the site

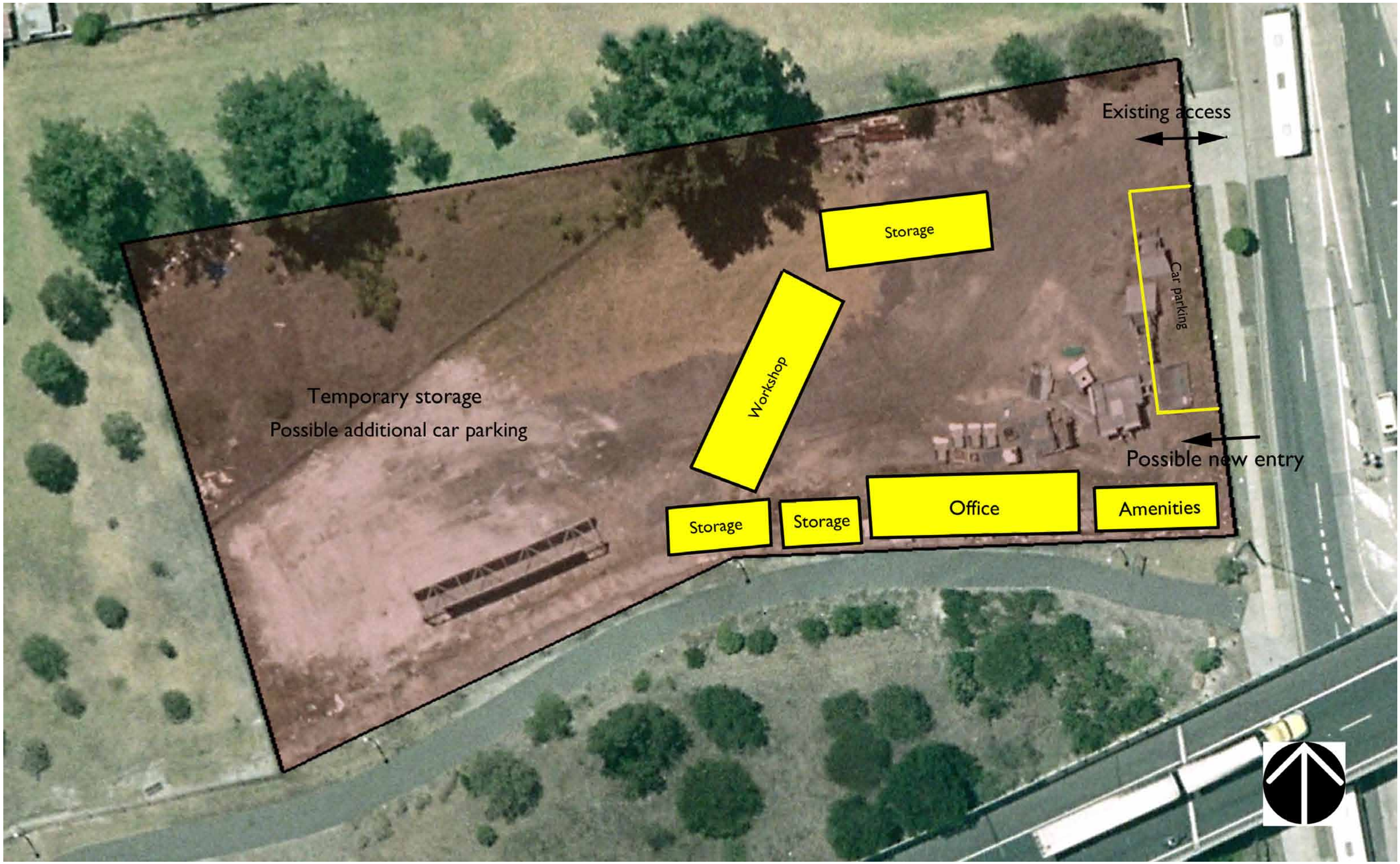
View northeast across the site

Trees along the northern boundary of the site

View southeast towards the site

View north along Kingsgrove Road. Existing site access in foreground.

Appendix B
Site layout


Existing access
Storage
Car parking
Workshop
Temporary storage
Possible additional car parking
Possible new entry
Storage
Storage
Office
Amenities

Appendix C
Noise assessment

REPORT

M5 EAST MOTORWAY, KINGSGROVE OPERATIONS COMPOUND, NOISE ASSESSMENT

Stuart J Hill Pty Ltd

Job No: 5534

3 February 2011

PROJECT TITLE:	**M5 EAST MOTORWAY, KINGSGROVE OPERATIONS COMPOUND, NOISE ASSESSMENT**
JOB NUMBER:	**5534**
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DOCUMENT CONTROL

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02	03.02.11	Chris Marsh	Glenn Homes

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GLOSSARY OF TERMS

A-weighting – refers to an adjustment made to the noise level reading to take into account the tonal composition of a noise relative to the ear's response to the various tones that make up the noise. A-weighting is done to make sure that the noise level reading properly reflects the loudness of the noise as perceived by the "average" human ear.

L_{Aeq} – The Equivalent Continuous Sound Level and has the same energy over the monitoring period as the actual noise environment.

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_{AN} – The level exceeded for N% of the monitoring time.

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.

1 INTRODUCTION

The Road Traffic Authority (RTA) is proposing to utilise a currently vacant site, at 197-201 Kingsgrove Road, as an operations compound for the M5 East Motorway and associated infrastructure. The site is located on the northern side of the M5 East Motorway, with industry located to the north and north-east of the site. Residences are located to the north and west of the site. The area contains a mix of residential and industrial usage.

The site will be used as a storage compound, repair and testing facility and will function as the starting and finishing point for day and night maintenance activities associated with the M5 East Motorway, during planned closures. These planned closures typically occur over a period of 5 consecutive nights, once a month. Outside of the planned closure period, a small daytime workforce would occupy the office and workshop.

PAEHolmes has been commissioned by Stuart J Hill Pty Ltd to undertake a noise impact assessment for the proposed activity. This report presents the results of this assessment including recommendations to minimise potential noise impacts.

2 SITE AND PROJECT DESCRIPTION

2.1 The Site

The site is located on the western side of Kingsgrove Road, immediately to the north of the M5 East Motorway. Immediately to the north east of the site are two industrial developments, the United Industrial Estate and Tapex Pty Ltd, the latter of which is located across Kingsgrove Road. The most noise sensitive usage near the proposed site is residential located to the north and west of the site. The potentially most affected of these are the dwellings to the north of the site, set back approximately 30m from the site boundary. The dwellings to the west are set back much further, approximately 60m

Figure 2-1 presents an aerial photograph of the site and surrounding area showing both residential and industrial usage.

Figure 2-1: Site Location and Surrounds

2.2 Proposed Development

The proposed development is a maintenance compound for the M5 East Motorway. It will contain several single storey pre-fabricated buildings including storage, a small workshop and an office. There will also be car parking for employee vehicles and work trucks, which include trucks with small mounted cranes.

The site will be used as a storage compound, repair and testing facility and will be the starting and finishing point for day and night maintenance activities associated with the M5 East Motorway, during planned closures. These planned closures typically occur over a period of 5

consecutive nights, once a month. Outside of the planned closure period, a small daytime workforce would occupy the office and workshop.

During the planned closures, work trucks will depart from the site for maintenance associated with the M5 East Motorway and return upon completion of these works. The site will also be used for the occasional storage and maintenance of assets used in the M5 East Motorway.

Figure 2-2 shows an indicative site layout plan provided by the RTA. The site has an area in the north west corner which has been fenced off and is currently not in use. This area is expected to remain unused by the development.

Based on information provided by the RTA, operations are expected to include the following:

Day

- A day shift based in the office and workshop, outside of the 5 day planned closure period.
- Following arrival in the early morning, the day workforce of approximately 8 vehicles will depart from site at approximately 3:30pm.

Evening

- Arrival of planned closure workforce in up to 40 private cars, at approximately 8.00pm.
- Departure of the M5 East Motorway site maintenance workforce in up to approximately 10 small trucks, at about 9.30pm, on nights of planned closure.

Night

- Arrival of the site workforce back to site at 12.00am during the meal break, on nights of planned closure.
- Departure of the site workforce in work vehicles at the end of break at 12.30am.
- Arrival of site work force at the end of the shift.
- Subsequent departure of the site workforce in private cars at around 5.00am.
- Occasional arrival of asset items during the night for repairs carried out during the daytime at nominated workshops.
- Outside of the planned closure period, the day workforce of approximately 8 will arrive on site from 6.00am.

The majority of the night time activities (i.e apart from day shift staff arrivals to site) occur during the period of planned closure, which takes place once a month for approximately five consecutive nights. Traffic movements related to site crew travelling to and from the M5 East Motorway site will be via the M5 East Motorway itself. Staff movements to and from site are expected to be by way of Kingsgrove Road (northbound and southbound) and the M5 East Motorway.

It is expected that the day shift workers will use the car park located at the eastern end of the site. During the planned closures nights, the additional staff vehicles will be parked at the western end of the site, where it is also expected that the work vehicles will be parked.

Delivery and storage of M5 East Motorway asset items is expected to be in the area between the site buildings, shielded by the site buildings from the nearby residents, or in the case of no available space, in the area at the west of the site.

Based on information provided by the RTA, the construction stage is expected to be relatively short-term and last for approximately four weeks. Major activities are expected to include the following:

- Excavation for sewerage and services lasting approximately three weeks.
- Establishment of pre-fabricated buildings lasting approximately one week.

Figure 2-2: Proposed Site Layout

3 NOISE ASSESSMENT GUIDELINES AND CRITERIA

3.1 Construction Noise

The NSW Interim Construction Noise Guideline (ICNG) presents the process to assess construction noise in NSW. The ICNG was developed by the Department of Environment, Climate Change & Water (DECCW) taking into consideration that construction is temporary, noisy and difficult to ameliorate. As such the ICNG was developed to focus on applying a range of work practices most suited to minimising construction noise impacts, rather than focusing only on achieving a numeric noise level.

The ICNG recommends that standard construction work hours should typically be as follows:

- Monday to Friday 7.00am to 6.00pm.
- Saturday 8.00am to 1.00pm.
- No work on Sundays or Public Holiday.

The ICNG presents the following noise management goals for commercial and industrial premises:

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

For the childcare centre the residential noise criteria would be adopted.

Additionally it recommends quantitative management noise goals at residences as presented in Table 3-1.

Table 3-1: Construction Noise Guideline Levels at Residential Receivers

Time of day	Management Level $L_{Aeq\ (15\ min)}$	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 $L_{Aeq,\ 15min}$ 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.
	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 + 5dBA	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 5dBA above the noise affected level, the proponent should negotiate with the community.

3.2 Site Noise Emission

The NSW Government's policy and guidelines for the assessment of industrial noise is presented in the Department of Environment, Conservation and Climate Change (DECCW) Industrial Noise Policy (INP). The INP recommends Intrusiveness Criteria for residential receivers to address the potential for disturbance and Amenity Criteria to maintain acoustic amenity appropriate to the relevant land use category of the area. These criteria are further described as follows:

Intrusiveness Noise Criterion – The $L_{Aeq,15min}$ noise level within the day (7.00am to 6.00pm, 8.00am to 6.00pm Sundays and Public Holidays), evening (6.00pm to 10.00pm) or night time (10.00pm to 7.00am, 10.00pm to 8.00am Sundays and Public Holidays) assessment periods should not exceed the L_{A90} background noise level (i.e. the Rating Background Level) within that period by more than 5dBA. The purpose of this noise goal is to minimise the likelihood of disturbance.

