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Prepared for: Goodman Property Services Pty Ltd

17 O'RIORDAN STREET GREEN SQUARE

PART A

ASSESSMENT OF IMPACTS ON THE PROPOSED DEVELOPMENT FROM ENVIRONMENTAL NOISE AND VIBRATION

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1. INTRODUCTION

This report presents our assessment of the potential impact of traffic, aircraft and rail noise and vibration on the acoustic amenity of the proposed commercial development located at 17 O'Riordan Street, Green Square.

The assessment has been based on vibration levels generated by train movements within the tunnel of the Airport and East Hills Railway which runs underground next to the proposed site.

Vibration results have been used to predict internal noise and vibration levels within the future development. If necessary, appropriate indicative noise/vibration attenuation treatments will be recommended to prevent regenerated noise levels and tactile vibration from exceeding the specified levels.

External noise intrusion will be assessed within the development in accordance with the relevant Australian Standards requirements.

As the building will have a concrete roof construction, the main noise path requiring assessment will be through the glazing and doors. The glazing assemblies and external doors required to exclude traffic and aircraft noise are recommended based on noise levels measured to comply with the internal noise objectives recommended in the Australian Standards requirements.

This assessment is based on drawings provided by Goodman Property Services Pty Ltd with drawing numbers: SD-003 to SD-008 dated 6 June 2008.

2. SITE DESCRIPTION

The proposed development is located at the 17 O'Riordan Street bounded by O'Riordan Street to the East which is a four lane road carrying medium to high traffic volumes distributed throughout the day. Traffic noise would potentially affect the Eastern building façades. The site is close to the ANEF 20 contour for Sydney Airport and is therefore affected by aircraft noise.

With the Airport and East Hill rail corridor located immediately north western next to the site, the potential train vibration source is train passbys within the tunnel of the Airport and East Hill with 2 tracks located under the proposed site.

Detailed of the project site and measurement locations are presented in Figure 1.

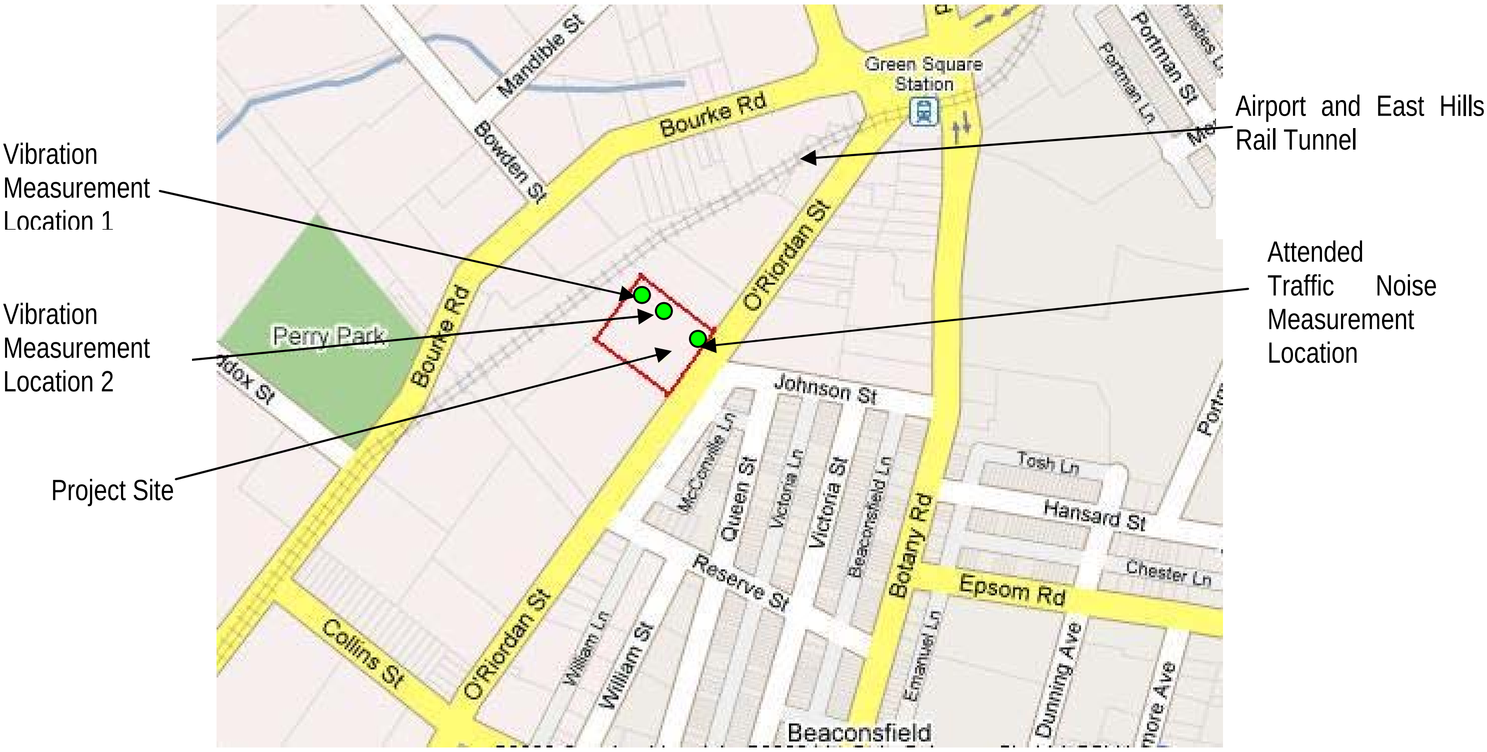


Figure 1 Site Map

3. RAILWAY VIBERATION ASSESSMENT

3.1 RAILWAY VIBRATION OBJECTIVES

Trains induce ground born vibration that is transmitted through the subsoil. This vibration can be perceptible close to railways, both as tactile vibration and as structure borne noise.

3.1.1 Tactile Vibration – Human Response

The vibration levels shall not exceed those given in AS 2670.2-1990. Australian Standard 2670 Part 1 "Evaluation of Human Exposure to Vibration and Shock in Buildings (1 to 80Hz)" recommends maximum vibration acceleration levels in buildings so as to ensure a low probability of disturbance to the occupants. The standard recommends that vibration spectra be assessed against criterion curves. A number of criterion curves are recommended, depending on the sensitivity of the occupancy to vibrations. The allowable level of vibration may be increased above the base vibration curve given in the standard (for the various occupancies) by the multiplication factors given in Table 1. The Environmental Protection Authority in their Noise Control Manual adopt the same criteria.

Table 1 - Range Of Multiplying Factors To Gauge Satisfactory Magnitudes Of Building Vibration With Respect To Human Response

Place	Time	Continuous or Intermittent vibration	Transient vibration excitation with several occurrences per day
Critical working areas e.g. Hospital operating theatres	Day Night	1	1
Residential	Day Night	2 to 4 1.4	30 – 90 1.4 to 20
Retail Shop/Offices	Day Night	4	60 to 128
Workshops	Day Night	8	90 to 128

The Australian Standard classifies building vibration as continuous/intermittent or transient in nature, and relates vibration conditions, which may cause adverse human response to annoyance curves. These curves are derived using multiplication factors. The multiplication factor used is dependant on the sensitivity of the occupancy to vibration (as indicated in the table).

For this project the rail tunnel vibration is regarded as intermittent in nature. Within commercial offices the most sensitive period is during the day or evening when it is recommended that vibration levels not exceed curve 4 which is the baseline curve multiplied by a factor of 4.

3.1.2 Structure Borne Noise

Vibration generated by train passbys within the train line next to the proposed development will potentially generate structure born vibration which will be radiated of internal building elements such as walls, floors and ceiling as audible noise. Internal noise levels associated with structure born noise generated from train passbys is required to comply with the following noise level objectives.

There are no documented rail structure borne noise level objectives for commercial buildings. For this reason, the rail structure borne noise level objectives will be based on the noise level recommended by Rail Infrastructure Corporation for residential buildings. The residential requirement is that the resulting structure borne noise level should not exceed 40 dB(A) L_{max}. Assuming this has been applied to limit loss of amenity in residential bedrooms, the corresponding difference in noise levels recommended in AS 2021 for these spaces will be used to adjust the bedroom level. AS 2021 recommends a noise level of 50 dB(A) L_{max} in sleeping areas, 50 dB(A) in laboratory areas, 65 dB(A) in generally office areas and 75 dB(A) in retail areas. Extrapolating this difference to railway induced noise gives a requirement of 40 dB(A) in laboratory areas, 55 dB(A) in office areas and 65 dB(A) in retail areas. At this level, structure radiated noise levels may be audible but would not be excessively intrusive.

Train vibration measurements conducted as part this assessment will be used to calculate internal noise levels generated from structure born vibration. Vibration measurements have been conducted at a number of locations as detailed in the sections below.

3.2 RAIL VIBRATION MEASUREMENTS

3.2.1 Vibration Measurements

Measurement Positions

Vibration from train passbys was measured at the locations shown in Figure 1. Loction1 was 15m from the site rear boundary and location 2 was 30m from the boundary.

Time of Measurements

The manned measurements were carried out on 24th April 2008.

Measurement Equipment

A Svan 912 AE vibration Analyser was used for the vibration measurements. The analyser was set to fast response and calibrated before and after the measurements using a SVANTEK SV03A calibrator. No significant drift was noted.

3.2.2 Tactile Vibration Levels

Measured tactile vibration levels were all well below the levels recommended in AS 2670.2 by at least 10 dB, and are also well below the criteria curve for critical situations such as hospitals, etc. The vibration levels measured were barely above ambient vibration levels (i.e. excluding the railway) even at 15m which is closer to the railway. Therefore, even allowing for any amplification of vibration levels at certain frequencies for the building on a suspended slab, treatment will not be required to comply with the tactile vibration criteria.

It is noted that a potential tenant is proposing to install vibration sensitive equipment within the building. We have not been provided with vibration limits for this equipment, however, because the levels of vibration induced by the railway are very low if these would effect the equipment then vibrations from traffic, people walking next to the equipment, etc would also affect the equipment. If the equipment is that sensitive to vibration it should be separately vibration isolated, notwithstanding any vibration produced by the railway.

3.2.3 Structure Born Noise Levels

Internal noise levels as a result of structure born noise have been calculated at a number of positions within the proposed development. Internal noise levels within the future development have been calculated based on the measured vibration levels.

These are presented in Table 2.

Table 2 – Calculated Structure Born Noise Levels

Position	Level	Calculated/Measured Noise Level dB(A) L_{max}
Location 1 (15m from north-western boundary)	Ground	39
	Level 1	35
Location 2 (30m from north-western boundary)	Ground	40
	Level 1	37

The predicted regenerated noise levels are well below recommended levels and are therefore acceptable.

3.3 Discussion and Recommendations

The results of the investigation of vibration generated from train passbys within the Airport and East Hills Tunnel revealed that:

- Tactile vibration levels were only barely above ambient levels and were clearly within acceptable vibration limits for normal office and laboratory tenancies. The vibration levels experienced would not affect vibration sensitive laboratory equipment, unless this equipment was ultra-sensitive to vibration in which case it would need its own vibration isolation treatment regardless of railway vibration.

- The internal regenerated noise levels will comply with recommended noise level recommendations, and no additional vibration isolation treatment needed.

4. TRAFFIC NOISE ASSESSMENT

Internal noise levels will primarily be as a result of noise transfer through the roof, windows and doors, as these are relatively light building elements that offer less resistance to the transmission of sound.

Noise transfer through the masonry and concrete elements will not be significant and need not be considered further.

The predicted noise levels through the roof, windows and doors are discussed below. The predicted noise levels have been based on the expected level and spectral characteristics of the external noise, the area of building elements exposed to aircraft noise, the absorption characteristics of the rooms and the noise reduction performance of the building elements.

4.1 CRITERIA

Assessment of traffic noise shall be conducted in accordance with Australian Standards AS2107-2000 "Recommended Design Sound Levels and Reverberation Times for Building Interiors" and AS3671 "Acoustics – Road Traffic Noise Intrusion – Building Siting and Construction". The standard recommends maximum design sound levels for different areas of occupancy in the commercial development. These are given in Table 3 below.

The noise criteria are expressed in terms of the repeatable maximum daytime L_{eq} (1 hour) parameter between 7 am and 10pm for traffic noise in all areas.

Table 3 - Traffic Noise Criteria for All Spaces Inside Commercial Buildings

SPACE/ACTIVITY TYPE	NOISE LEVEL dB(A) L_{eq}
General Office	45
Lab	50
Warehouse	60

4.2 TRAFFIC NOISE MEASUREMENTS

Measurements were performed generally in accordance with the Australian Standard AS 1055 - Description and measurement of environmental noise - General Procedures.

4.3 MEASUREMENT POSITIONS

Manned measurements were taken during December 2007. The measurement location was 3m back from the kerb facing O'Riordan Street. Unattended measurements over a number of days were also obtained using a noise logger.

4.4 TRAFFIC NOISE DESCRIPTORS

Traffic noise constantly varies in level, due to fluctuations in traffic speed, vehicle types, road conditions and traffic densities. Accordingly, it is not possible to accurately determine prevailing traffic noise conditions by measuring a single, instantaneous noise level.

To accurately determine the effects of traffic noise a 15-20 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters. These parameters are used to measure how much annoyance would be caused by a particular noise source.

In the case of environmental noise three principle measurement parameters are used, namely L_{10}, L_{90} and L_{eq}.

The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement intervals.

The L_{10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the L_{90} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the 15 minute period. L_{eq} is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of traffic noise.

Current practice favours the L_{eq} parameter as a means of measuring traffic noise, whereas the L_{10} parameter has been used in the past and is still incorporated in some codes. For the reasons outlined above, the L_{90} parameter is not used to assess traffic noise intrusion.

4.5 MEASURED NOISE LEVELS

Table 4 lists the measured noise levels that occurred at the measurement location. These noise levels will be used to predict the resultant internal noise levels.

Table 4 - Measured Traffic Noise Levels

MEASUREMENT LOCATION	DAY TIME NOISE LEVEL dB(A) $L_{eq\ (1\ hour)}$
O'Riordan St @ 3m	74

5. AIRCRAFT NOISE OBJECTIVES AND ASSESSMENT

5.1 SITE EVALUATION OF AIRCRAFT NOISE

The aircraft noise intrusion into the proposed development is assessed in accordance with AS 2021-2000 "Aircraft Noise Intrusion - Building Siting and Construction".