Amenity Noise Criterion – The maximum ambient L_{Aeq} noise level within the day, evening and night assessment period should not exceed deemed acceptable noise levels published in the INP, dependant on the relevant receiver type and area category for the residential receiver. The purpose of this noise goal is to provide an upper limit to industry related noise emission and prevent industrial noise from creeping higher with each new successive industrial development. Where the existing industrial noise level is close to the relevant deemed acceptable noise level, the project specific amenity noise criterion is then set lower than the INP acceptable noise level (i.e. the INP recommended amenity criterion) so that the total level of industrial noise (i.e. new plus existing) does not exceed the deemed INP acceptable level. On the other hand, where the existing level of industrial noise is higher than the INP acceptable level, then the project specific noise criterion is set 10dBA lower than the prevailing noise level if it is unlikely that the prevailing industrial noise level will reduce in the future. If it is likely that the overall noise level will reduce, then the project specific amenity criterion is set 10dBA below the INP acceptable noise level.

Table 2.1 of the INP sets out amenity noise criteria (deemed acceptable levels) for various receiver types, including residential receivers, and for various corresponding categories of residential receiver. For the Urban category of residential receiver (deemed appropriate in this case), the relevant acceptable amenity noise criteria are:

- Day $L_{Aeq,\ 11hr}$ – 60dBA
- Evening $L_{Aeq,\ 4hr}$ – 50dBA
- Night $L_{Aeq,\ 9hr}$ – 45dBA

3.3 Road Traffic Noise

The NSW Government's Environmental Criteria for Road Traffic Noise (ECRTN) presents the NSW Government's recommended guidelines and criteria for the assessment of road traffic noise on public roads. These criteria are not mandatory; however compliance should be achieved where considered reasonable and feasible. The guideline presents noise criteria for noise-sensitive receivers next to various categories of roads, including local, collector, and arterial roads and dependant on whether the road is new or a redevelopment (upgrade). The relevant criteria are summarised in Table 5-2 of the ECRTN noise policy document.

The residents located on Kingsgrove road are potentially most likely to be impacted by noise from site related traffic. The classification of Kingsgrove Road according to the ECRTN is a sub-arterial road as it connects arterial roads and transports traffic from one region to another. For

the purposes of setting noise criteria, the ECRTN groups sub-arterial roads with arterial roads and freeways. The noise criteria are summarised in Table 3-2.

Table 3-2: Road Traffic Noise Criteria, Kingsgrove Road

Type of Development	Criteria, dBA		
	Day (7.00am-10.00pm)	Night (10.00pm-7.00am)	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 treatments. In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB.

4 PREVAILING AMBIENT NOISE ENVIRONMENT AND NOISE MONITORING

A combination of attended and unattended noise monitoring was carried out in order to provide information to quantify the prevailing ambient noise environment for the purpose of this assessment. Noise monitoring was carried out between 13th December 2010 and 20th December 2010. Weather conditions were generally fine, with a thunderstorm occurring on Friday evening and on Sunday evening. The noise logging at one of the two locations was repeated between 14 January 2011 and 23 January 2011 due to a failure in the instrumentation. Weather was generally fine during this survey except for a period of relatively high wind during the afternoon of 17 January 2011.

4.1 Unattended Noise Measurements

Unattended noise monitoring was carried out between 13th December 2010 and 20th December 2010 at 185 Kingsgrove Road using an ARL 215 noise logger and between 14th January 2011 and 23rd January 2011 near the northern boundary of the proposed site using a Rion NL-31 noise logger. The noise loggers were both Type 1 noise logging equipment and were programmed to continuously monitor noise and record the relevant statistical descriptors at the end of each 15 minute period.

Noise monitoring was carried out at the locations indicated in Figure 4-1. Noise logging at Logger Position 1 was undertaken to quantify representative noise levels at the closest residential properties. Measurements at Logger Position 2 was undertaken to quantify the existing road traffic noise on Kingsgrove Road for the purpose of assessing traffic noise impact.

A summary of the logger results is presented in Table 4-1 and the measured traffic noise levels at Position 2 in Table 4-2. Periods potentially affected by adverse weather conditions including

high wind and rain were omitted from the analysis. The logging data is presented in full in Appendix A.

Table 4-1: Measured Background Noise Levels

Location Address	Background Noise Level (RBL), dBA		
	Day	Evening	Night
185 Kingsgrove Road (Logger Position 2)	59	56	45
197-201 Kingsgrove Road Compound (Logger Position 1)	54	54	46

Table 4-2: Measured Road Traffic Noise Levels at Position 2

Location	Traffic $L_{Aeq\ 15hr}$ Day, dBA	Traffic $L_{Aeq\ 9hr}$ Night, dBA
185 Kingsgrove Road	68	64

4.2 Attended Noise Measurements

Attended noise measurements were carried out in order to better understand the night time noise environment and to identify the noise sources present in the vicinity of the site and residential receivers, including any industrial noise.

Measurements were carried out on the night of 13th December 2010 between 11.55pm and 1.15am using a Rion NL-21 sound level meter. This Sound Level Meter conforms to Australian Standard AS 1259 "Acoustics – Sound Level Meters" as a Type 2 Precision Sound Level Meter which has an accuracy suitable for general field use. The A-Weighting filter of the meter was selected and the time weighting was set to 'fast'. Calibration of the meter was checked before and after the measurements using a Pulsar 105 Type 1 acoustic calibrator and no significant drift was noted.

Measurements were carried out at two locations representative of the nearest residential receivers to the north and west of the site, as shown in Figure 4-1. Attended Measurement Position 1 was located near the rear fences of the residential properties to the west of the site and Attended Measurement Position 2, near the northern residences.

A summary of the measurement results is presented in Table 4-3.

Table 4-3: Attended Noise Measurement Results

Location	Time	L_{Aeq}, dBA	L_{A1}, dBA	L_{A10}, dBA	L_{A90}, dBA	Noise sources
Position 1 (west)	11.55pm	44	52	47	41	Local traffic passing 47-55 dBA, distant traffic 36dBA, industrial noise approximately 41dBA
Position 1 (west)	12.40am	45	52	48	41	Local traffic passing 50-64 dBA, distant traffic 39 dBA, industrial noise approximately 41dBA
Position 2 (north)	12.15am	50	58	54	44	Local traffic passing 49-54dBA, distant traffic 37dBA, industrial noise 44dBA
Position 2 (north)	1.03am	48	56	51	44	Local traffic passing 49-57dBA, distant traffic 39dBA, industrial noise 44dBA

Observations during the night time noise survey indicated that the noise environment was dominated by noise from the surrounding roads which include the M5 East Motorway and Kingsgrove Road, in addition to some industrial noise from the TAPEX factory located at 200 Kingsgrove Road. The noise observed from the factory was constant and is considered likely to be generated by ventilation and condensing units. This noise dominates the night time background noise level and was clearly audible during lulls in traffic noise.

Traffic on Kingsgrove Road was light with an almost constant flow and dominated the noise environment. Industrial noise from the TAPEX factory was clearly audible during quieter times and during breaks in the traffic flow.

In summary, it was observed that the background noise environment was dominated by the industrial noise from the TAPEX plant, although only audible during the breaks in traffic noise.

Figure 4-1 Noise Measurement Locations

5 PROJECT SPECIFIC NOISE CRITIERA

5.1 Construction Noise Criteria

The construction noise criteria have been established using the RBL measured at the unattended logging location and is presented in Table 5-1.

Table 5-1: $L_{Aeq,\ 15min}$ Construction Noise Criteria

Receiver	Criteria $L_{Aeq,15min}$, dBA	
	Standard Hours	Outside Standard Hours
Forrester Street (north of site)	64	51
Karingal Street (west of site)	61	48

5.2 Intrusiveness Noise Criteria

The intrusiveness noise criteria are based on the background noise levels. Using the results from the attended and unattended measurements it is possible to set the following criteria, presented in Table 5-2.

Table 5-2: Project Specific Intrusiveness Criteria

Receiver	Criteria $L_{Aeq,15min}$, dBA		
	Day	Evening	Night
Forrester Street (north of site)	59	59	51
Karingal Street (west of site)	56	56	48

5.3 Amenity Noise Criteria

The amenity criteria have been derived from both attended and unattended noise measurements.

Given that the night time L_{A90} at the time of the operator attended noise survey was dominated and controlled by the steady industrial noise contribution whereas the L_{Aeq} noise level was controlled by road traffic, the industrial L_{Aeq} noise contribution can be estimated by adding 1dBA to the L_{Aeq} noise level measured on site. This 1dBA relationship is based on past experience on similar projects near industrial type noise sources. This results in an industrial noise L_{Aeq} contribution of 45dBA at the dwellings to the north of the site and 42dBA at the dwellings to the west, based on the 3dBA relationship established from the attended site measurements between the two locations. Theoretically, for an ideally steady noise source under ideal measurement conditions, the difference between the L_{Aeq} and L_{A90} is 0dBA. Therefore, the difference of 1dBA under non-ideal conditions assumed here, based on past experience, is considered reasonable.

For the purpose of assessment, the local area is categorised as “urban” based on the guidance in the INP, due to the presence of through flow traffic and a dominating industrial noise source. Therefore, based on the results of the noise survey and the guidance in the INP, the relevant amenity criteria are presented in Table 5-3.

Table 5-3: Project Specific Amenity Criteria

Receiver	Criteria $L_{Aeq,period}$, dBA		
	Day	Evening	Night
Forrester Street (north of site)	60	48	37
Karingal Street (west of site)	60	50	41

5.4 Sleep Disturbance Screening Criteria

Based on the site noise measurements, the relevant sleep disturbance screening criteria applicable at 1m from any bedroom window are presented in Table 5-4.

Table 5-4: Sleep Disturbance Screening Criteria

Receiver	Criteria $L_{A1,1min}$, dBA
Forrester Street (north of site)	61
Karingal Street (west of site)	58

6 SITE NOISE EMISSIONS

Noise modelling has been undertaken using the ISO 9613 Standard algorithms, as implemented within the CadnaA acoustic modelling package. The noise modelling takes into consideration the sound power level of site operations, activities and equipment, and applies adjustments for attenuation from geometric spreading, acoustic shielding from intervening ground topography, ground effect, atmospheric absorption, etc. The algorithm is inherently conservative, representing enhanced noise due to moderate downwind conditions.

Background information for the purpose of the noise modelling was provided by the RTA. Data provided by the RTA for the noise modelling included project description, plant, equipment and operations, aerial photography of the site and the proposed layout plans.

Using information supplied by the client, various scenarios for construction and operation have been examined to investigate the level of noise impact.

6.1 Construction Noise

The construction noise has been calculated for the purpose of assessment and the predicted noise levels are summarised in Table 6-1 for the most noise intensive activities. It is recommended and assumed that the construction work will be carried out during the standard construction hours recommended in the DECCW guidelines.

Table 6-1: Calculated Construction Noise Levels

Receiver	Criteria $L_{Aeq, 15min}$, dBA	Calculated Noise Level $L_{Aeq, 15min}$, dBA		
		Mobile Crane	Excavator	Both
Forrester Street (north of site)	66	57	60	62
Karingal Street (west of site)	63	46	51	52

As seen in Table 6-1, noise generated by construction is expected to comply with the current construction noise guidelines. Furthermore, construction activity is expected to be relatively short-term and completed within a period of approximately 4 weeks. Also, construction activities are unlikely to be continuous over the entire construction period.

6.2 Operational Noise

The operational model has been prepared based on a number of assumptions as follows:

- Site layout provided by the RTA.
- 40 private cars arrive in a period of 30 minutes and depart in 30 minutes during operations.
- The cars will be parked in the area noted possible car park towards the western end of the site, as indicated in the initial plans supplied by the RTA.
- The events of cars or trucks leaving/arriving do not occur simultaneously
- Work vehicles will depart twice and return twice during the night time period.
- Private cars will arrive during the evening time and depart in the night time period.

Sound Power Levels used for vehicles and activities for the purpose of modelling have been obtained from our database and are summarised in Table 6-2.

Table 6-2: Source Sound Power Levels

Item	Sound Power Level, dBA
Car	90
Truck	95
Truck Mounted Crane	86
Excavator	84
Crane for lifting prefabricated units	86
Air Conditioning Unit	65

6.2.1 Intrusive Noise

The intrusive noise criterion is based on an assessment period of 15 minutes and as such the scenarios have been calculated over a fifteen minute period. The different operational activities have been arranged into scenarios which take into account a worst case activities that may occur during a fifteen minute period. The scenarios are presented in Table 6-3.

Table 6-3: Operational Scenarios

Scenario	Activities	Period	Overall Duration (minutes)	Typical Number of Events per period
1	Private Cars Arrive or Depart from Site	Evening and Night	30	1
2	Work Vehicles Arrive or Depart from Site	Night	15	4
3	Truck with Mobile Crane deposits Asset Items in Compound, at Western End	Night	15	1
4	Truck with Mobile Crane deposits Asset Items in Compound, shielded by site buildings	Night	15	1
5	Private Cars Arrive or Depart from site for day shift	Day	15	1

The results of the noise modelling for intrusive noise are summarised in Table 6-4.

Table 6-4: Calculated $L_{Aeq,15min}$ Noise Levels

Receiver	Criteria $L_{Aeq,15min}$, dBA			Scenario Calculated Noise Level $L_{Aeq,15min}$, dBA				
	Day	Evening	Night	1	2	3	4	5
Forrester Street	59	59	51	**55**	46	**61**	50	35
Karingal Street	56	56	48	**48**	38	**56**	41	24

Note: Values in bold indicate the applicable criteria are exceeded

6.2.2 Local Amenity

The noise levels relating to the amenity criteria have been calculated according to how many events happen in the assessment period and their corresponding noise level.

Table 6-5 presents a summary of the calculated noise levels.

Table 6-5: Calculated Amenity Period Noise Levels

Receiver	Day $L_{Aeq,\ 11hr}$, dBA		Evening $L_{Aeq,\ 4hr}$, dBA		Night $L_{Aeq,\ 9hr}$, dBA	
	Criteria	Noise Level	Criteria	Noise Level	Criteria	Noise Level
Forrester Street (north of site)	60	45	48	47	37	**48**
Karingal Street (west of site)	60	39	50	39	41	**42**

Note: Values in bold indicate the applicable criteria are exceeded

6.2.3 Sleep Disturbance

Noise sources with the potential to cause sleep disturbance include the following:

- Vehicle doors closing
- Normal Conversation
- Maximum truck passby noise levels
- Mobile Crane

As it is possible that the mobile crane could be operated near the western end of the site where it is unshielded from the residents and also near the workshop where it would be shielded, noise levels at both these locations was calculated. The sound power levels used to calculate the noise level of events at the receiver locations are summarised in Table 6-6.

Table 6-6: Maximum Sound Power Levels

Activity	Maximum Sound Power Level, dBA
Vehicle Door Closing	90
Normal Conversation	68
Maximum Truck Passby Level	95
Mobile Crane	110
Mobile Crane Shielded Position	110

The calculated maximum noise levels are presented in Table 6-7.

Table 6-7: Calculated Maximum Noise Levels

Receiver	Criteria $L_{A1, 1min}$ dBA	Calculated Noise Level $L_{A1, 1min}$, dBA				
		Vehicle Door Closing	Normal Conversation	Truck Passby	Mobile Crane	Mobile Crane (shielded)
Forrester Street (north of site)	61	55	30	53	**66**	56
Karingal Street (west of site)	58	44	18	41	**62**	46

Note: Values in bold indicate the applicable criteria are exceeded

6.3 Road Traffic Noise

Vehicle movements from the site compound to the M5 East Motorway worksite and back to the site compound again would be via the M5 East Motorway directly. Staff arriving to and departing from the site compound may travel along Kingsgrove Road north of the site, Kingsgrove Road south of the site or via the M5 East Motorway. During the worst case night time period on nights of planned closure, allowing for 40 cars for staff departing from site, and assuming one third of traffic travels on each route, the $L_{Aeq, 9hr}$ night road traffic noise contribution along Kingsgrove Road route is calculated to be 45dBA. This is 10dBA lower, i.e. well below the night time ECRTN noise criterion of 55dBA and 19dBA below the measured existing road traffic noise level of 64dBA. This relatively small volume of additional traffic during the more sensitive night time period will therefore not result in any increase in the $L_{Aeq, 9hr}$ noise level and will comply with the ECRTN recommendation not to result in any increase in noise level of more than 2dBA given that the existing noise levels already exceed the ECRTN noise criteria.

7 SITE NOISE EMISSION ASSESSMENT AND MITIGATION

The modelling results presented in this report indicate the potential for noise from site operations to exceed the noise criteria during the night time period. Noise mitigation will therefore be required to comply with the relevant noise criteria and minimise the potential noise impact to an acceptable level.

It is recommended that:

- A minimum 2.1m height fence be erected on the perimeter of the site, represented by the yellow line in Figure 7-1. The fence should be of solid construction such as lapped and capped timber, colorbond or equivalent, of at least 10kg/m^2 surface density, without any gaps or openings. This measure will have the added benefit of visual screening as well as preventing light from headlights shining into the nearby dwellings.
- Buildings should be constructed similarly to the site layout shown in Figure 2-2, with doorways preferably facing into the centre rather and away from the residences.
- At night, truck mounted crane use, if required, should be restricted to the area shielded by the site buildings (i.e the area surrounded by the buildings) and not the possible storage area at the western end of the site. If necessary, any temporarily stored equipment can be relocated to the western area during the daytime.

Figure 7-1 Proposed Perimeter Fence

Table 7-1, Table 7-2 and Table 7-3 show the predicted noise levels based on the above noise mitigation measures.

A noise contour map of showing the mitigated $L_{Aeq,\ 15min}$ noise levels when up to 40 employee vehicles arrive or depart from site is presented in Appendix B.

Scenario 3 has only been included in order to demonstrate the potential non-compliance that would occur with the fence in place, should the truck mounted crane be used in the storage area at the western end of the site instead of behind the site buildings as is recommended.

Table 7-1: Calculated Mitigated $L_{Aeq,15min}$ Noise Levels

Receiver	Criteria, $L_{Aeq,15min}$, dBA			Scenario Calculated Noise Level, dBA				
	Day	Evening	Night	1	2	3	4	5
Forrester Street (north of site)	59	59	51	47	41	**54**	45	29
Karingal Street (west of site)	56	56	48	41	34	**50**	39	21

Note: Values in bold indicate that the appropriate criterion is exceeded. Also note that Scenario 3 is presented only to demonstrate the non-compliance that would occur if the crane was used at night in the western area of the site with the 2.1m fence in place.

Table 7-2: Calculated Mitigated Amenity Period Noise Levels

Receiver	Day $L_{Aeq,\ 11hr}$, dBA		Evening $L_{Aeq,\ 4hr}$, dBA		Night $L_{Aeq,\ 9hr}$, dBA	
	Criteria	Result	Criteria	Result	Criteria	Result
Forrester Street (north of site)	60	28	48	38	37	**39**
Karingal Street (west of site)	60	21	50	32	41	33

Note: Value in bold indicates a marginal 2dBA exceedance of the night time noise criterion with a 2.1m fence in place

Table 7-3: Mitigated Maximum Noise Level

Receiver	Criteria $L_{A1,\ 1min}$, dBA	Calculated Noise Level $L_{A1,\ 1min}$, dBA				
		Vehicle Door Closing	Normal Conversation	Truck Passby	Mobile Crane	Mobile Crane (Shielded)
Forrester Street (north of site)	61	46	21	43	59	50
Karingal Street (west of site)	58	36	<20	34	55	44

A review of the mitigated noise levels with the 2.1m fence in place indicates compliance, except for a marginal 2dBA exceedance of the amenity criterion at the nearest Forrester Street residences. A 2.5m high boundary fence would be required to achieve full compliance with the amenity criterion and this non-standard height barrier would require specific structural design for the purpose. A 2dBA degree of exceedance with the 2.1m high fence will however be barely perceptible to the human ear and is considered acceptable, particularly given that the night time activities associated with the planned closures occur for a period of only 5 nights in a month.

In addition, in order to minimise the potential for disturbance and complaints from neighbouring residents resulting from night time operations, it is further recommended that the following general measures be implemented via a management plan:

- Personnel should be made aware of the sensitivity of the neighbouring community and the need to minimise noise on site, particularly at night. This may be via site induction procedure, signage and any other means.
- Vehicle engines to be turned off when not in use.
- Where feasible, reversing alarms should be replaced with broadband “quacker” type alarms. Where this is not possible, reversing should be kept to a minimum by, for example, positioning vehicles so that no reversing is necessary.
- Care should be taken when closing vehicle and building doors to prevent banging.
- Personnel on site should arrive and depart in an orderly manner and as quickly as possible without lingering in the car park.
- Doors to buildings should be closed when occupied, where possible.
- No PA equipment to be used on site.
- Personnel should gather indoors during the night rather than outside in the car park area

8 CONCLUSION

The potential noise impacts associated with the proposed development of an operational compound for M5 East Motorway maintenance at Kingsgrove Road, Kingsgrove has been assessed.

Noise mitigation measures including the erection of a minimum 2.1m solid fence around the perimeter of the compound closest to the dwellings and restricting any night time use of the truck mounted crane to the storage area shielded by the site buildings are recommended to comply with the relevant noise guidelines and minimise any adverse impact on the local community.

Noise associated with the construction of the buildings and drainage trenches is expected to be short term and to comply with the construction noise criteria based on the relevant construction noise guidelines.

References

DECCW, (1999), “Environmental Criteria for Road Traffic Noise”.