The standard sets criteria for allowable levels of aircraft noise exposure depending on the proposed land use for the site being assessed.

The acceptability of a site in terms of aircraft noise exposure is assessed using the Australian Noise Exposure Forecast System (ANEF). Three basic parameters influence perception of aircraft noise: the frequency of aircraft movements overhead, the noise level and duration of individual aircraft movements, and the time of the day in which they occur. ANEF was developed to provide a rating system that reflects actual human response to these factors so that the noise exposure of a particular location can be readily assessed.

The proposed site is located near the 20 contour, based on the 2023/24 ANEF contour map as presented in Appendix 3. AS2021 allows industrial development in any ANEF zone. Not withstanding this, the proposed development must be assessed to ensure that internal noise levels are limited to those recommended in AS2021.

5.2 INTERNAL AIRCRAFT NOISE LEVELS

AS2021 states that a full evaluation of internal noise levels should be carried out for locations with an aircraft noise exposure close to or exceeding ANEF 20. This full evaluation requires an examination of likely levels of internal noise from aircraft flyovers.

AS2021 stipulates the internal noise levels listed in Table 5 for commercial/industrial buildings. These levels will be used to assess aircraft noise intrusion into the development.

Table 5 - Aircraft Noise Levels inside Commercial/Industrial Buildings

ACTIVITY	INDOOR DESIGN SOUND LEVEL FROM AIRCRAFT FLYOVER, dB(A)
Meeting room	55 dB(A)
General Offices	65 dB(A)
Laboratories	65 dB(A)
Warehouse	85 dB(A)

5.3 EXTERNAL AIRCRAFT NOISE LEVELS

Aircraft noise levels at the site were determined using AS 2021. The Standard gives aircraft noise levels for aircraft landing and taking off for locations near airports. The location of the runways was obtained from Sydney Airport 2023/24 ANEF map.

Based on the distance from the site to the runways, AS 2021 predicts that the loudest typical aircraft movement will be from 767 aircraft taking off from the third runway. The noise level at the site from 767 aircraft, as indicated by the standard, is 72dB(A). This noise level will be used to predict the resultant internal noise levels.

6. COMPLYING CONSTRUCTIONS

The measurements and analysis carried out indicate that the only environmental noise and vibration sources requiring treatment are traffic noise and aircraft noise.

Calculations of traffic and aircraft sources transmission into the proposed buildings were performed taking into account the orientation of windows, barrier effects (where applicable), the total area of glazing, facade transmission loss and room sound absorption characteristics. In this way the likely interior noise levels can be predicted. It's assumed that the meeting rooms and administration areas will be carpet floor finish, hard floor for remaining areas.

It is recommended that only window systems which have test results indicating compliance with the required ratings obtained in a certified laboratory be used where windows with acoustic seals have been recommended.

6.1 GLAZING

The complying glazing/facade assemblies are indicated in Table 6. In all cases, the selected glazing type reduces internal noise levels to within the nominated criterion for the various space types. The recommended glazing has been designed to control traffic and aircraft noise intrusion.

The glazing thicknesses recommended are those needed to satisfy acoustic requirements and do not take into account other requirements such as structural, safety or other considerations. These additional considerations may require the glazing thickness to be increased beyond the acoustic requirement.

All windows and doors require acoustic seals. Acoustics seals shall be equal to Schlegel Q-lon seals. In addition to meeting the minimum glazing thickness requirements given, the design of the window mullions, perimeter seals and the installation of the windows/doors in the building openings shall not reduce the STC rating of the glazing assembly below the values nominated in Table 7 Note that mohair type seals will not be acceptable for the windows requiring acoustic seals.

Table 6 – Glazing Requirements

Facade	Location	Glazing Requirement	Acoustic Seals
North	Lab	6mm Float	Yes
	Administration	10mm Float	Yes
	Meeting	10mm Float	Yes
South	Lab	6mm Float	Yes
	Administration	10mm Float	Yes
	Meeting	10mm Float	Yes
East	Administration	12.38mm Laminated	Yes
	Meeting	12.38mm Laminated	Yes
West	Lab	6mm Float	Yes

Table 7 - Minimum STC of Glazing

Glazing Assembly	Acoustic Seals	Minimum STC of Installed Window
6mm Float	Yes	29
10mm Float	Yes	33
12.38mm Laminated	Yes	37

6.2 ROOF/ CEILING CONSTRUCTIONS

The proposed concrete roof construction will not require additional acoustic treatment.

6.3 EXTERNAL WALLS CONSTRUCTION

The glass element of the external walls shall be designed to meet the indicated thicknesses in Table 6 glazing requirements. Any external wall element constructed of concrete or masonry will not require further acoustic treatment save for seals to doors and windows where indicated.

6.4 MECHANICAL VENTILATION

As internal noise levels from aircraft and traffic movements cannot be achieved with windows open it is required that an alternative outside air supply system or air conditioning be installed in accordance with AS 1668.2 requirements. The mechanical ventilation system that is installed should be acoustically designed such that the acoustic performance of the recommended constructions are not reduced by any duct or pipe penetrating the wall/ceiling/roof. Noise emitted to the property boundaries by any ventilation system shall comply with Australia Standard requirements.

7. CONCLUSION

This report provides the results of an assessment of traffic, rail and aircraft noise intrusion into the proposed Commercial development at 17 O'Riordan Street Green Square.

Traffic noise and vibration levels were measured and the results used to determine treatments required for compliance with relevant Australian Standards requirements for internal noise and vibration levels.

Provided the recommendations documented in Section 6 of this report are implemented noise and vibration levels will comply with the criteria nominated in this report.

Vibration measurements conducted on site indicate that vibration attenuation measures are not required in order to:

- Ground vibration levels at the site were measured to be only barely above ambient levels. Cosequently, the vibration levels in the completed building would be clearly within acceptable vibration limits for normal office and laboratory tenancies.

- Comply with project requirements for reradiated noise levels within the future building.

We trust that this information is satisfactory. Please contact us should you have any further queries.

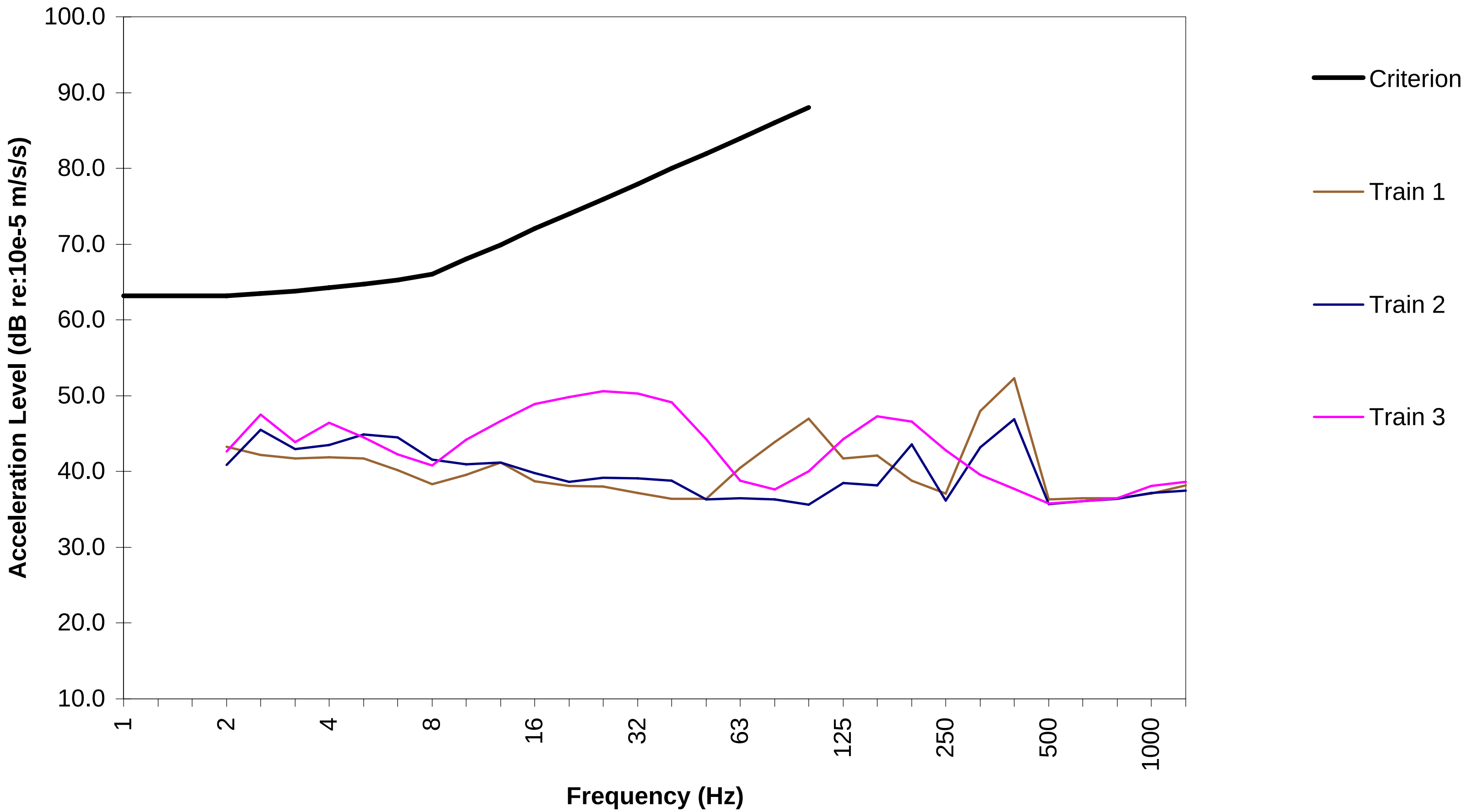
Report prepared by

ACOUSTIC LOGIC CONSULTANCY PTY LTD
Judy Zhang

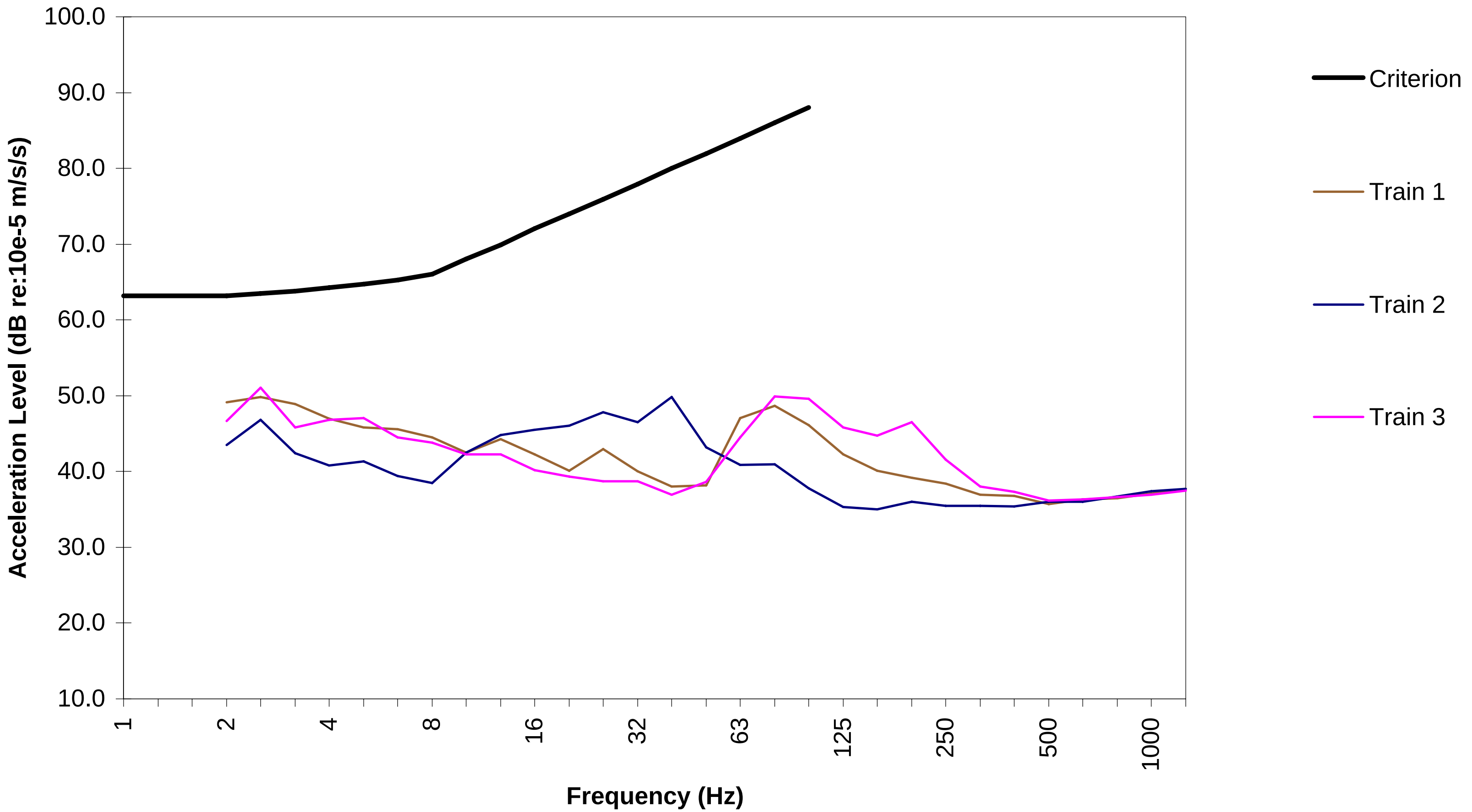
APPENDIX 1

MEASURED VIBRATION

Measured Train Vibration - Day Time Criteria - Location 1



Measured Train Vibration - Day Time Criteria - Location 2

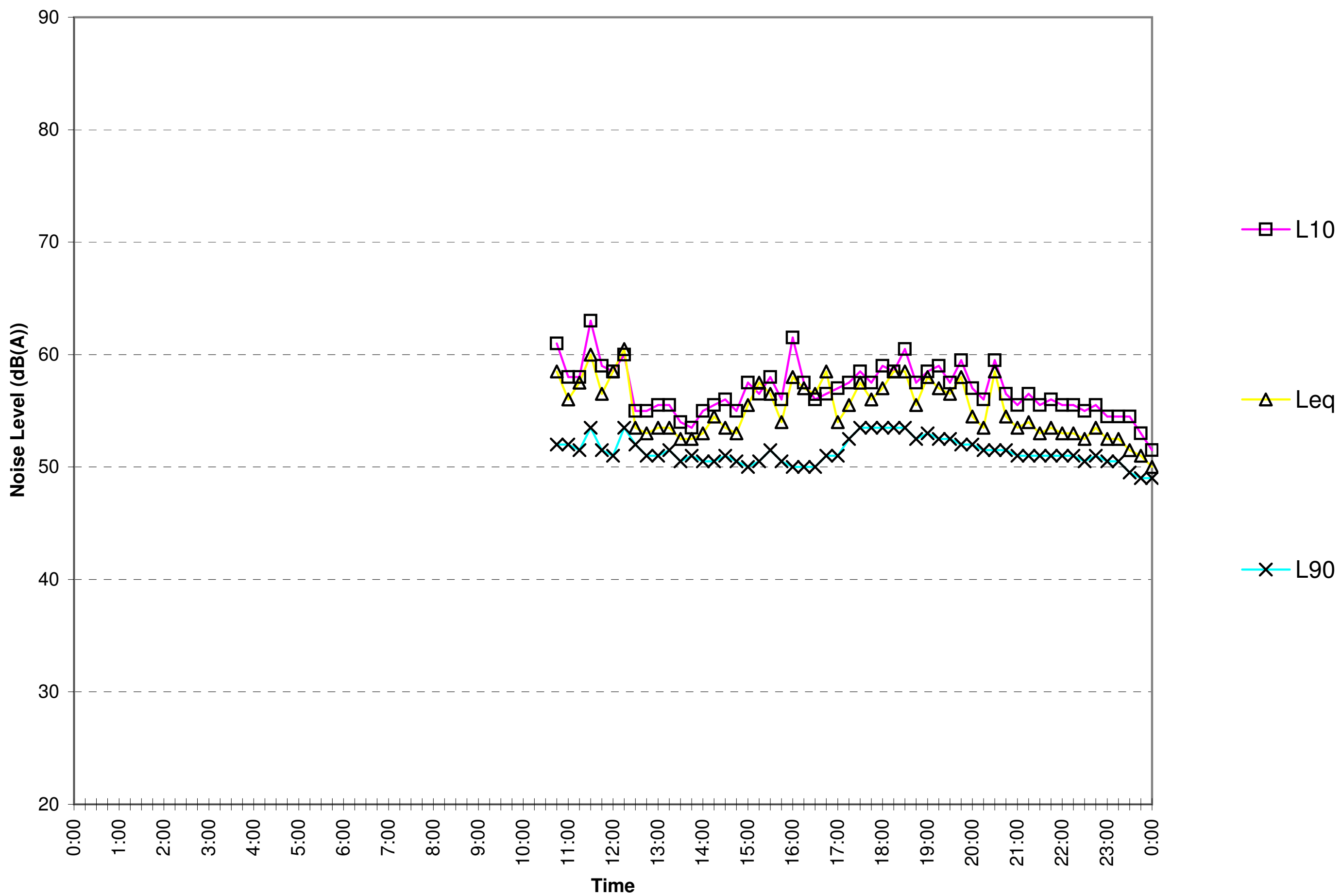


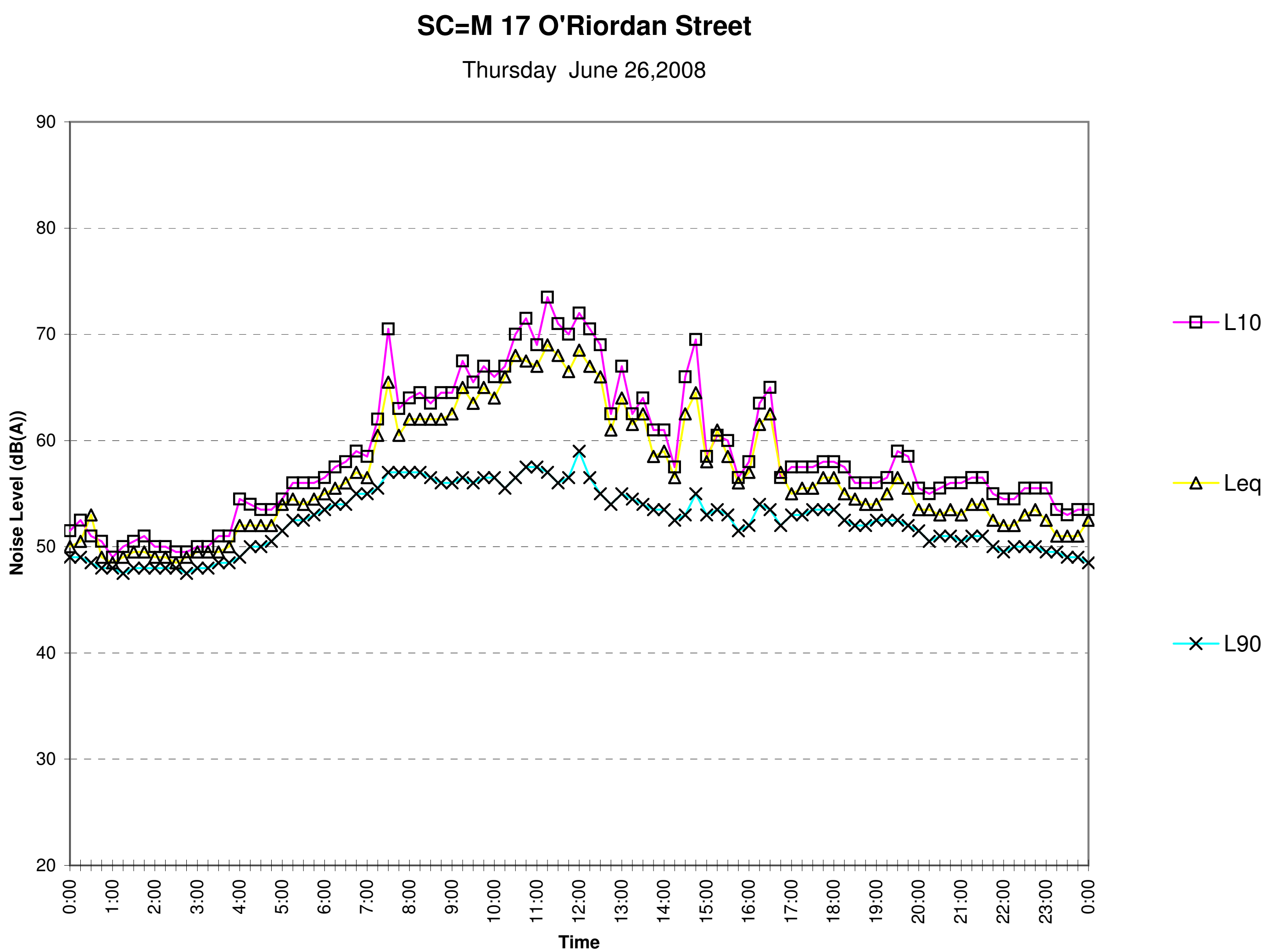
APPENDIX 2

MEASURED AMBIENT NOISE LEVELS

SC=M 17 O'Riordan Street

Wednesday June 25,2008




SC=M 17 O'Riordan Street
Thursday June 26,2008
Noise Level (dB(A))
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
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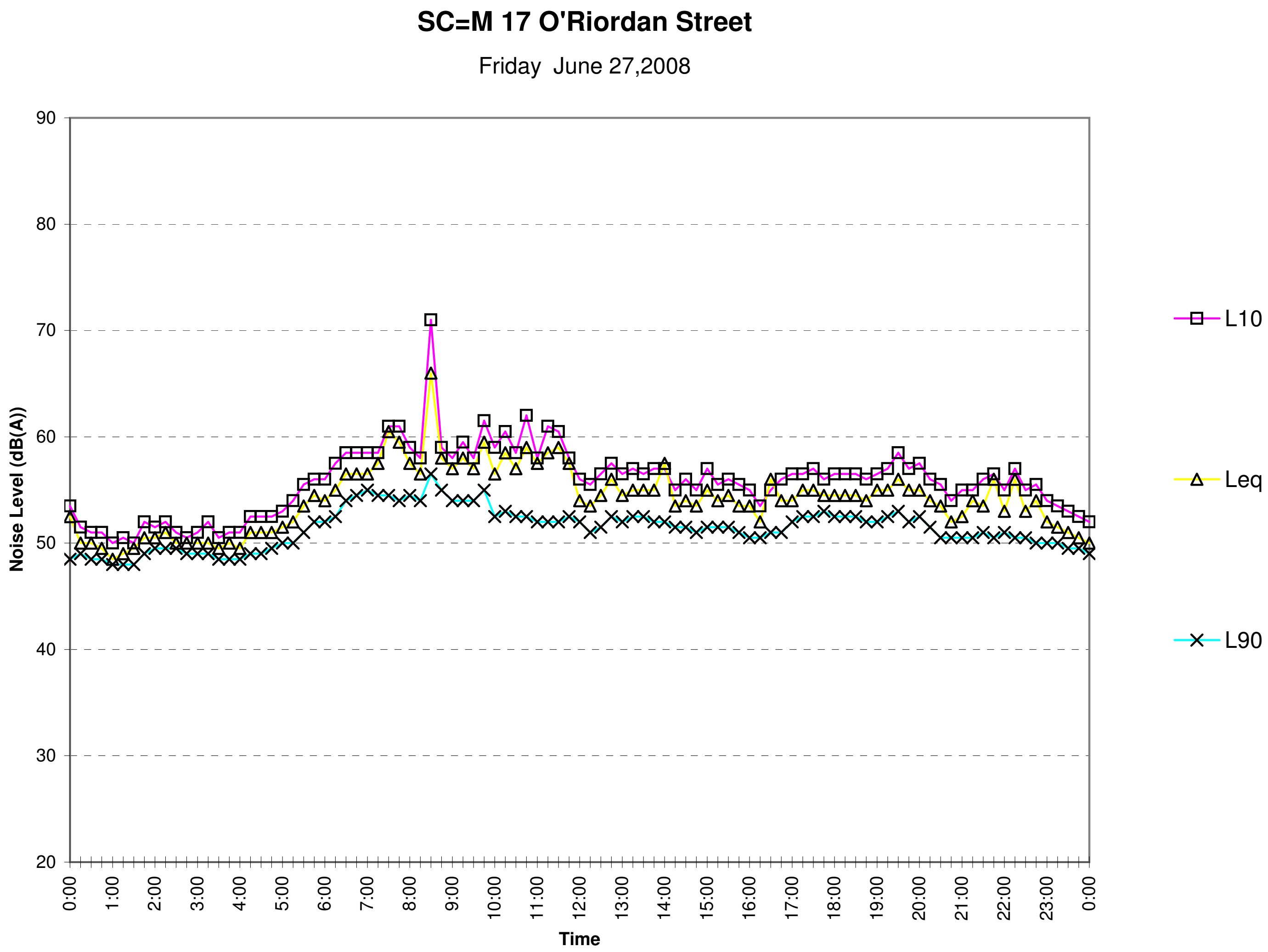
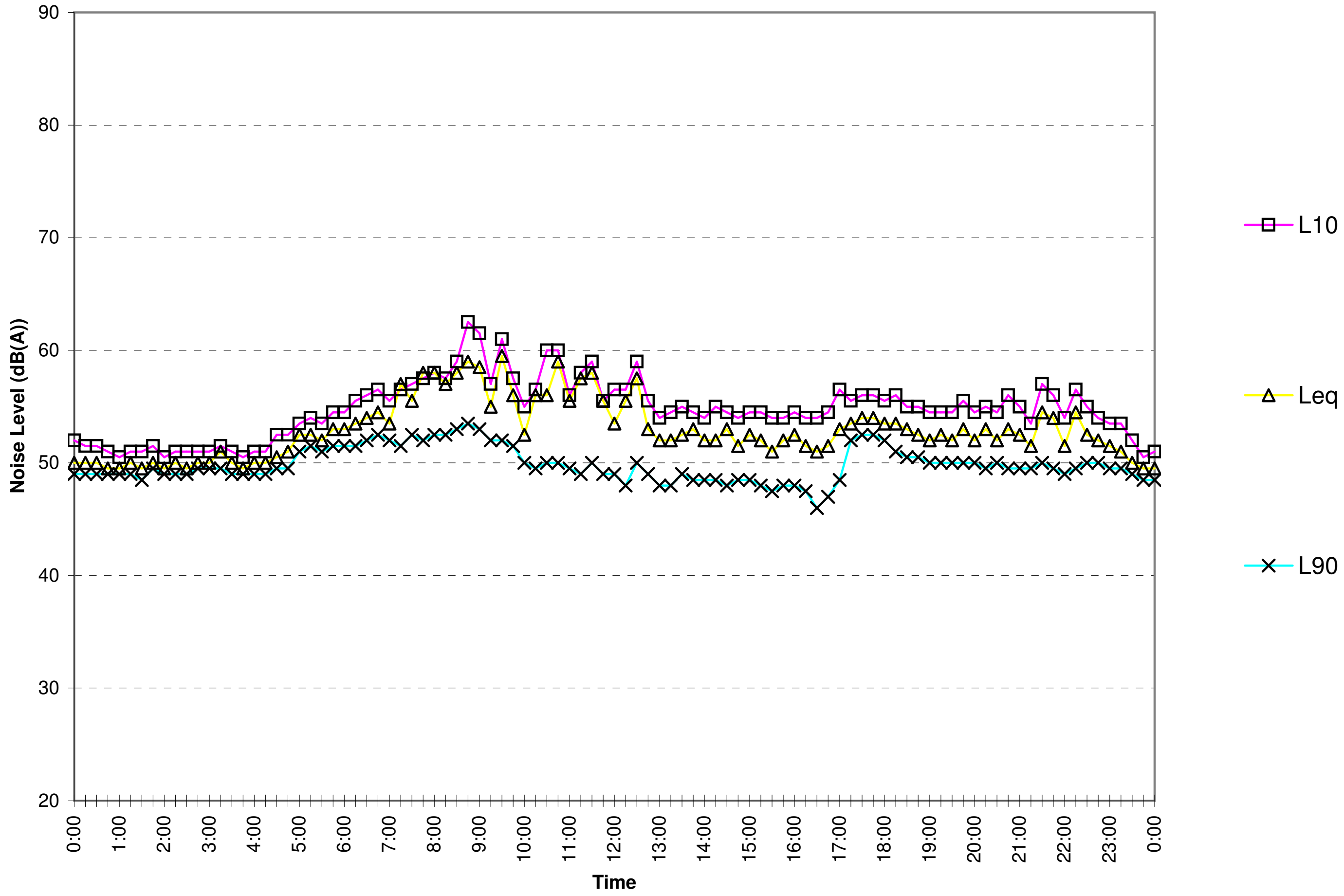
19:00
20:00
21:00
22:00
23:00
0:00
Time
L10
Leq
L90