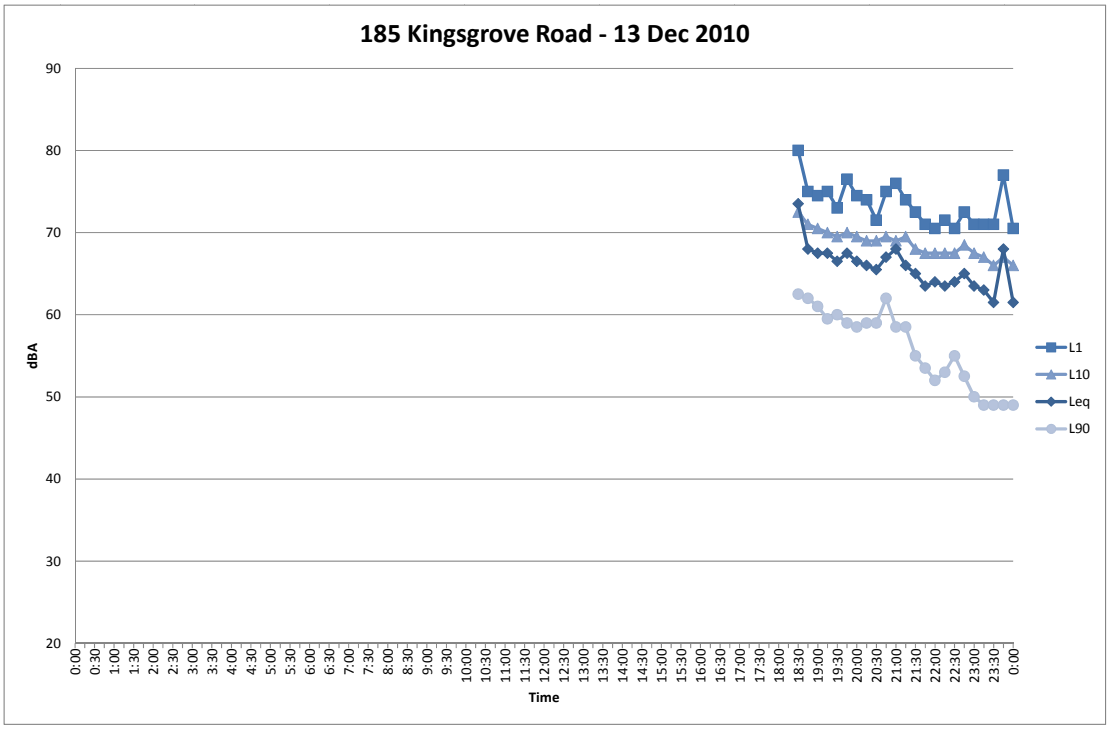
DECCW, (2000), “Industrial Noise Policy”.

RTA, (2000), “Environmental Noise Management Manual”.

DECCW, (2009), “Interim Construction Noise Guideline”.