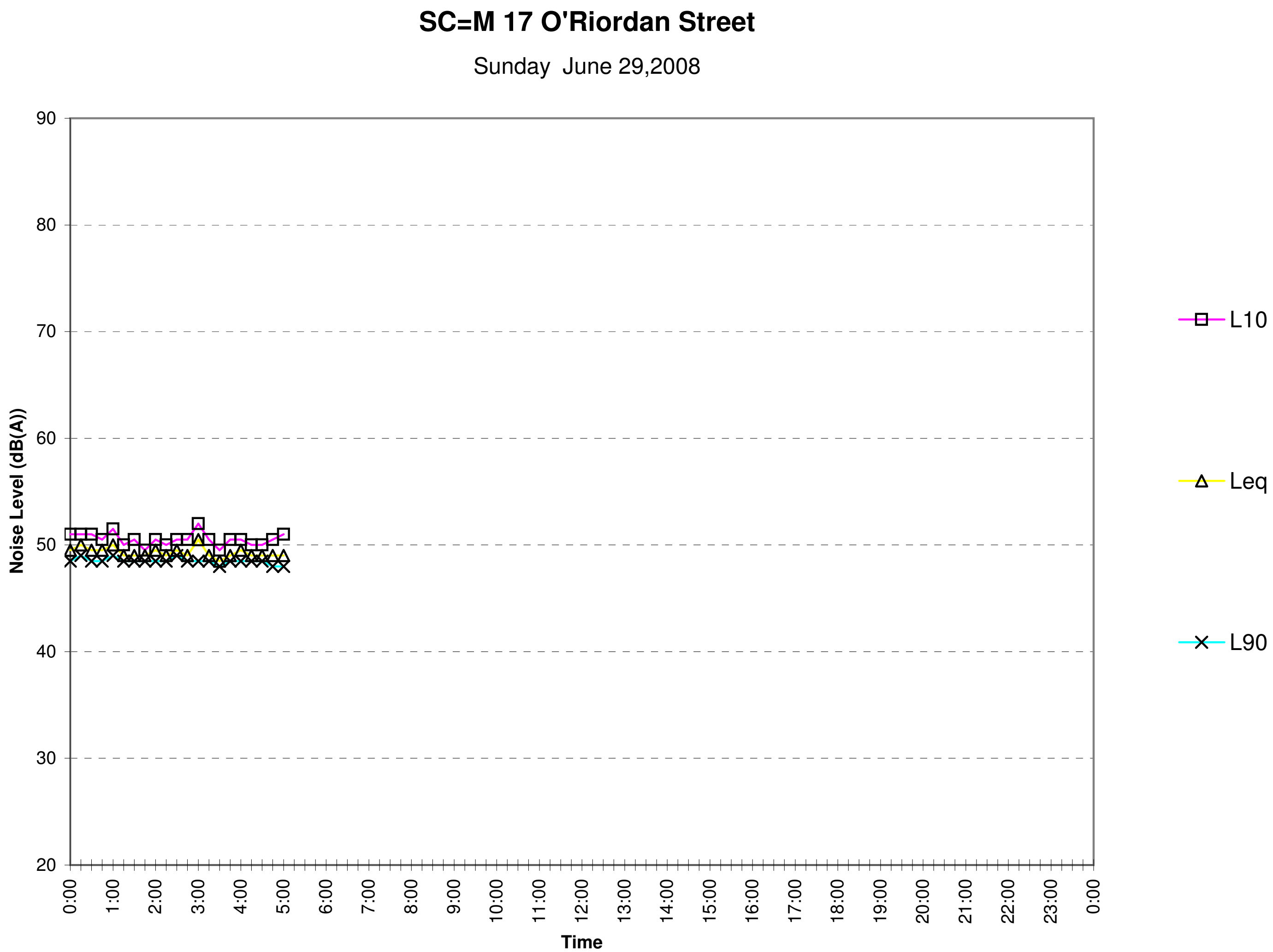
17ORIORDANST-20080702

SC=M 17 O'Riordan Street

Saturday June 28,2008

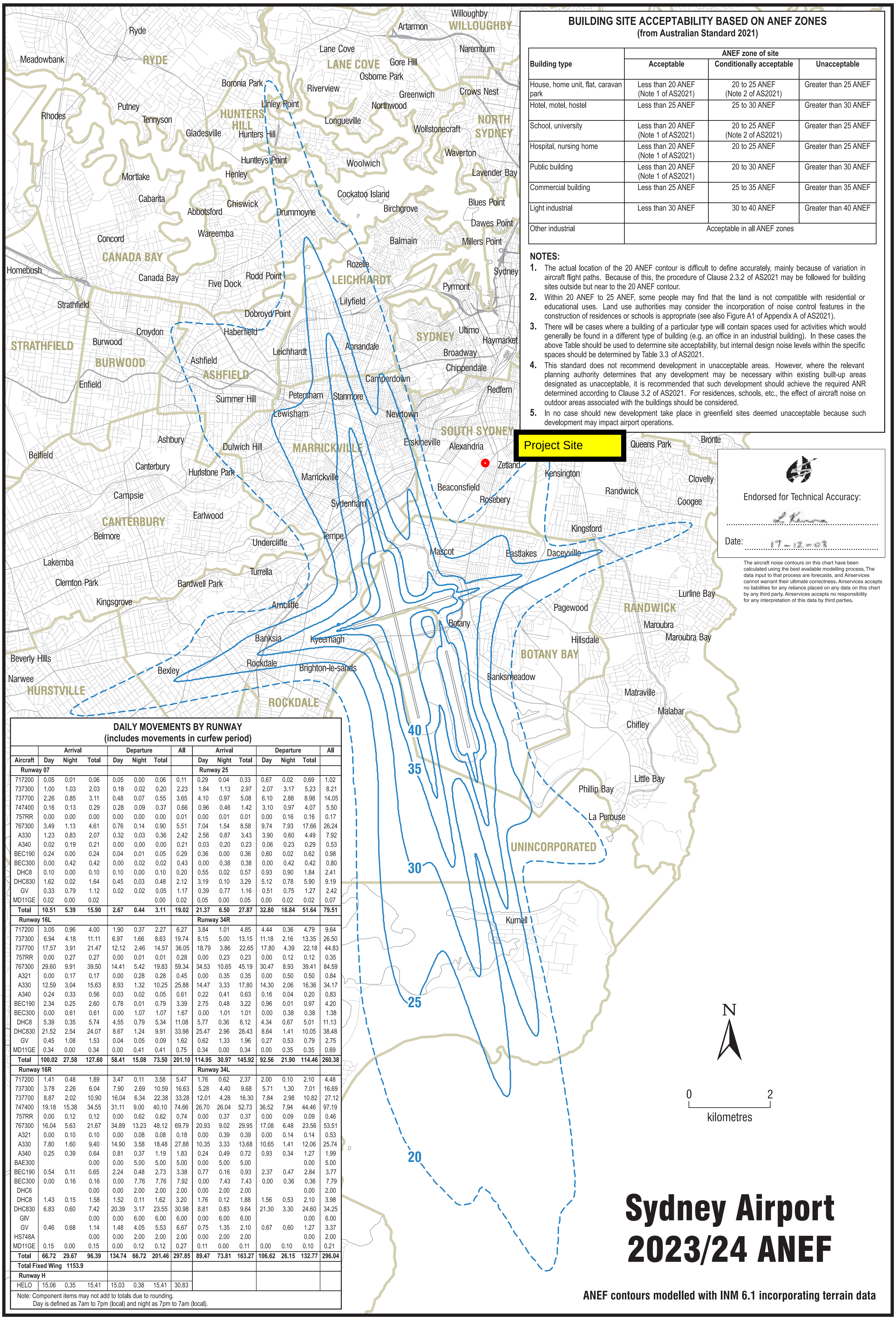


17ORIORDANST-20080702


SC=M 17 O'Riordan Street
Sunday June 29,2008
Noise Level (dB(A))
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time
L10
Leq
L90

APPENDIX 3

SYDNEY AIRPORT 2023/24 ANEF CONTOUR MAP



BUILDING SITE ACCEPTABILITY BASED ON ANEF ZONES
(from Australian Standard 2021)

Building type	ANEF zone of site		
	Acceptable	Conditionally acceptable	Unacceptable
House, home unit, flat, caravan park	Less than 20 ANEF (Note 1 of AS2021)	20 to 25 ANEF (Note 2 of AS2021)	Greater than 25 ANEF
Hotel, motel, hostel	Less than 25 ANEF	25 to 30 ANEF	Greater than 30 ANEF
School, university	Less than 20 ANEF (Note 1 of AS2021)	20 to 25 ANEF (Note 2 of AS2021)	Greater than 25 ANEF
Hospital, nursing home	Less than 20 ANEF (Note 1 of AS2021)	20 to 25 ANEF	Greater than 25 ANEF
Public building	Less than 20 ANEF (Note 1 of AS2021)	20 to 30 ANEF	Greater than 30 ANEF
Commercial building	Less than 25 ANEF	25 to 35 ANEF	Greater than 35 ANEF
Light industrial	Less than 30 ANEF	30 to 40 ANEF	Greater than 40 ANEF
Other industrial	Acceptable in all ANEF zones		

NOTES:

1. The actual location of the 20 ANEF contour is difficult to define accurately, mainly because of variation in aircraft flight paths. Because of this, the procedure of Clause 2.3.2 of AS2021 may be followed for building sites outside but near to the 20 ANEF contour.
2. Within 20 ANEF to 25 ANEF, some people may find that the land is not compatible with residential or educational uses. Land use authorities may consider the incorporation of noise control features in the construction of residences or schools is appropriate (see also Figure A1 of Appendix A of AS2021).
3. There will be cases where a building of a particular type will contain spaces used for activities which would generally be found in a different type of building (e.g. an office in an industrial building). In these cases the above Table should be used to determine site acceptability, but internal design noise levels within the specific spaces should be determined by Table 3.3 of AS2021.
4. This standard does not recommend development in unacceptable areas. However, where the relevant planning authority determines that any development may be necessary within existing built-up areas designated as unacceptable, it is recommended that such development should achieve the required ANR determined according to Clause 3.2 of AS2021. For residences, schools, etc., the effect of aircraft noise on outdoor areas associated with the buildings should be considered.
5. In no case should new development take place in greenfield sites deemed unacceptable because such development may impact airport operations.

Endorsed for Technical Accuracy:

Date: 17-12-03

The aircraft noise contours on this chart have been calculated using the best available modelling process. The data input to that process are forecasts, and Airservices cannot warrant their ultimate correctness. Airservices accepts no liabilities for any reliance placed on any data on this chart by any third party. Airservices accepts no responsibility for any interpretation of this data by third parties.

DAILY MOVEMENTS BY RUNWAY
(includes movements in curfew period)

	Arrival			Departure			All	Arrival			Departure			All
Aircraft	Day	Night	Total	Day	Night	Total		Day	Night	Total	Day	Night	Total	
Runway 07								**Runway 25**						
717200	0.05	0.01	0.06	0.05	0.00	0.06	0.11	0.29	0.04	0.33	0.67	0.02	0.69	1.02
737300	1.00	1.03	2.03	0.18	0.02	0.20	2.23	1.84	1.13	2.97	2.07	3.17	5.23	8.21
737700	2.26	0.85	3.11	0.48	0.07	0.55	3.65	4.10	0.97	5.08	6.10	2.88	8.98	14.05
747400	0.16	0.13	0.29	0.28	0.09	0.37	0.66	0.96	0.46	1.42	3.10	0.97	4.07	5.50
757RR	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.16	0.16	0.17
767300	3.49	1.13	4.61	0.76	0.14	0.90	5.51	7.04	1.54	8.58	9.74	7.93	17.66	26.24
A330	1.23	0.83	2.07	0.32	0.03	0.36	2.42	2.56	0.87	3.43	3.90	0.60	4.49	7.92
A340	0.02	0.19	0.21	0.00	0.00	0.00	0.21	0.03	0.20	0.23	0.06	0.23	0.29	0.53
BEC190	0.24	0.00	0.24	0.04	0.01	0.05	0.29	0.36	0.00	0.36	0.60	0.02	0.62	0.98
BEC300	0.00	0.42	0.42	0.00	0.02	0.02	0.43	0.00	0.38	0.38	0.00	0.42	0.42	0.80
DHC8	0.10	0.00	0.10	0.10	0.00	0.10	0.20	0.55	0.02	0.57	0.93	0.90	1.84	2.41
DHC830	1.62	0.02	1.64	0.45	0.03	0.48	2.12	3.19	0.10	3.29	5.12	0.78	5.90	9.19
GV	0.33	0.79	1.12	0.02	0.02	0.05	1.17	0.39	0.77	1.16	0.51	0.75	1.27	2.42
MD11GE	0.02	0.00	0.02			0.00	0.02	0.05	0.00	0.05	0.00	0.02	0.02	0.07
Total	**10.51**	**5.39**	**15.90**	**2.67**	**0.44**	**3.11**	**19.02**	**21.37**	**6.50**	**27.87**	**32.80**	**18.84**	**51.64**	**79.51**
Runway 16L								**Runway 34R**						
717200	3.05	0.96	4.00	1.90	0.37	2.27	6.27	3.84	1.01	4.85	4.44	0.36	4.79	9.64
737300	6.94	4.18	11.11	6.97	1.66	8.63	19.74	8.15	5.00	13.15	11.18	2.16	13.35	26.50
737700	17.57	3.91	21.47	12.12	2.46	14.57	36.05	18.79	3.86	22.65	17.80	4.39	22.18	44.83
757RR	0.00	0.27	0.27	0.00	0.01	0.01	0.28	0.00	0.23	0.23	0.00	0.12	0.12	0.35
767300	29.60	9.91	39.50	14.41	5.42	19.83	59.34	34.53	10.65	45.19	30.47	8.93	39.41	84.59
A321	0.00	0.17	0.17	0.00	0.28	0.28	0.45	0.00	0.35	0.35	0.00	0.50	0.50	0.84
A330	12.59	3.04	15.63	8.93	1.32	10.25	25.88	14.47	3.33	17.80	14.30	2.06	16.36	34.17
A340	0.24	0.33	0.56	0.03	0.02	0.05	0.61	0.22	0.41	0.63	0.16	0.04	0.20	0.83
BEC190	2.34	0.25	2.60	0.78	0.01	0.79	3.39	2.75	0.48	3.22	0.96	0.01	0.97	4.20
BEC300	0.00	0.61	0.61	0.00	1.07	1.07	1.67	0.00	1.01	1.01	0.00	0.38	0.38	1.38
DHC8	5.39	0.35	5.74	4.55	0.79	5.34	11.08	5.77	0.36	6.12	4.34	0.67	5.01	11.13
DHC830	21.52	2.54	24.07	8.67	1.24	9.91	33.98	25.47	2.96	28.43	8.64	1.41	10.05	38.48
GV	0.45	1.08	1.53	0.04	0.05	0.09	1.62	0.62	1.33	1.96	0.27	0.53	0.79	2.75
MD11GE	0.34	0.00	0.34	0.00	0.41	0.41	0.75	0.34	0.00	0.34	0.00	0.35	0.35	0.69
Total	**100.02**	**27.58**	**127.60**	**58.41**	**15.08**	**73.50**	**201.10**	**114.95**	**30.97**	**145.92**	**92.56**	**21.90**	**114.46**	**260.38**
Runway 16R								**Runway 34L**						
717200	1.41	0.48	1.89	3.47	0.11	3.58	5.47	1.76	0.62	2.37	2.00	0.10	2.10	4.48
737300	3.78	2.26	6.04	7.90	2.69	10.59	16.63	5.28	4.40	9.68	5.71	1.30	7.01	16.69
737700	8.87	2.02	10.90	16.04	6.34	22.38	33.28	12.01	4.28	16.30	7.84	2.98	10.82	27.12
747400	19.18	15.38	34.55	31.11	9.00	40.10	74.66	26.70	26.04	52.73	36.52	7.94	44.46	97.19
757RR	0.00	0.12	0.12	0.00	0.62	0.62	0.74	0.00	0.37	0.37	0.00	0.09	0.09	0.46
767300	16.04	5.63	21.67	34.89	13.23	48.12	69.79	20.93	9.02	29.95	17.08	6.48	23.56	53.51
A321	0.00	0.10	0.10	0.00	0.08	0.08	0.18	0.00	0.39	0.39	0.00	0.14	0.14	0.53
A330	7.80	1.60	9.40	14.90	3.58	18.48	27.88	10.35	3.33	13.68	10.65	1.41	12.06	25.74
A340	0.25	0.39	0.64	0.81	0.37	1.19	1.83	0.24	0.49	0.72	0.93	0.34	1.27	1.99
BAE300			0.00	0.00	5.00	5.00	5.00	0.00	5.00	5.00			0.00	5.00
BEC190	0.54	0.11	0.65	2.24	0.48	2.73	3.38	0.77	0.16	0.93	2.37	0.47	2.84	3.77
BEC300	0.00	0.16	0.16	0.00	7.76	7.76	7.92	0.00	7.43	7.43	0.00	0.36	0.36	7.79
DHC6			0.00	0.00	2.00	2.00	2.00	0.00	2.00	2.00			0.00	2.00
DHC8	1.43	0.15	1.58	1.52	0.11	1.62	3.20	1.76	0.12	1.88	1.56	0.53	2.10	3.98
DHC830	6.83	0.60	7.42	20.39	3.17	23.55	30.98	8.81	0.83	9.64	21.30	3.30	24.60	34.25
GIV			0.00	0.00	6.00	6.00	6.00	0.00	6.00	6.00			0.00	6.00
GV	0.46	0.68	1.14	1.48	4.05	5.53	6.67	0.75	1.35	2.10	0.67	0.60	1.27	3.37
HS748A			0.00	0.00	2.00	2.00	2.00	0.00	2.00	2.00			0.00	2.00
MD11GE	0.15	0.00	0.15	0.00	0.12	0.12	0.27	0.11	0.00	0.11	0.00	0.10	0.10	0.21
Total	**66.72**	**29.67**	**96.39**	**134.74**	**66.72**	**201.46**	**297.85**	**89.47**	**73.81**	**163.27**	**106.62**	**26.15**	**132.77**	**296.04**
Total Fixed Wing 1153.9														
Runway H														
HELO	15.06	0.35	15.41	15.03	0.38	15.41	30.83							

Note: Component items may not add to totals due to rounding.
Day is defined as 7am to 7pm (local) and night as 7pm to 7am (local).

Sydney Airport 2023/24 ANEF

ANEF contours modelled with INM 6.1 incorporating terrain data

Sydney Airport Master Plan 2003/04

Qualification

Factors taken into account in the ANEF calculation are the following:

- The numbers and types of aircraft forecast to operate on the day, their distribution on the various runways and flight paths at their destinations
- The noise characteristics of each aircraft type at each phase of its operation (landing or take-off), and
- Whether the operation was in daytime (7am – 7pm) or night time (7pm – 7am).

Contours are plotted at steps of 5 ANEF over the range 20 to 40 ANEF – the higher the ANEF value the grater the noise exposure. Aircraft noise does not stop at the 20 ANEF contour, but outside 20 ANEF, noise from sources other than aircraft tends to predominate over aircraft noise.

Sydney Airport Corporation Limited (SACL) neither assumes nor accepts responsibility for the accuracy of the contours or any reliance placed upon them.

This drawing has been prepared to illustrate the Sydney Airport Master Plan and is not intended to serve any other purpose. The drawing must be read in conjunction with the Master Plan.

Figure 16.4 Sydney Airport 2023/24 ANEF

Sydney Airport Corporation Limited

ACOUSTIC LOGIC CONSULTANCY
noise and vibration consultants
abn 11 068 954 343

17 O'RIORDAN STREET GREEN SQUARE

PART B

ASSESSMENT OF NOISE AND VIBRATION IMPACTS ON SURROUNDING PROPERTIES

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1. INTRODUCTION

This report presents our assessment of the potential impact of noise and vibration emissions arising from the construction and operation of the proposed Australian Red Cross Blood Service (ARCBS) facility to be located at 17 O'Riordan Street, Green Square on the surrounding properties.

Noise objectives and a preliminary assessment of potential noise emissions from process equipment, mechanical services plant and equipment, and vehicle movements generated by the proposed development has been undertaken. Noise emissions during the demolition, excavation and construction phase of the project has also been identified and assessed as part of the study.

This assessment is based on drawings provided by Goodman Property Services Pty Ltd with drawing numbers: SD-003 to SD-008 dated 6 June 2008 and A.2002 to A.2005 revision G dated June and July 2008.

2. SITE DESCRIPTION

The proposed development is located at the 17 O'Riordan Street bounded by O'Riordan Street to the east, which is a four lane road carrying medium to high traffic volumes distributed throughout the day. The proposed Australia Red Cross Blood Service (ARCBS) is a commercial/industrial facility consisting of:

- Underground car parking level
- Ground level for warehouse and distribution
- Level 1 for plant and office
- Level 2 and Level 3 laboratory & offices

Details of the project site, noise measurement locations and potential noise receivers are presented in Figure 1.

Figure 1 Site Map

2.1 POTENTIAL AFFECTED NOISE RECEIVERS

The potentially most affected noise receivers will be the commercial/industrial buildings located around the site and residential properties to the southeast across Reserve Street presented in Figure 1.

3. NOISE EMISSIONS FROM THE SITE

Noise emissions from plant and activities shall comply with the '*Provisions of the Protection of the Environment Operations Act 1997 and Department of Environment and Climate Change (DECC)'* Industrial Noise Policy. The guidelines in the Industrial Noise Policy provide assessment objectives depending on the time of day. There are two requirements which both have to be complied with, that is the intrusiveness and the amenity criteria. Sleep arousal from night time operations should also be assessed.

3.1 NOISE EMISSION OBJECTIVES

3.1.1 Requirements

Noise emissions from plant and equipment, and other activities carried out on the site should be assessed using the DECC Industrial Noise Policy.

3.1.2 Noise Emission Limits

The DECC Industrial Noise Policy provides guidelines for assessing noise impacts from industrial developments. The recommended assessment objectives vary depending on the potentially affected receivers, the time of day, and the type of noise source. The DECC Industrial Noise Policy has two requirements which both have to be complied with, namely an amenity criterion and an intrusiveness criterion. In addition, the DECC in its Environmental Noise Control Manual states that noise controls should be applied with the General intent to protect residences from sleep arousal.

3.1.3 Intrusiveness Criterion

The operation of all plant and vehicle movements on site shall not give rise to an equivalent continuous (L_{Aeq}) sound pressure level at any point on any residential property greater than 5dB(A) above the existing background L_{A90} level (in absence of the noise under consideration).

For assessment purposes, the above L_{Aeq} sound level shall be assessed over a period of 10-15 minutes and adjusted in accordance with DECC guidelines for tonality, frequency weighting, impulsive characteristics, fluctuations and temporal content where necessary.

3.1.4 Amenity Criterion

The guideline is intended to limit the absolute noise level from all noise sources to a level that is consistent with the general environment.

Based on the DECC's requirement the following acceptable noise levels would apply to existing residences and industrial properties potentially affected by the proposal.

Table 1 – Recommended Acceptable Noise Levels

Time of day	Recommended Acceptable Noise Level dB(A) L_{eq}	
	Residential	Industrial/Commercial
Day (7am to 6pm)	55	65
Evening (6pm -10pm)	45	65
Night (10pm -7am)	40	65

If the existing amenity noise levels due to industrial noise are close to or above the recommended acceptable noise levels then operation of the site shall be designed to a lower level than the acceptable noise level.

If the existing amenity levels from industrial noise and other transportation noise sources are more than 2 dB(A) above the acceptable levels, and there is no prospect of these levels reducing in the future, then the amenity criterion is set at 10 dB(A) below the existing level. In practice, this prevents any audible increase in the existing noise level.

3.1.5 Sleep Arousal

To minimise the potential for sleep arousal the L_1 noise level of any specific noise source does not exceed the background noise level (L_{90}) by more than 15 dB(A) outside a resident's bedroom window between the hours of 10pm and 7am. The L_1 noise level is the level exceeded for 1 per cent of the time and approximates the typical maximum noise level from a particular source. Since the minimum repeatable noise level is 41dB(A) the sleep disturbance criterion is 56dB(A) L_1 outside the closest bedroom window.

If the L_1 noise level emitted by the proposed development from new plant and equipment exceeds 56 dB(A) an assessment of the proposed development's potential to significantly increase sleep arousal (when compared to the existing noise sources) should be carried out.

3.2 BACKGROUND NOISE MEASUREMENTS

Measurement of background noise was conducted from 9 September 2008 to 17 September 2008 using a noise logger located in the front yard of residential property along Reserve Street approximately 30m from O'Riordan Street. Equipment used consisted of an Acoustic Research Laboratories Pty Ltd noise logger. The logger was programmed to store 15-minute statistical noise levels throughout the monitoring period. The equipment was calibrated at the beginning and the end of the measurement using a Rion NC-73 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode. The results of the monitoring are below in Table 2.

Table 2 – Rating Background Noise Level

Time Period	Background Noise Level dB(A) L_{90}
Day (7am – 6pm)	55
Evening (6pm – 10pm)	48
Night (10pm – 7pm)	41

3.3 NOISE ASSESSMENT OBJECTIVES

Under the current DECC requirements the Industrial Noise Policy supersedes the requirements of the Noise Control Manual for assessment of mechanical plant noise. In addition we note that compliance with the Industrial Noise Policy will also indicate compliance with the Protection of the Environment Operations Act.

Based on the DECC's Industrial Noise Policy, Table 3 and Table 4 provide a summary of the assessment criteria applicable to the subject premises at the neighbouring potentially affected residential properties based on noise monitoring conducted for the subject site. The intrusiveness and amenity criteria for this project have been determined using the DECC guidelines and the noise monitoring results.

Table 3 –Noise Level Objectives

Time Period	Noise Level dB(A) L_{eq}	
	Residential	Commercial
Day (7am to 6pm)	55	65
Evening (6pm -10pm)	45	65
Night (10pm -7am)	40	65

Table 4 –Noise Level Objectives for Infrequent or Intermittent Noise Sources

Time Period	Noise Level dB(A) L_{eq}
	Residential
Day (7am to 6pm)	60
Evening (6pm -10pm)	53
Night (10pm -7am)	46
Sleep Disturbance Objective L_1	56dB(A) L_1

Noise level criteria are to be applied to traffic generated from vehicle movements on the site and noise emissions from plant and equipment installed on the site, as presented by the Industrial Noise Policy.

3.4 PLANT NOISE EMISSIONS

Detailed plant selections are not available at this stage, so it is not possible to carry out a detailed examination of the ameliorative measures that may be required to achieve the noise targets. However, a preliminary assessment has been undertaken based on indicative plant noise levels, and applying the recommended noise control principles outlined below.

The majority of major plant would be located in a roof plant room comprising, emergency generator, air handling units an fans, boilers, pumps, air cooled chillers and associated minor plant.

The loudest normally operating plant would be the chillers that are proposed to be located in an open roof plant area that would be screened off from the nearby residences by the other plant rooms surrounding this area. The expected noise levels from this plant at the sensitive receivers are indicated below:

	dB(A)
Chiller Sound Power Level (low noise model with compressor jackets and low noise fans)	95
3 chillers max at evening/night	+5
Barrier effect from enclosure	-20
Distance Loss to residential receiver	-45
Receiver Level	35
Night Noise target	40

(Note: An alternative to using a low noise chiller would be to roof the plant room and install acoustic silencers on the air intake and discharge points.)

The generator room is also a significant noise source. This would be housed in a masonry plant room (or other material to give an equivalent acoustic rating) with attenuated air inlets and exhausts, and residential class mufflers fitted to the engine exhaust. Acoustically rated plant room doors would be provided. An analysis of the inlet and exhaust noise is provided below.

	dB(A)
Generator Sound Power Level	125
Plant room losses	-5
Barrier effect from roof (based on east or south facing louvre (worst case))	-5
Distance Loss to residential receiver	-43
Silencer Insertion Loss	35
Receiver Level	37
Night Noise target	40

	dB(A)
Fume Cupboard Fan Sound Power Level	85
Directivity losses – vertical discharge	-7
Distance Loss to residential receiver	-46
Receiver Level	32
Night Noise target	40

All remaining plant major would be located within plant rooms. For these plant rooms the enclosure materials can be selected to prevent excessive sound transmission. Similarly, air intake and discharge points can be suitably attenuated.