APPENDIX A

Ambient Noise Monitoring Results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dBA
Time
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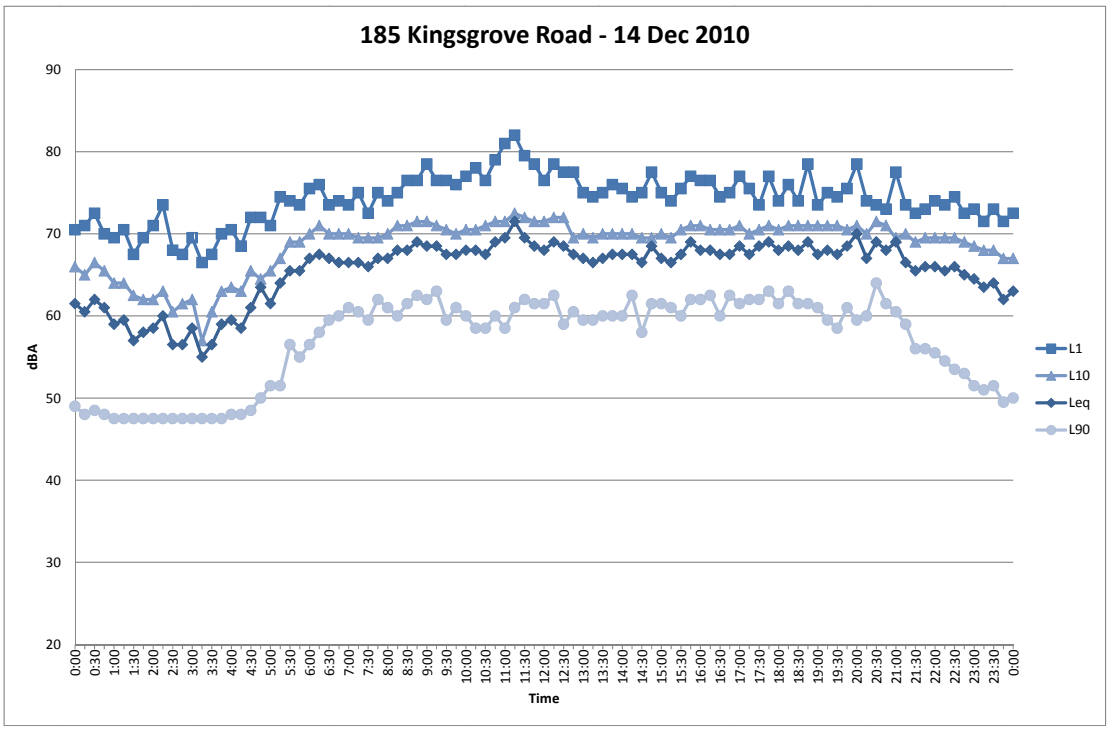
Leq
L90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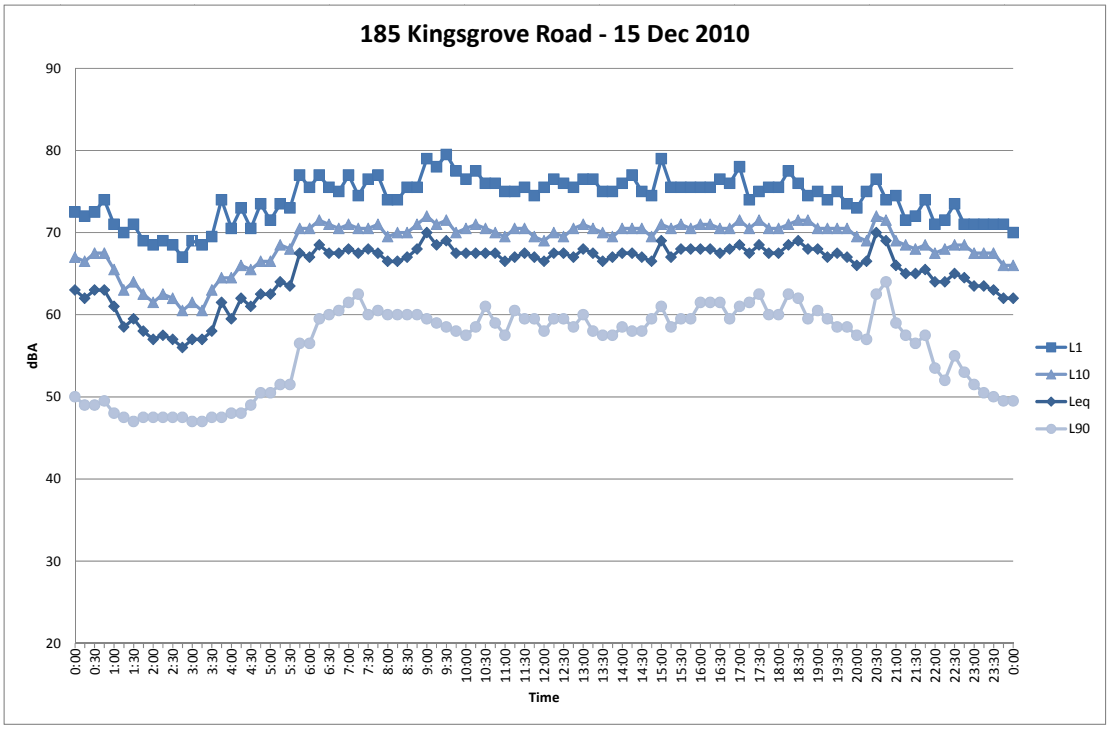
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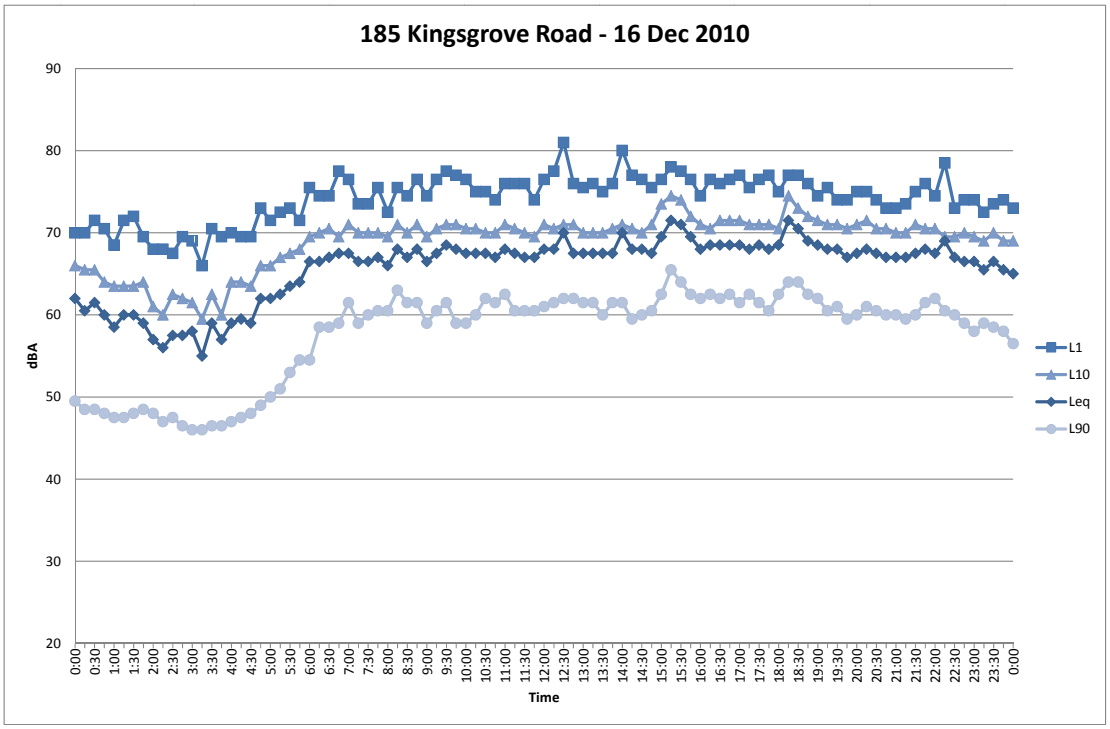
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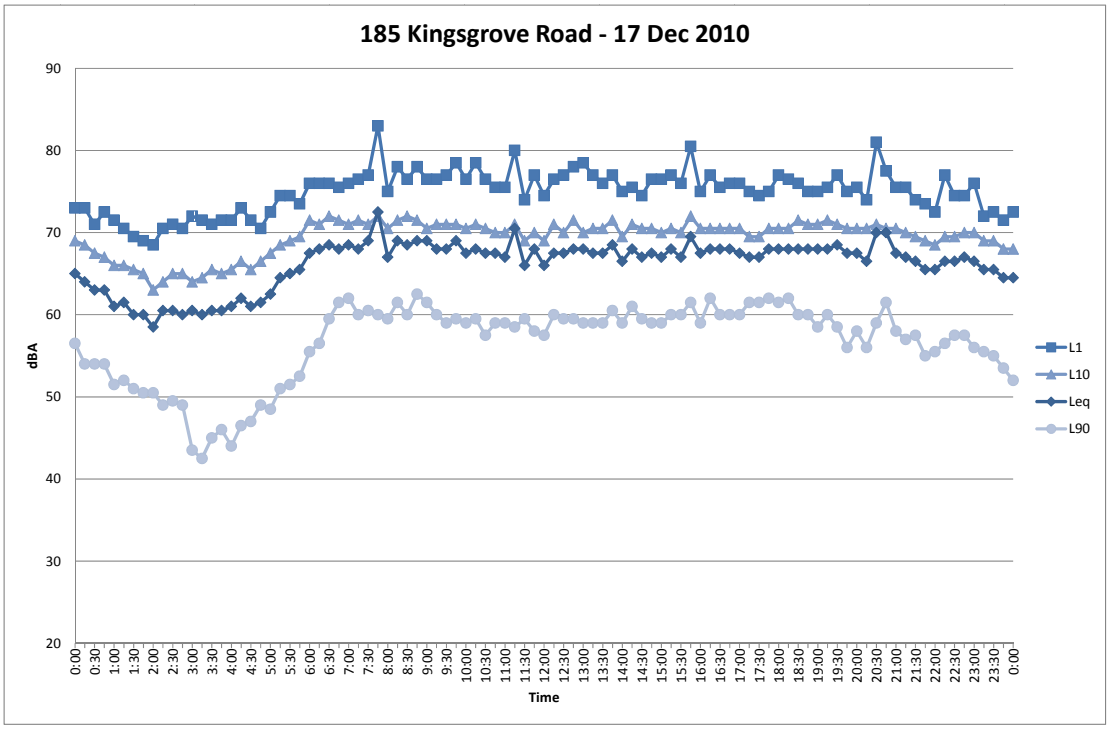
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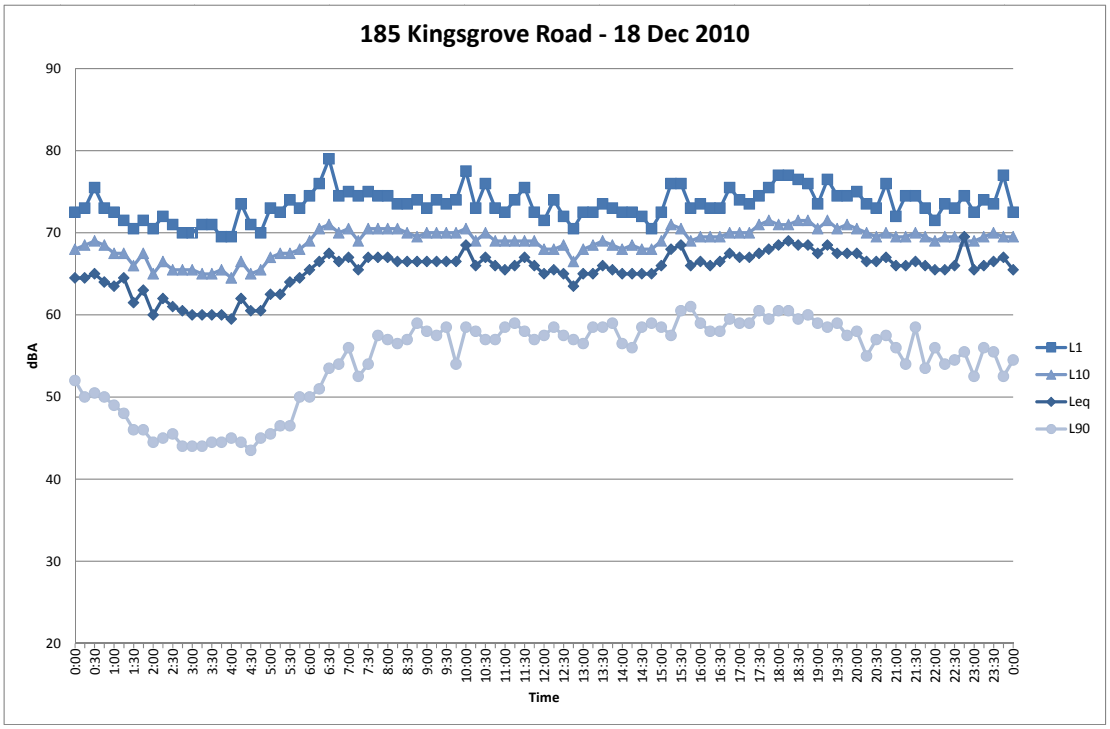
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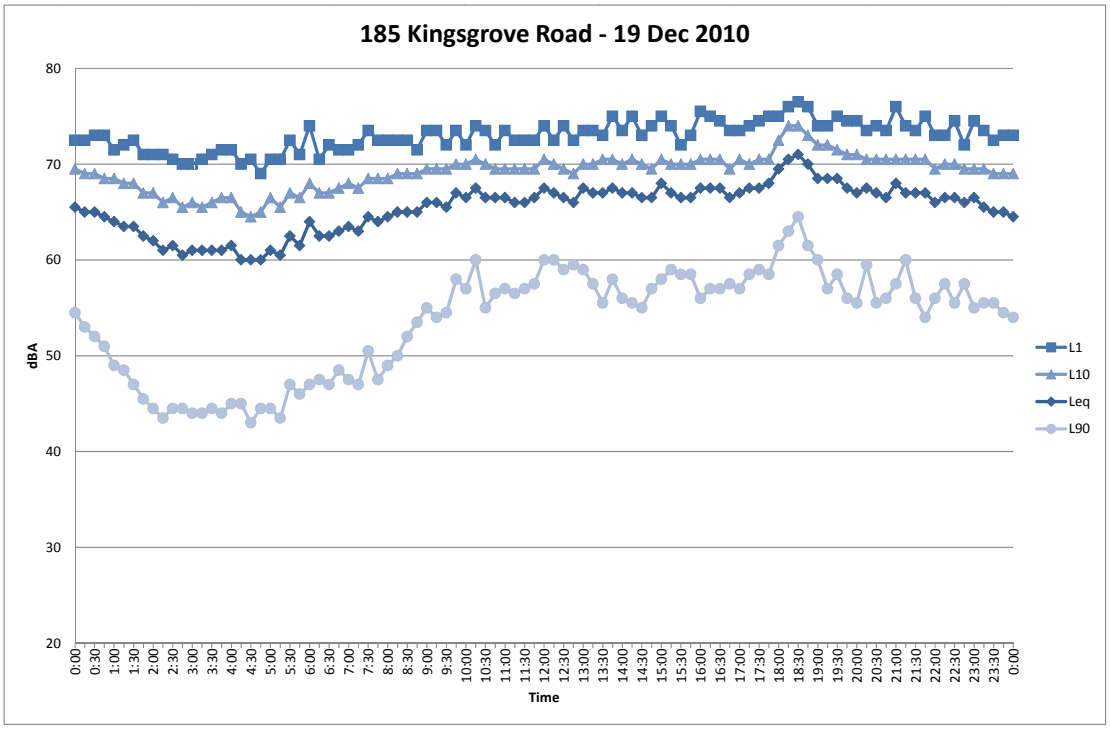