A substation and passive electrical equipment are proposed to be located in a louvred plant room at the front of the building. No noise impacts will be produced by this plant as this equipment generates relatively low levels of noise emissions.

It is concluded that noise emissions to all residential receivers can be made to comply with the nominated noise objectives with the application of standard noise control methods (as indicated below).

For the adjacent commercial and industrial properties, the proposed plant would be well below the noise emission limits given the relatively high noise level goals for these occupancies.

The preliminary assessment indicates that the recommended noise objectives could be readily achieved at all surrounding receivers with the application of standard noise control treatments that are routinely applied such as

- Selecting quite plant
- Barriers and enclosures
- Acoustic louvers and silencers
- Duct treatment
- Vibration isolation
- Speed control
- Time control

It is appropriate that a full acoustic analysis be carried out during the building design once sufficient information regarding the type of plant to be installed is known and the treatment and recommendations arising from this assessment be implemented.

3.5 NOISE EMISSIONS RESULTING FROM INTERNALLY GENERATED NOISE

3.5.1 Process and Warehouse Noise

The process and warehouse areas will be fully enclosed including masonry walls and a concrete cover (ie the other levels of the building), Openings located on the western facade which is screened and well away from the sensitive recievers. There are louvres located on the northern and southern facades which are proposed to be backed with acoustic splitters.

The only potential source of significant noise emissions are the louvres on the north and soutth facades. However, they are proposed to be treated and even for relatively high internal noise levels such as 85 dB(A), noise emissions would be well below the requried noise emission limits at all recievers with the proposed treatment.

3.5.2 Office Areas

Office Areas would generate relatively low noise levels that would be totally inaudible at the residential recievers.

3.5.3 Carpark Roller Door

A roller door for the carpark is located on the western facade. The main potential noise impact from this source would be on residential recievers opposite at night.

Based on an expected noise level of 65 dB(A) at 5m, and operation of the door for a total or 1.5 minutes in every 15 minutes at night gives an expected noise level at the nearest reciever of 35 dB(A) L_{eq} and 45 dB(A) L_1 , which are well below the target noise levels for intermittently operating plant at night (ie 46 L_{eq} and 56 L_1).

3.6 EXTERNAL VEHICLE MOVEMENTS ON THE SITE

Vehicle movements would include:

- Passenger vehicles from employees and vehicles, which would mainly be directly into the underground carpark
- Commercial vehicle movements, are predominantly small vans and "Hi-Ace" delivery vans with a limited number of larger vehicles. The proposed main loading docks will be located on the southern side of the building with drive ways on the northern side and southern sides of the building. All loading docks are screened from sensitive residential receivers and are located well away from these receivers.

Noise emissions from vehicle movements associated with the loading activities, and loading activities in the southern docks were predicted at the sensitive receivers. Expected noise emission levels were corrected for distance attenuation, acoustic screening, façade attenuation and air absorption to determine the resultant noise level at the nearest potentially affected residential receiver. Calculations were based on noise emission levels from similar activities obtained at a warehouse facility. Noise measurements were conducted using a Norsonics SA-110 precision sound level analyser, set to fast response. The precision sound level analyser was calibrated before and after the measurements using a RION NC-73 precision sound level calibrator. No significant drift was recorded. The noise source emission levels used in calculations are presented in Table 5.

Table 5 - Noise Source Emission Levels

Noise Source	Sound Emission Level dB(A) at 7m	Type of Noise Source
Small Truck Reversing alarm	75[1]	Quasi-Steady, tonal
Trucks Manoeuvring/Reversing	75	Quasi-Steady
Truck Air Brakes	89	Transient
Truck Door Closing	75	Transient
Truck Starting	72	Transient
Semi-trailer Starting	89	Transient
Van Starting	75 at 3m	Transient

[1] A 5 dB(A) penalty has been applied to this source to account for the tonal characteristic of noise produced.

Calculations for the day, evening and night time assessment periods are based on worst case vehicle movements scenarios predicted by traffic engineers Masson Wilson Twiney Traffic and Transport Consultants dated 7 August 2008 for this project

Day and Evening– *Worst case scenario with 10 vans/ courier taxi and 2 trucks in and out the worst one hour.*

Night Time - *Worst case scenario with 1 truck in and out the worst one hour.*

Table 6 presents the predicted noise levels at the nearest potentially affected residential receivers situated on Reserve Street *(Refer to Figure 1)* compared to the recommended acceptable noise levels.

Table 6 – Predicted Noise Emission Levels at the Nearest Potentially Affected Residential Receivers

Location	Time of day	Predicted Noise Emission Level dB(A) $L_{Aeq\ (15\ minutes)}$	Constant Noise** Source Criteria dB(A) L_{Aeq}	Intermittent Noise Source Criteria dB(A) L_{Aeq}	Complies
Residential Receivers	Day	43	55	60	Yes
	Evening	43	45	53	Yes
	Night	39 L_{eq} / 58 L_1	40	46 L_{eq}/56 L_1	Yes*
Commercial Receivers	Day	<55	65	65	Yes

* - Refer discussion below

** - Because the tabled traffic noise levels are based on peak movement levels, and vehicle movements are intermittent, comparison with the criteria for constantly operating sources is conservative as traffic noise levels averaged over the day, evening and night periods will be less. Notwithstanding this, the predicted peak noise levels are still less than the criteria.

The predicted noise levels are below the criteria in all cases, except for late night truck movements. The L_1 noise level of 58 dB(A) is produced with the truck entering/leaving the site at the south east entrance. As the predicted noise level exceeds background plus 15 dB(A) it is necessary to compare the sleep arousal impact of this noise source to the existing sleep arousal impacts from ambient short term events.

These movements will be limited to 2 to 3 movements per night causing a noise level of 58 dB(A). The noise monitoring results obtained indicates that noise peaks from existing traffic movements regularly exceed 75 dB(A). In this context, the limited number of night time vehicle movements would cause no perceptible change in potential sleep arousal, and therefore no adverse impacts.

The noise predictions clearly illustrate that noise emissions from operations associated with the proposed development will comply during the day and night time assessment periods.

4. NOISE FROM TRAFFIC GENERATED BY THE PROPOSAL ON PUBLIC ROADS

The level of noise from traffic generated by the proposed development will be assessed based on DECC's guidelines.

4.1 ENVIRONMENTAL CRITERIA FOR ROAD AND TRAFFIC NOISE

The DECC "Environmental Criteria for Road Traffic Noise" (ECTRN) guidelines for new development are presented in Table 7.

Table 7 - Criteria for Traffic Noise for New Developments

Type of Development	Day (7am to 10pm)	Night (10pm to 7am)	Where Criteria Are Already Exceeded
Land use developments with potential to create additional traffic on collector road	60 $L_{Aeq(1hr)}$	55 $L_{Aeq(1hr)}$	In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB

4.2 TRAFFIC NOISE GENERATION

4.2.1 Traffic Noise Measurements

The noise monitor use to measure background noise levels also provides an indication of existing traffic noise levels at the nearest affected residential receivers. The results of the monitoring are below in Table 8.

Table 8 – Measured Traffic Noise Level

Time Period	Traffic Noise Level dB(A) L_{eq}
Day (7am – 10pm)	66
Night (10pm – 7pm)	57

The existing traffic noise levels exceed the noise objectives in the ECRTN, therefore the proposed development should not increase existing noise levels by more than 2 dB(A).

4.2.2 Generated Traffic Noise

The traffic assessment report undertaken by Masson Wilson Twiney Traffic and Transport Consultants dated 7 August 2008 for this project, indicates the estimated development traffic volumes generated by the development is significantly less than existing traffic volumes. The site will generate approximately 100 peak hour movements whereas the existing movements are in the order of 2000.

Any additional noise generated by traffic associated with the site would produce a noise increase well below 2 dB(A), and would be imperceptible.

5. CONSTRUCTION NOISE AND VIBRATION

5.1 ACTIVITIES TO BE CONDUCTED AND THE ASSOCIATED NOISE SOURCES

A description of each of these processes and the associated equipment proposed to be used on the site are presented below:

5.1.1 Demolition and Excavation

The site will require demolition, excavation and removal of waste material at the site.

5.1.2 Erection of Structure

This involves the construction of new building structure. The processes involved in this activity include delivery of materials, pouring of slabs, erection of formwork, steel erection, etc. All materials for construction are transported to the work site using O'Riordan Street.

Descriptions of noise generated from activities associated with the procedures detailed above are outlined in Table 9 below.

Table 9 – Noise Levels Generated from Construction Activities

CONSTRUCTION ACTIVITY	EQUIPMENT /PROCESS	SOUND POWER LEVEL dB(A)
1 – Demolition and Excavation	Bulldozers	Medium to High
	Truck	Medium
	Bobcat	Medium
	Angle grinders	Medium
2 – Erection of Structure	Cement mixing truck	Medium to High
	Concrete pumps	Medium to High
	Concrete vibrator	Medium
	Electric Saw	Medium
	Drilling	Medium
	Hammering	High
	Air Compressors	Medium
	Nail Guns	Medium

5.2 PROPOSED CONSTRUCTION OPERATION HOURS

Construction activities operating hours are as following:

- Monday to Friday: 7:00am to 5:00pm
- Saturdays: 7:00am to 3:00pm
- Sundays and Public holidays: no work

5.3 CONSTRUCTION NOISE AND VIBRATION OBJECTIVES

5.3.1 Noise

The applicable guidelines and standards are:

- Draft DECC Noise Control Manual Construction Noise and Vibration Guideline. This guideline nominates acceptable levels of noise emissions above the background noise level depending on the total construction period. For periods up to 6 months the guideline recommends a noise level of 10 dB(A) above the background.

- Australian Standard 2436-1981 "Guide to Noise Control on Construction Maintenance and Demolition Site". In particular, the requirements stipulated in Section 3 of the standard will be followed.

The Draft DECC guideline and Section 3 of AS 2436 states that care shall be taken in applying criteria that normally would be used to regulate noise emitted from industrial, commercial and residential premises to construction, particularly for those activities which are transitory and of short duration. For the control and regulation of noise from construction sites AS2436 nominates the following:

- That reasonable suitable noise criterion is established.
- That all practicable measures be taken on the building site to regulate noise emissions, including the sitting of noisy static processes parts of the site where they can be shielded, selecting less noisy processes, and if required regulating construction hours
- The undertaking of noise monitoring where non-compliance occurs to assist in the management and control of noise emission from the building site.

Based on these the following procedure will be used to assess noise emissions:

- Predict noise levels produced by typical construction activities at the sensitive receivers.

- If noise levels exceed "background + 10 dB(A)" noise goal at sensitive receiver locations, investigate and implement all practical and cost effective techniques to limit noise emissions.

- If the noise goal is still exceeded after applying all practical engineering controls to limit noise emissions investigate management and other techniques to mitigate noise emissions.

A construction & demolition noise and vibration management plan is to be developed by the builder to ensure this occurs.

5.3.2 Vibration Criteria

Building Damage

Australian Standard 2187-1993, "SAA Explosives Code, Part 2 - Use of Explosives" stipulates in Section 11 acceptable levels of ground vibration to limit the probability of structural damage and human discomfort. The criteria presented in this Standard are summarised below.

Table 10 - AS2187 Recommend Peak Particle Velocity

	TYPE OF BUILDING OR STRUCTURE	PEAK PARTICLE VELOCITY (V_p) mm/s
1	Historical buildings and monuments, and buildings of special value and significance	2
2	House and low rise residential buildings: Commercial buildings not included in item 3 below	10
3	Commercial and industrial buildings or structures of reinforced concrete or steel construction	25

The properties near 17 O'Riordan Street site would fall into Category 2 or 3. Notwithstanding this, ground vibration during excavation would also induce structure radiated noise within the surrounding buildings. This may limit permissible vibration levels below that permitted by structural damage considerations.

Railcorp generally adopts a 20mm/s limit to prevent potential damage to rail infrastructure. Monitoring would be implemented, as required by Railcorp to ensure the vibration levels are not exceeded in the rail tunnels near the site.

Amenity

Vibration objectives for residential and commercial receivers are based on DECC "Assessing Vibration: A technical Guideline" document.

The document provides assessment goals depending on the type of vibration being produced and procedures for assessing vibration impacts. The recommendations of this document shall be used to guide the assessment, selection of processes and methods and implementation of ameliorative treatment where appropriate.

Ground vibration during excavation can also induce structure radiated noise within the surrounding buildings. This may limit permissible vibration levels below that permitted by structural damage considerations and the resultant impacts would be assessed as indicated above for other noise emissions.

5.4 MITIGATION TREATMENTS, MANAGEMENT METHODS

5.4.1 Noise Control Methods

The determination of appropriate noise control measures will be dependant on the particular activities and construction appliances. This section provides an outline of available methods.

<u>Selection of Alternate Appliance or Process</u>

Where a particular activity or construction appliance is found to generate noise levels that exceed the criteria, it may be possible to select an alternative approach or appliance.

<u>Acoustic Barrier</u>

Barriers or screens can be an effective means of reducing noise. Barriers can be located either at the source or receiver.

The placement of barriers at the source is generally only effective for static plant (tower cranes). Equipment which is on the move or working in rough or undulating terrain cannot be effectively attenuated by placing barriers at the source.

Barriers can also be placed between the source and the receiver.

The degree of noise reduction provided by barriers is dependant on the amount by which line of sight can be blocked by the barrier. If the receiver is totally shielded from the noise source reductions of up to 15 dB(A) can be effected. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8 dB(A) may be achieved. Where no line of sight is obstructed by the barrier, generally no noise reduction will occur.

As barriers are used to provide shielding and do not act as an enclosure, the material they are constructed from should have a noise reduction performance which is approximately 10dB(A) greater than the maximum reduction provided by the barrier. In this case the use of a material such as 10 or 15mm plywood would be acceptable for the barriers.

<u>Silencing devices</u>

Where construction process or appliances are noisy, the use of silencing devices may be possible. These may take the form of engine shrouding, or special industrial silencers fitted to exhausts.

<u>Material handling</u>

The installation of rubber matting over material handling areas can reduce the sound of impacts due to material being dropped by up to 20dB(A).