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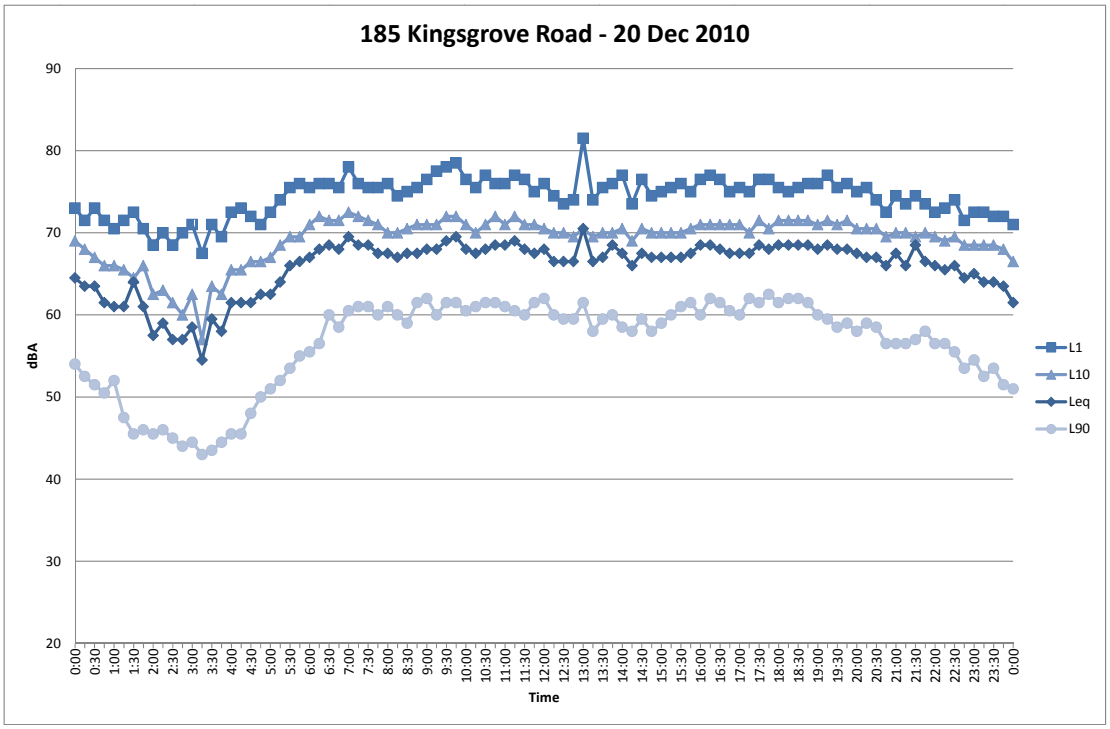
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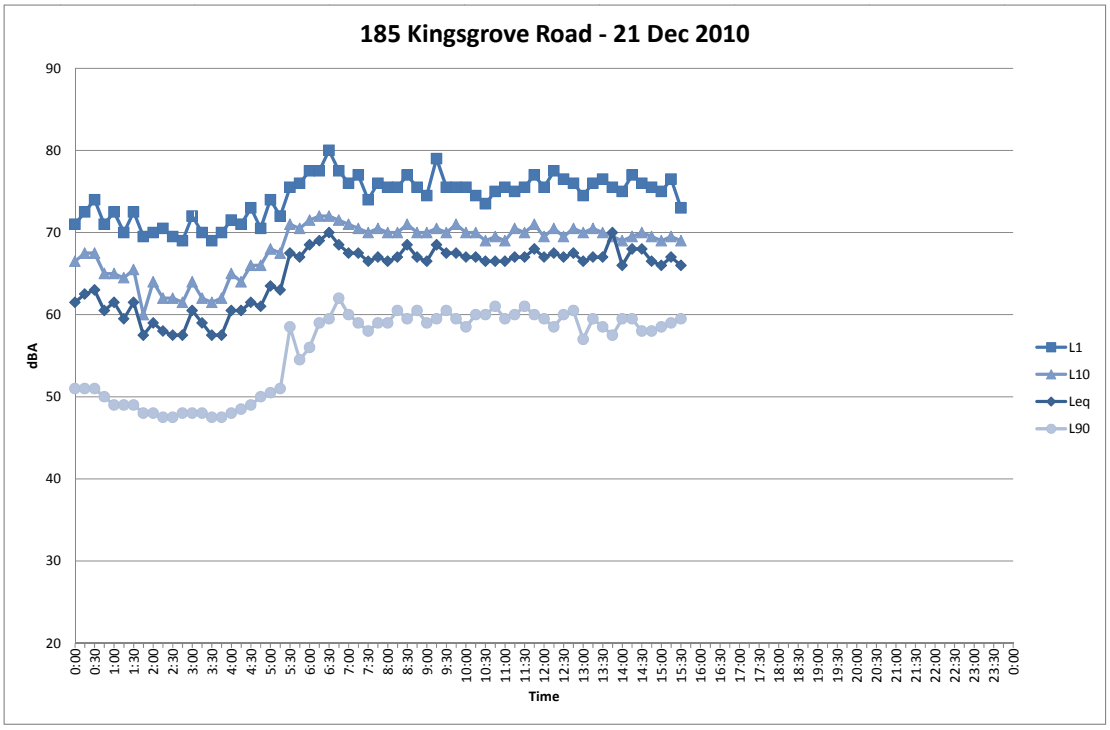
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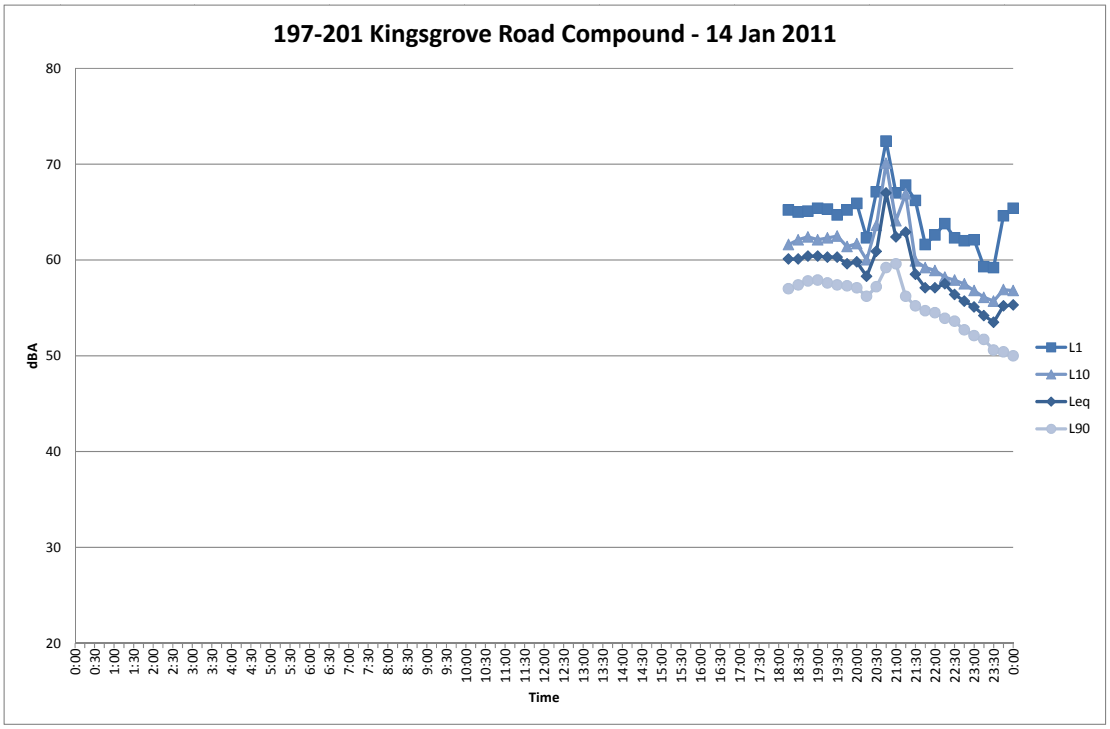
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Leq
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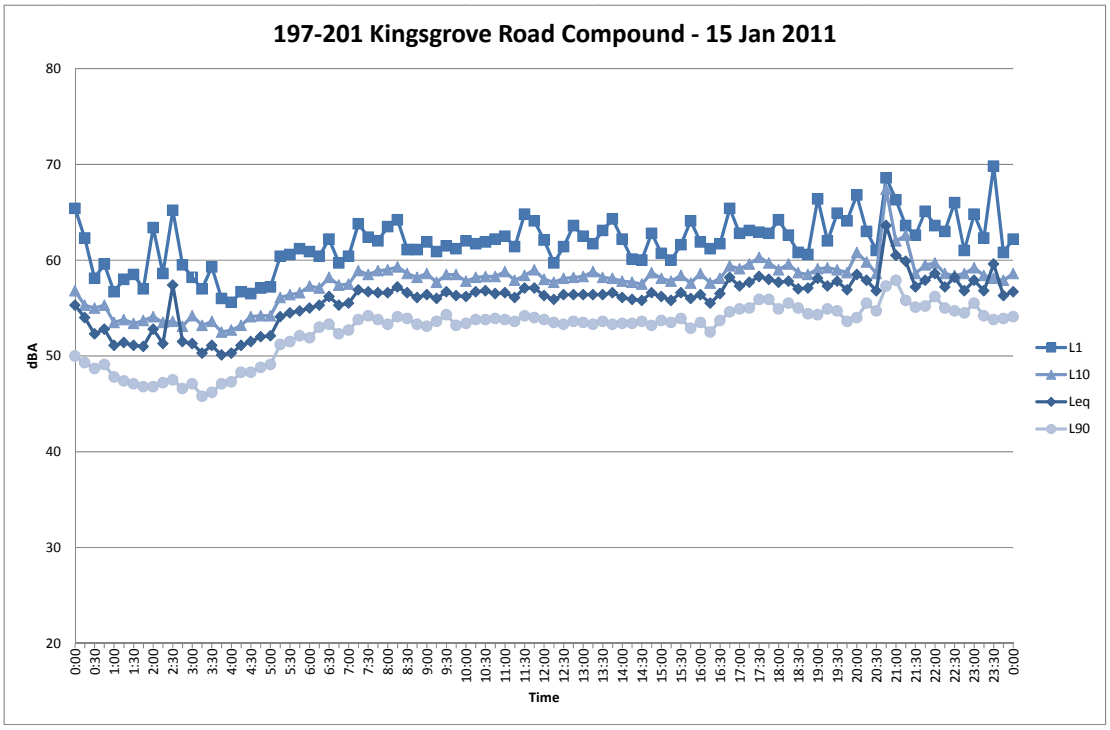
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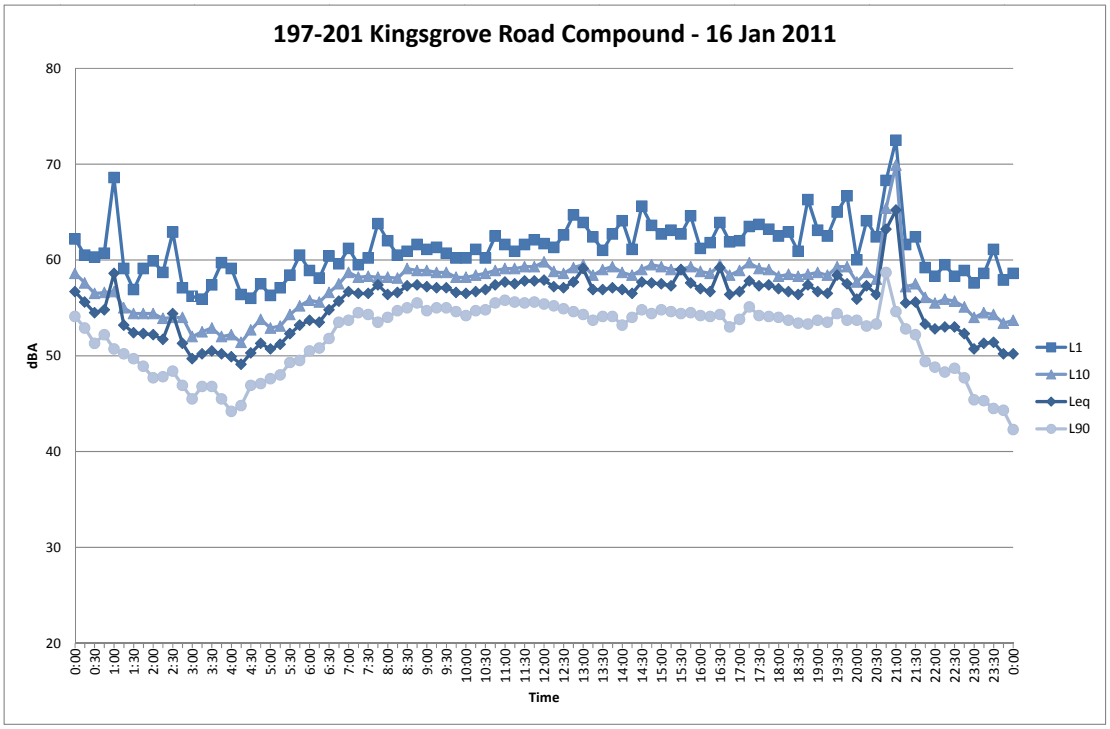
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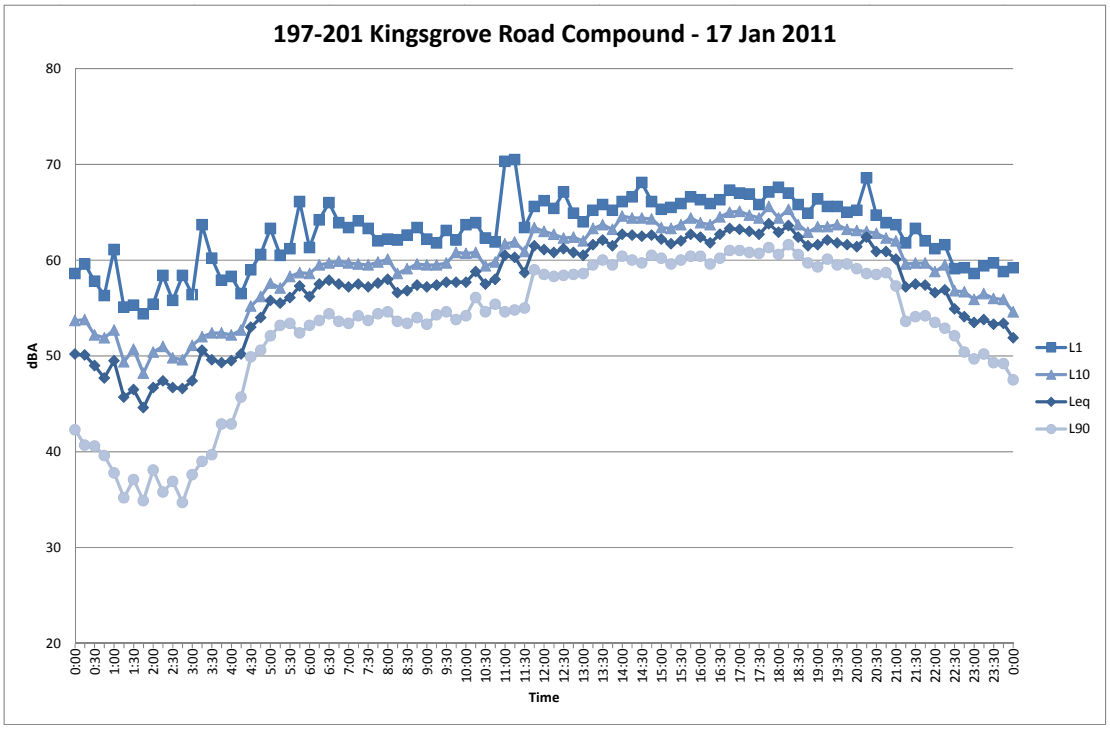
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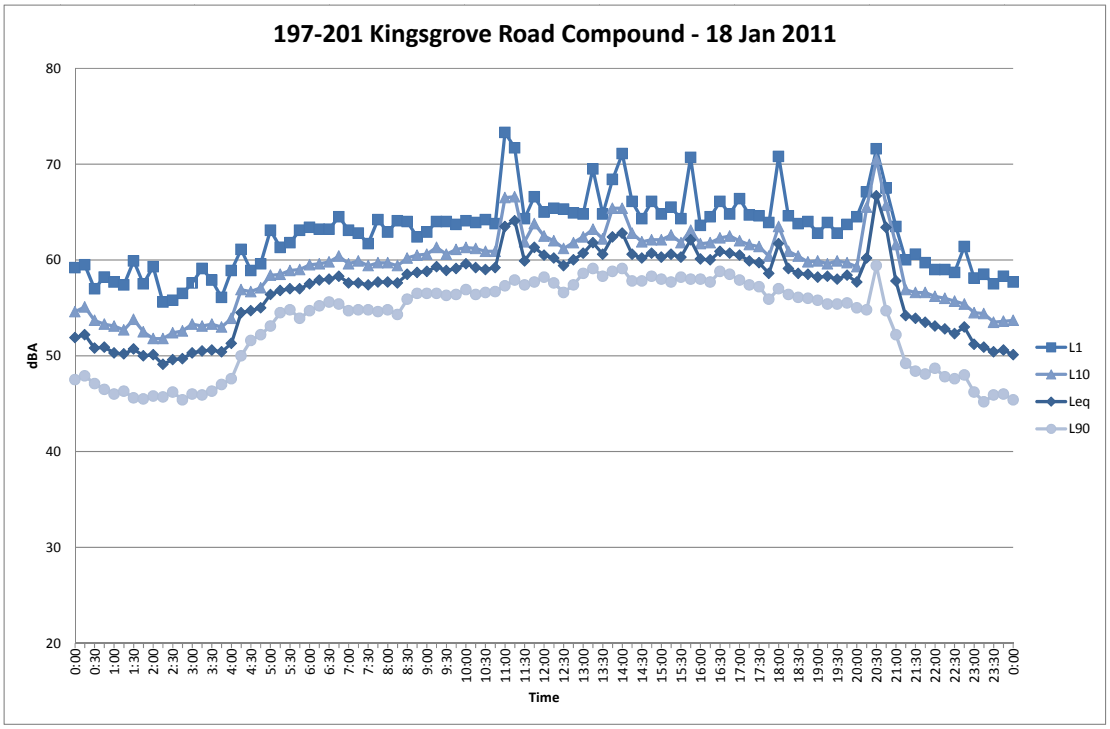
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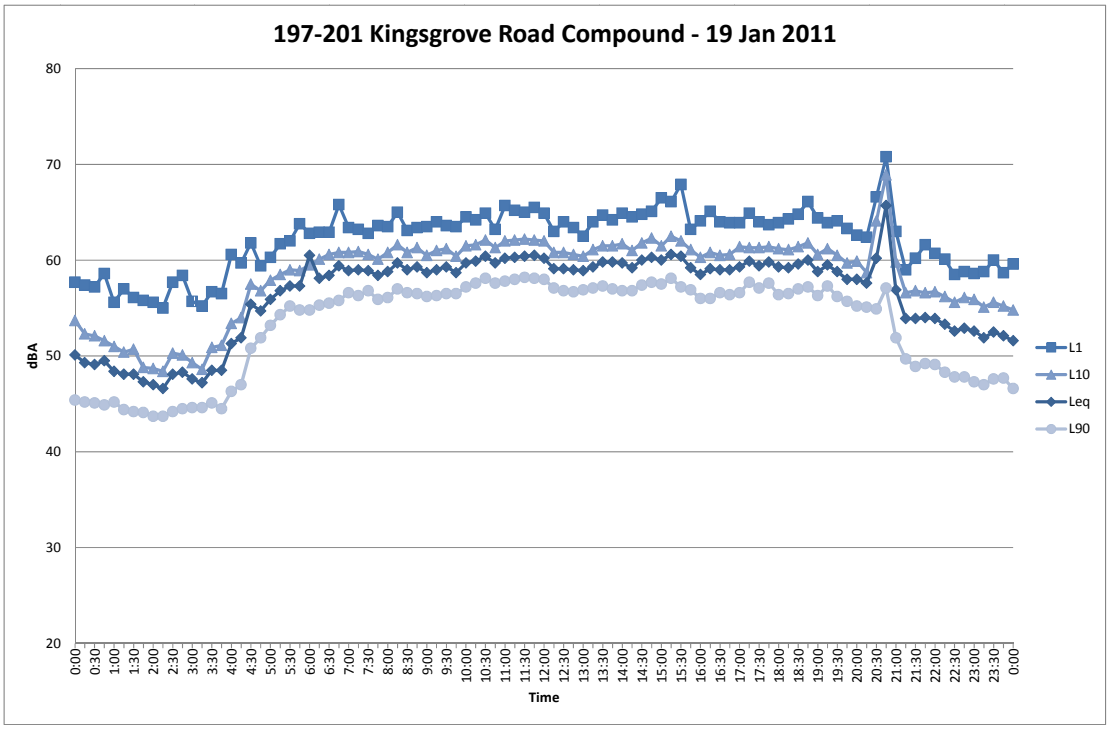
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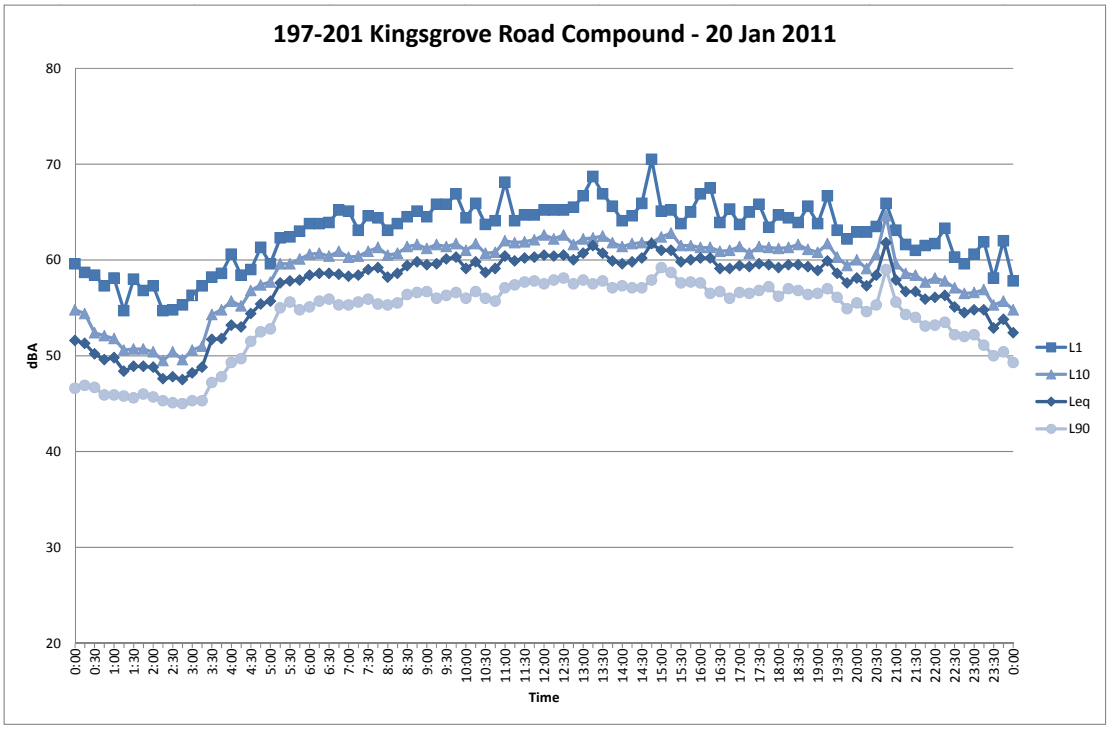
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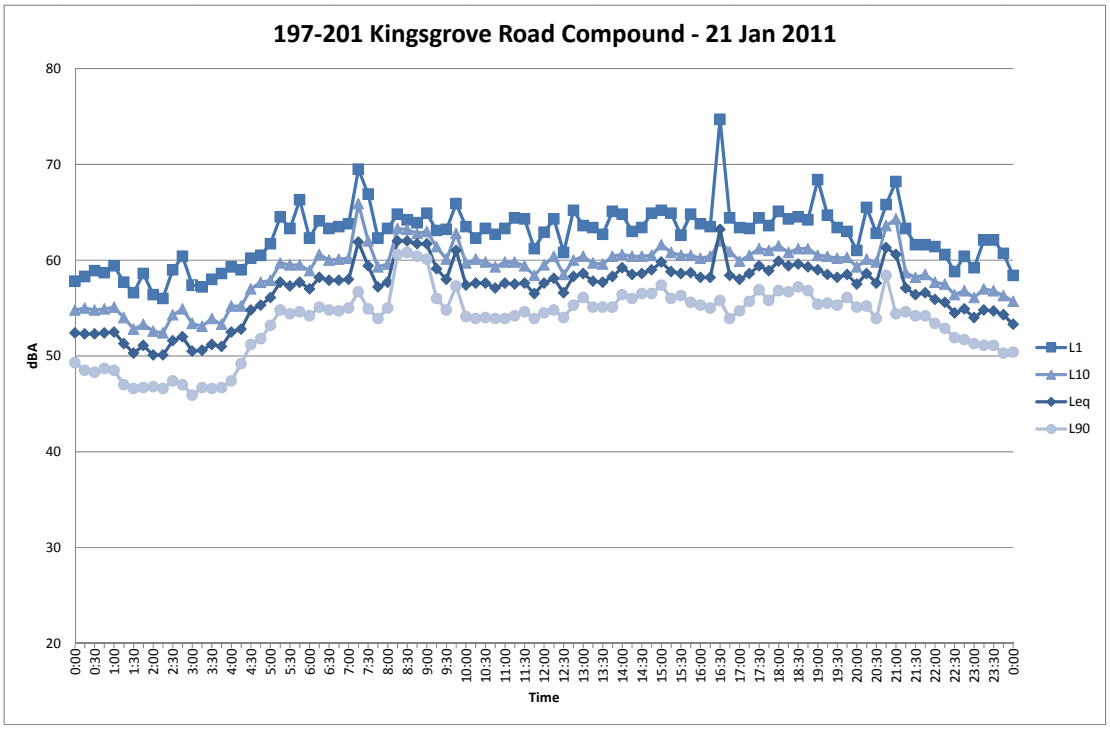
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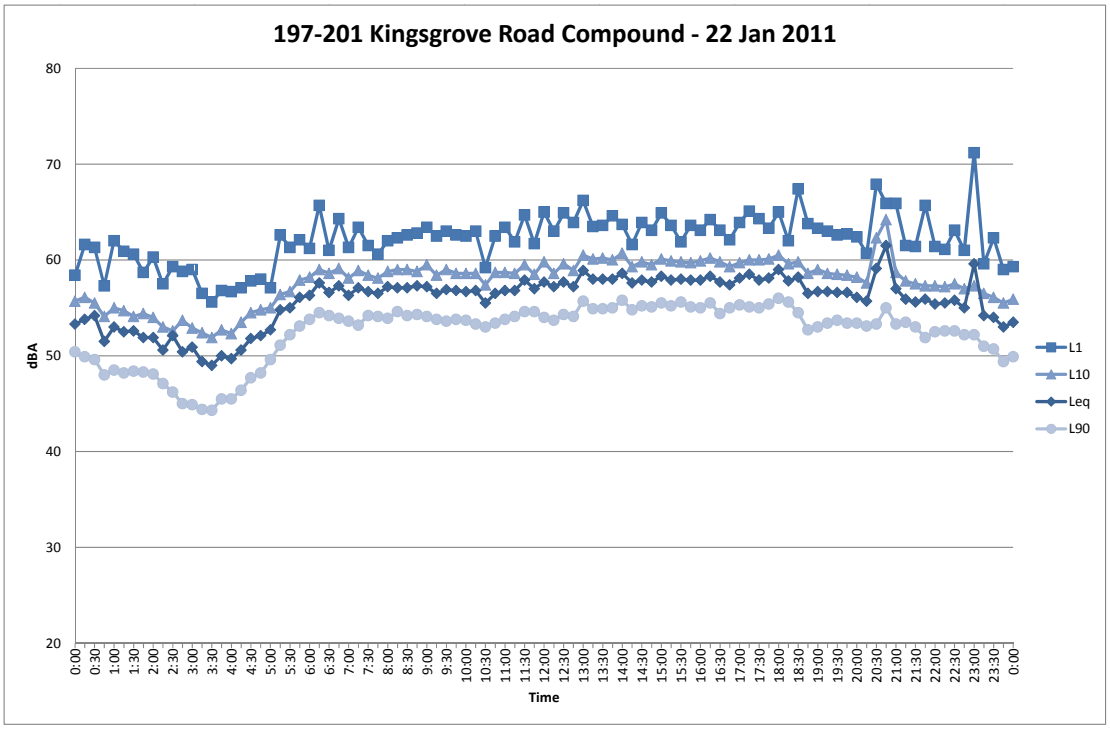
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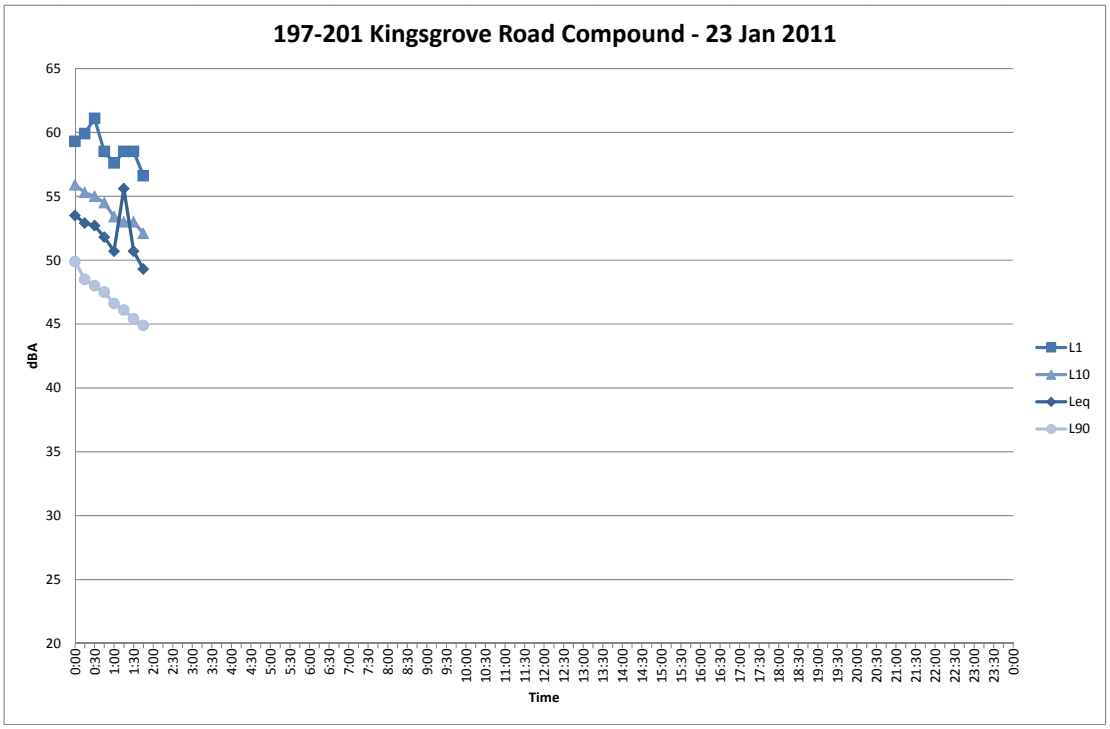
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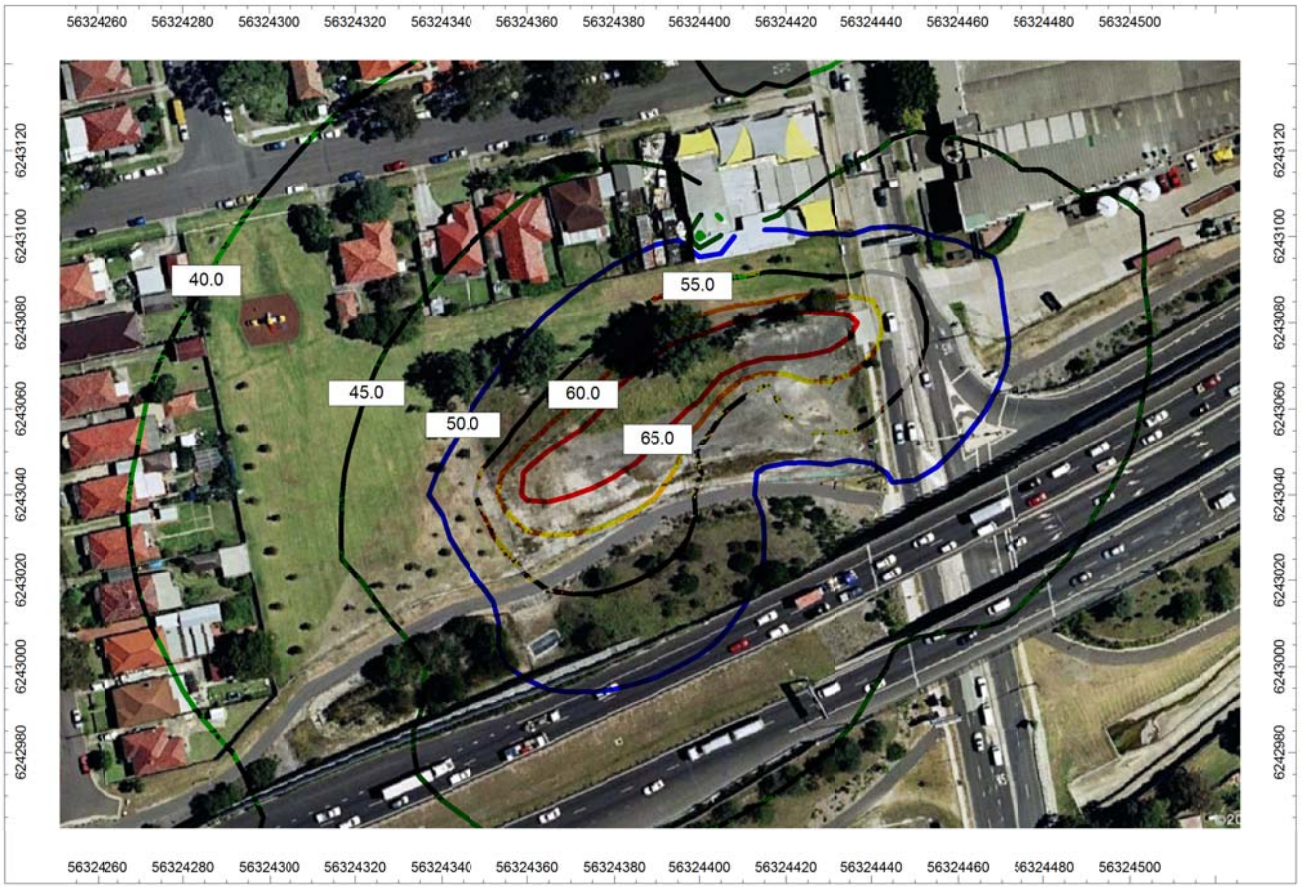
APPENDIX B