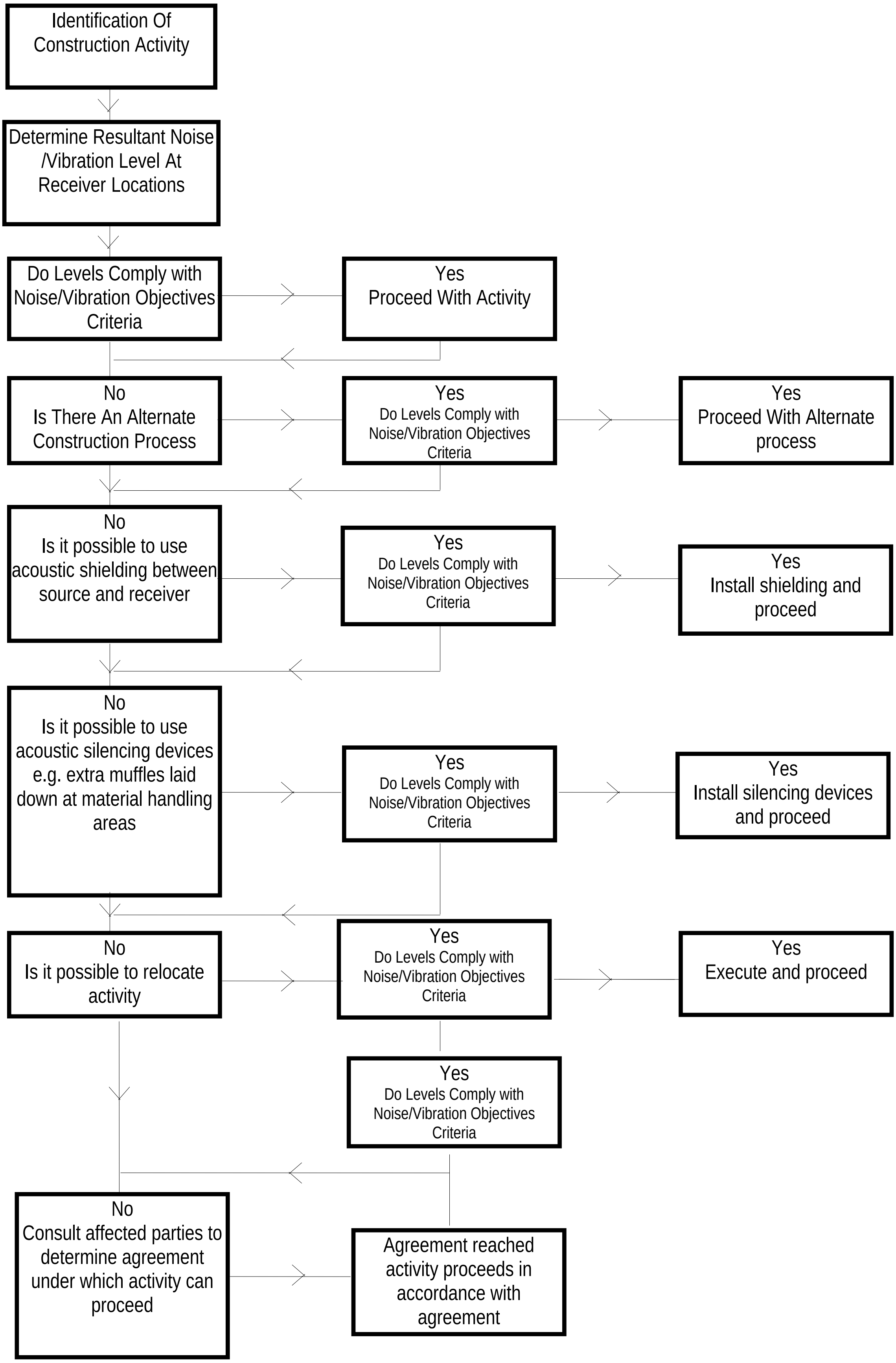
<u>Treatment of specific equipment</u>

In certain cases it may be possible to specially treat a piece of equipment to dramatically reduce the sound levels emitted.

<u>Establishment of Site Practices</u>

This involves the formulation of work practices to reduce noise generation. A noise plan will be developed for this project outlining work procedures and methods for minimising noise.

CONTROL OF NOISE



5.4.2 Vibration

To minimise vibration from construction activities it is proposed that non percussive activities will be used where possible.

It is not expected that the proposed construction activities will generate vibration which will exceed proposed criteria.

6. RECOMMENDATIONS

- Noise and vibration from demolition and construction should be minimised through the development and implementation of a noise and vibration management plan that regulates activities so that all noise emissions from processes are minimised to the extent that it is feasible and reasonable, and comply to the relevant guidelines as outline in Section 5 of this report.

- A detailed assessment of noise emissions from the proposed mechanical plant and equipment should be undertaken by a specialist acoustic consultant and these recommendations shall be implemented in the design and construction of the building and equipment selection to ensure that the combine noise emissions from the site do not exceed the noise levels stipulated in Section 3 of this report.

- The louvres proposed for the north and south facades shall acoustically treated ensure that the combine noise emissions from the site do not exceed the noise levels stipulated in Section 3 of this report.

7. CONCLUSION

This report provides the results of an assessment of the potential impact of noise and vibration emissions arises from the construction and operation of the proposed commercial development located at 17 O'Riordan Street, Green Square on the surrounding properties.

Noise from by traffic movements generated by the proposed development will have no audible effect on existing levels of noise.

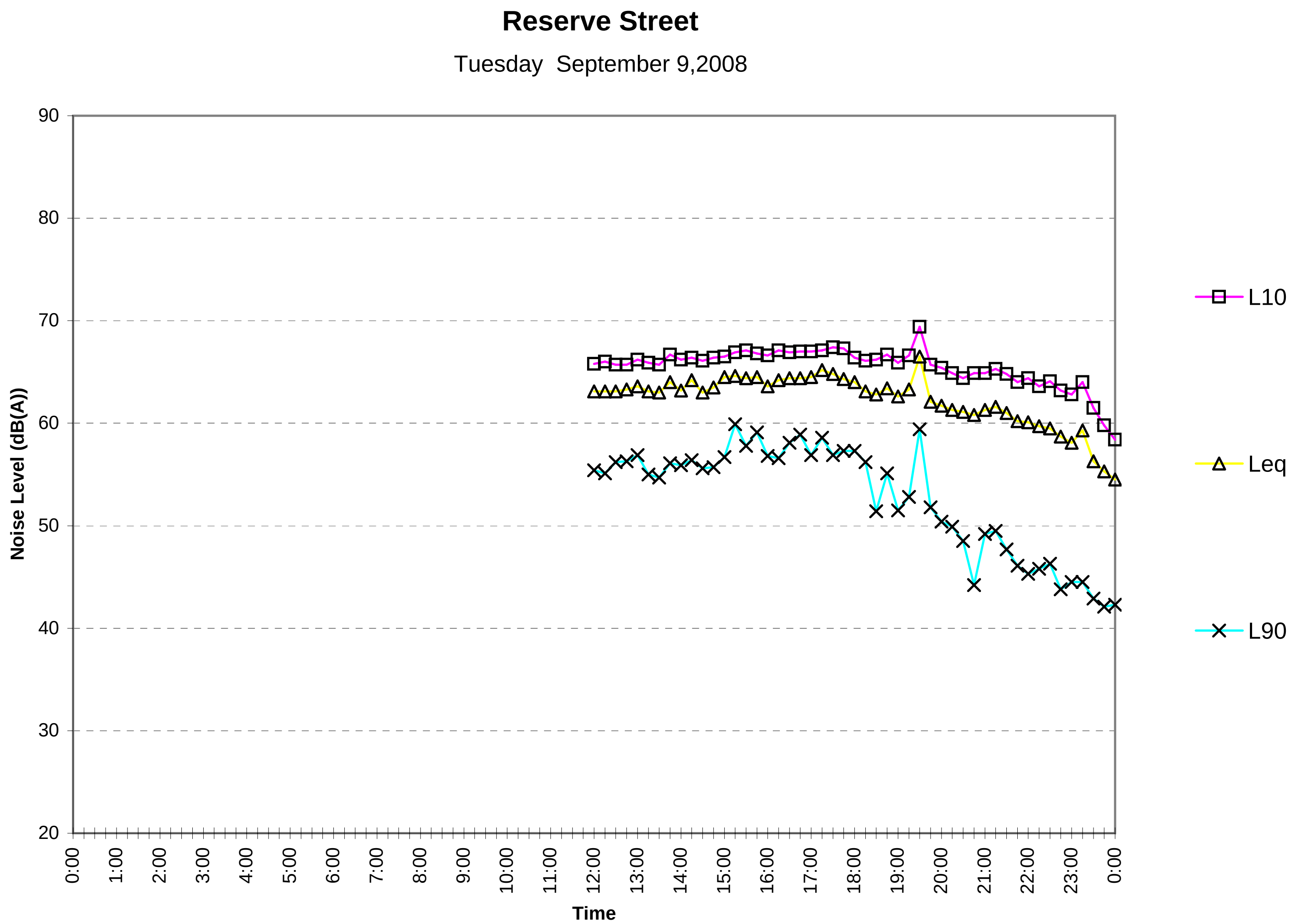
Noise emissions from the proposed operations and plant associated with the proposed development will comply at all times. The noise and vibration emissions from construction activities taking place on the site will be managed in accordance with the recommendations of this report.

Report prepared by

ACOUSTIC LOGIC CONSULTANCY PTY LTD
Judy Zhang

APPENDIX 1

MEASURED NOISE LEVELS



Reserve Street
Tuesday September 9,2008
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80
70
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40
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20
Noise Level (dB(A))
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6:00
7:00
8:00
9:00
10:00
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17:00
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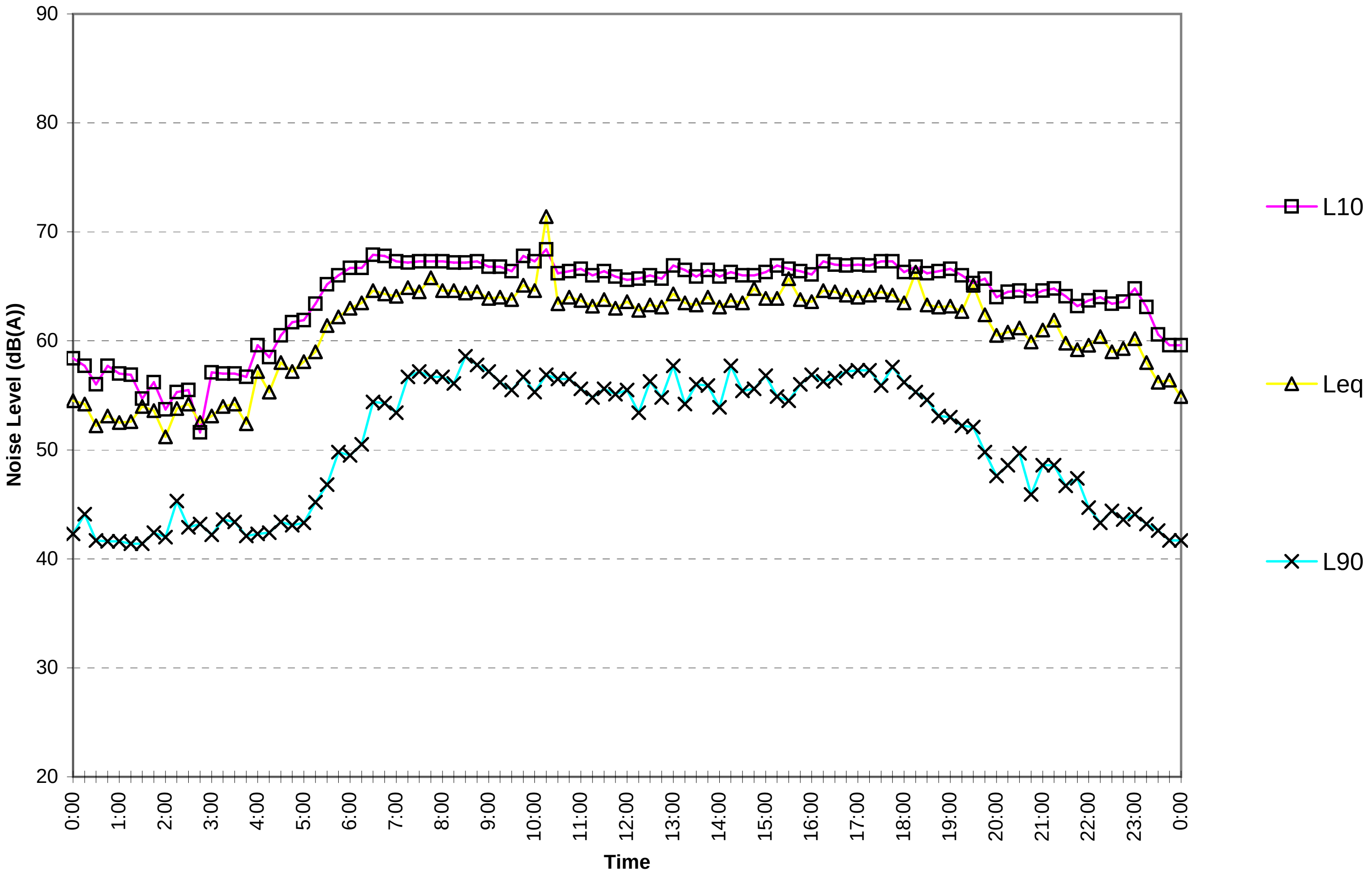
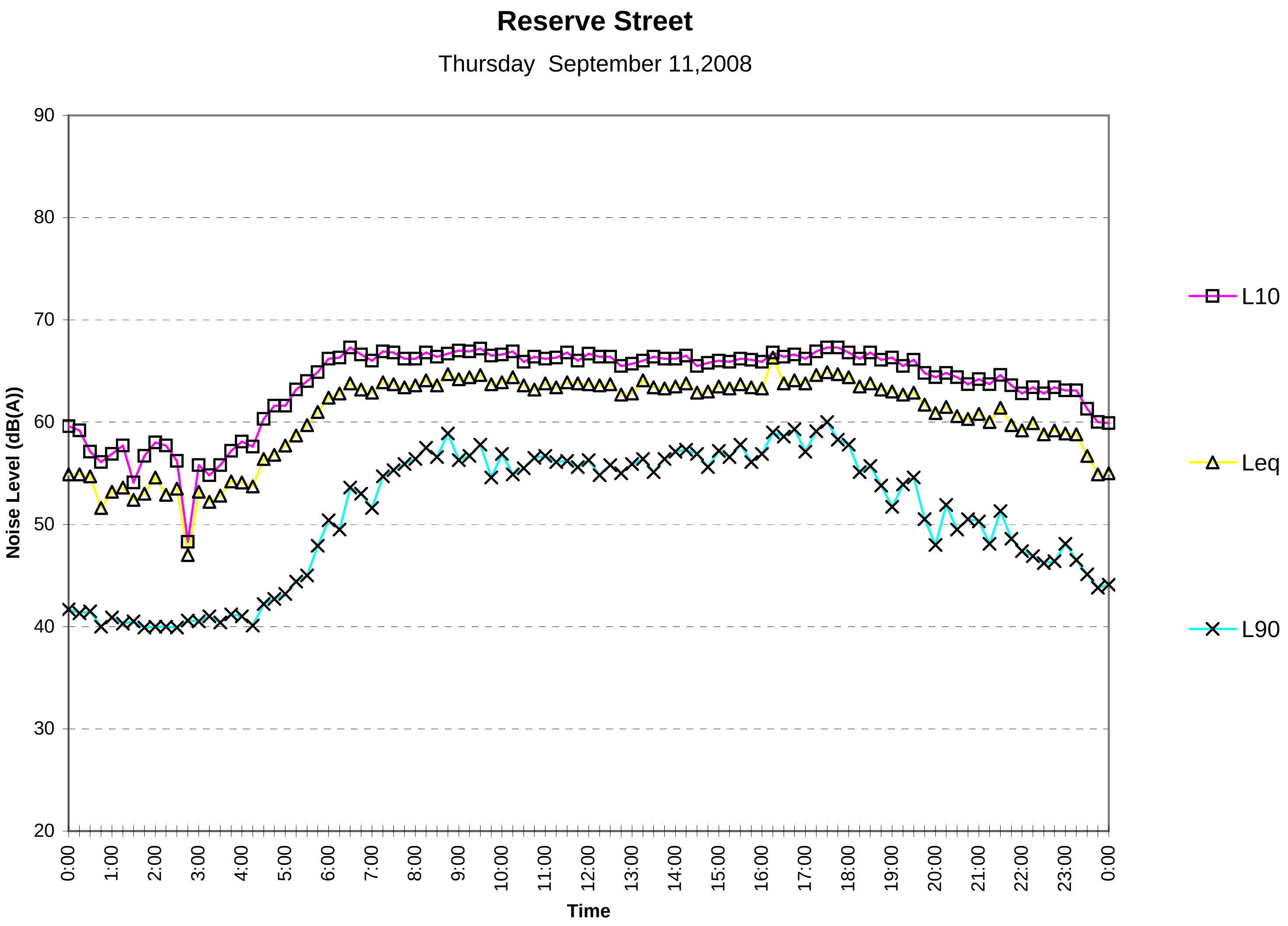
23:00
0:00
Time
L10
Leq
L90