Noise Contour Map – Staff Arrival and Departure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Appendix D
Fact sheet and letter to residents

To the **householder**

Transport Roads & Traffic Authority

NSW GOVERNMENT

FEBRUARY 2011

2 February, 2011

Dear resident

Re: Proposed permanent M5 East Motorway compound, 197-201 Kingsgrove Road

The Roads and Traffic Authority (RTA) is currently seeking planning approval to establish a permanent compound at 197-201 Kingsgrove Road, Kingsgrove (corner of Kingsgrove Road and the M5 East Motorway).

The proposed site is owned by the RTA and would be used to maintain the M5 East Motorway and tunnel.

The compound would include:

- A single story site office
- Marshalling area for maintenance trucks and cranes
- Material and tool storage
- A workshop
- Two driveways off Kingsgrove Road, one for entry, one for exit.

The compound would operate day and night. Night work at the compound would be scheduled for a minimum of five nights a month during motorway maintenance closures. Emergency motorway maintenance may require additional night work.

It is anticipated that the noisiest activities, such as truck marshalling would occur in the south eastern corner of the site, closest to the motorway.

If you have any questions or would like to give feedback about the proposed compound please call RTA Project Engineer, Hassan Reslan on (02) 8837 0913.

Yours sincerely

Peter Cook
Manager, M5 East Operations
Roads and Traffic Authority

SPEEDING KILLS ROADWORKERS TOO.
Slow down at worksites.

Fact sheet

Transport Roads & Traffic Authority

NSW GOVERNMENT

JANUARY 2011

Proposed permanent compound, 197-201 Kingsgrove Road

The RTA is currently seeking planning approval to establish a permanent compound site at 197-201 Kingsgrove Road, Kingsgrove (corner of Kingsgrove Road and the M5 East Motorway).

What would this compound be used for?

The proposed compound would be used for maintenance of the M5 East Motorway and tunnel.
The compound would include:

- A single story site office
- Workshop
- Crane and truck marshalling area
- Materials and tool storage
- Two driveways off Kingsgrove Road, one for exit, one for entry.

When would the compound be used?

The compound would be used day and night whenever the motorway and tunnel require maintenance. The motorway is closed for maintenance five nights a month. On these nights it is anticipated the site will be busiest at around 8pm as vehicles are marshalled to begin work and again at 5am as they return from duty.

Why is this site proposed?

197-201 Kingsgrove Road is proposed for use as a compound because of its close proximity to the motorway. This compound would allow for a quick response to emergencies such as breakdowns or incidents in the tunnel.

The proposed site is owned by the RTA and no additional land would be acquired to establish the compound.

Would the site have any impacts on residents and businesses?

Some night work at the proposed compound would be noisy. To minimise impacts, noisy activities such as marshalling trucks and cranes would occur in the south eastern corner of the site, furthest from residences.

When would the compound site be in operation?

Set up of the compound would only go ahead if the RTA's proposal is approved by the Department of Planning. The RTA will seek approval from the Minister for Planning in the coming weeks. If approved, it is expected that a decision will be provided from the Department of Planning in the first half of 2011. Residents and business owners will be advised of the decision.

How can I find out further information?

For further information or to give feedback on the proposal, please contact RTA Project Engineer, Hassan Reslan on (02) 8837 0913.

SPEEDING KILLS ROADWORKERS TOO.
Slow down at worksites.

Transport
Roads & Traffic
Authority

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www.rta.nsw.gov.au

RTA/Pub. 11.185
ISBN 978-1-921899-32-4