Reserve Street

Wednesday September 10,2008

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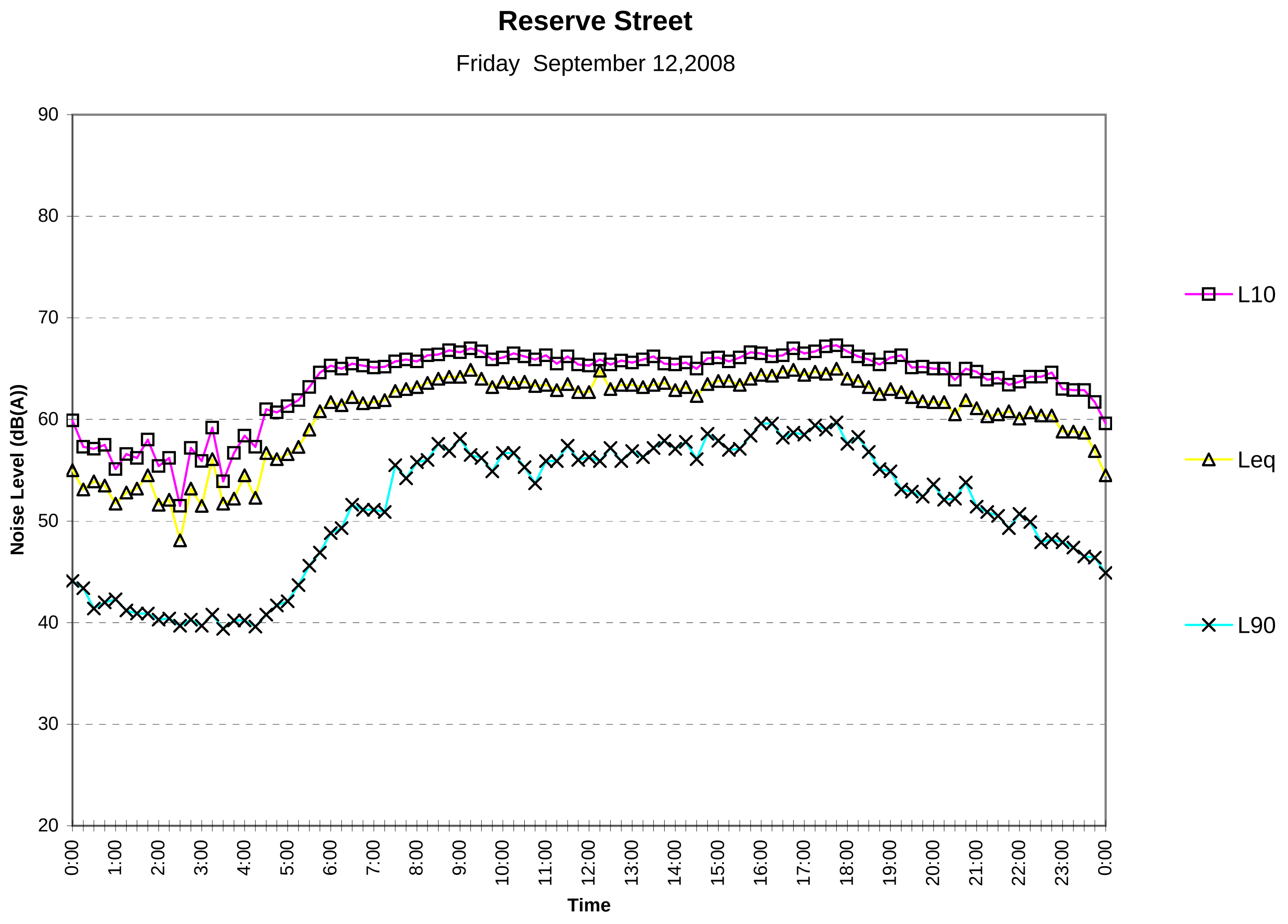

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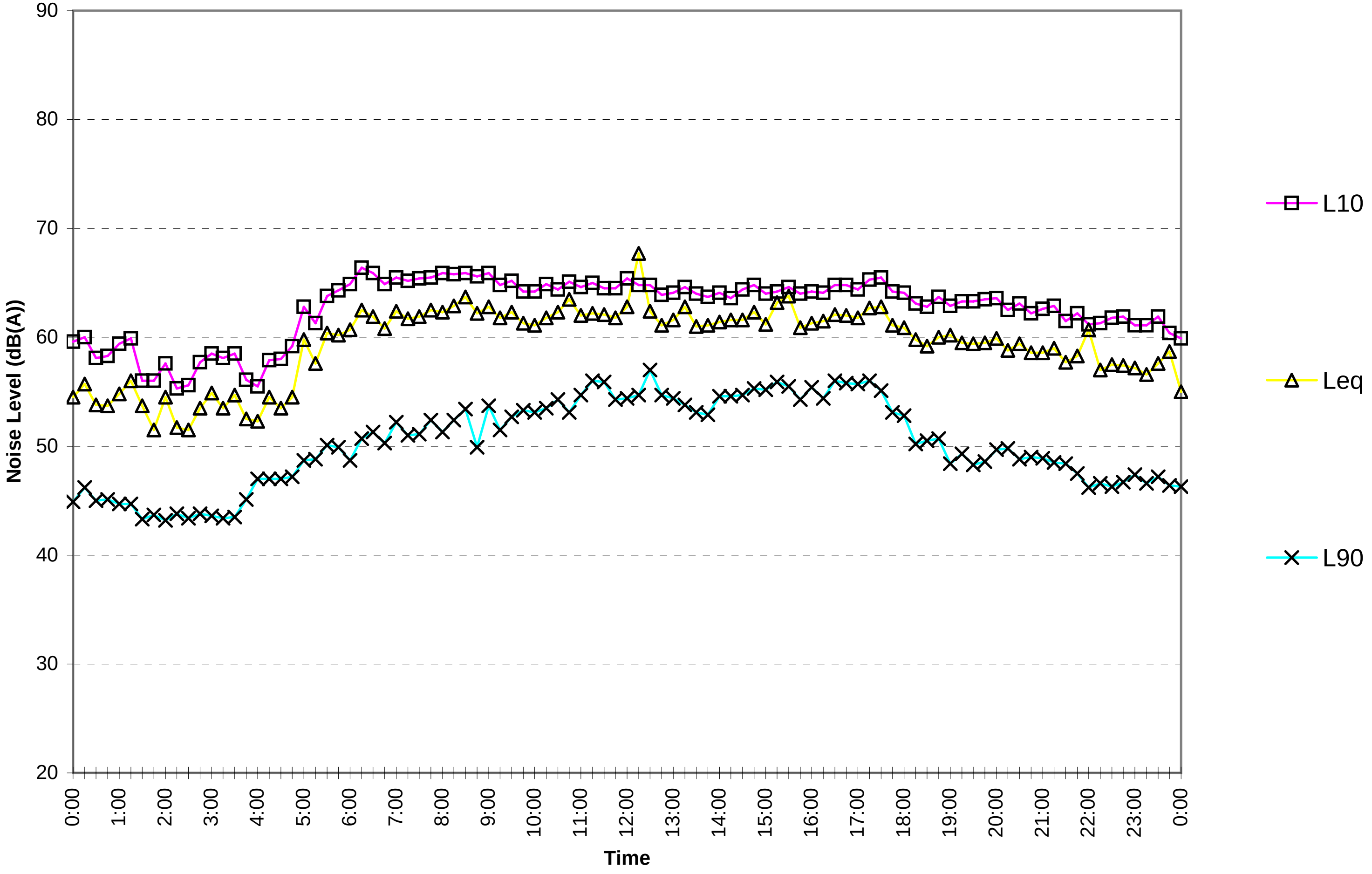
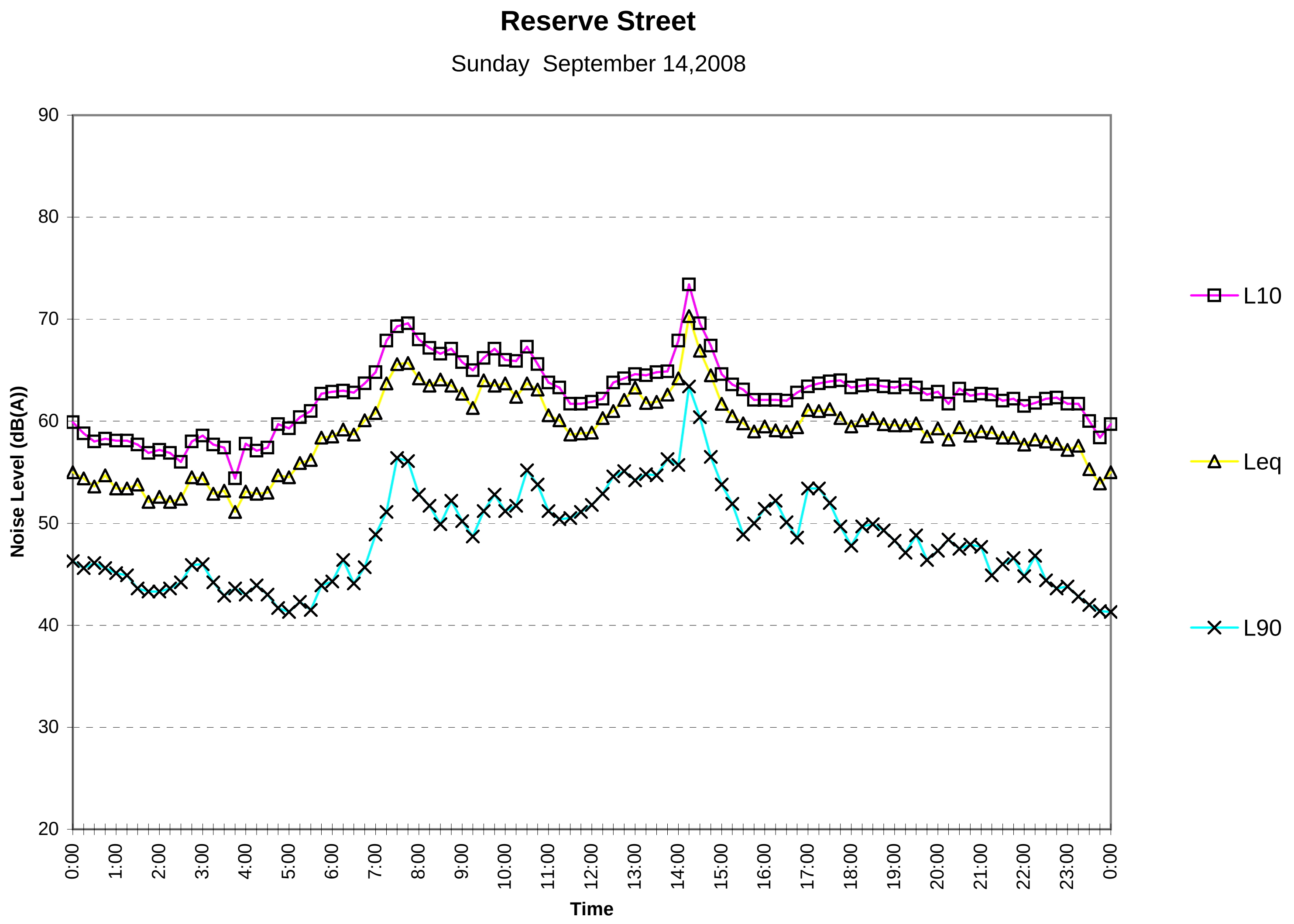
Reserve Street

Saturday September 13,2008

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Time
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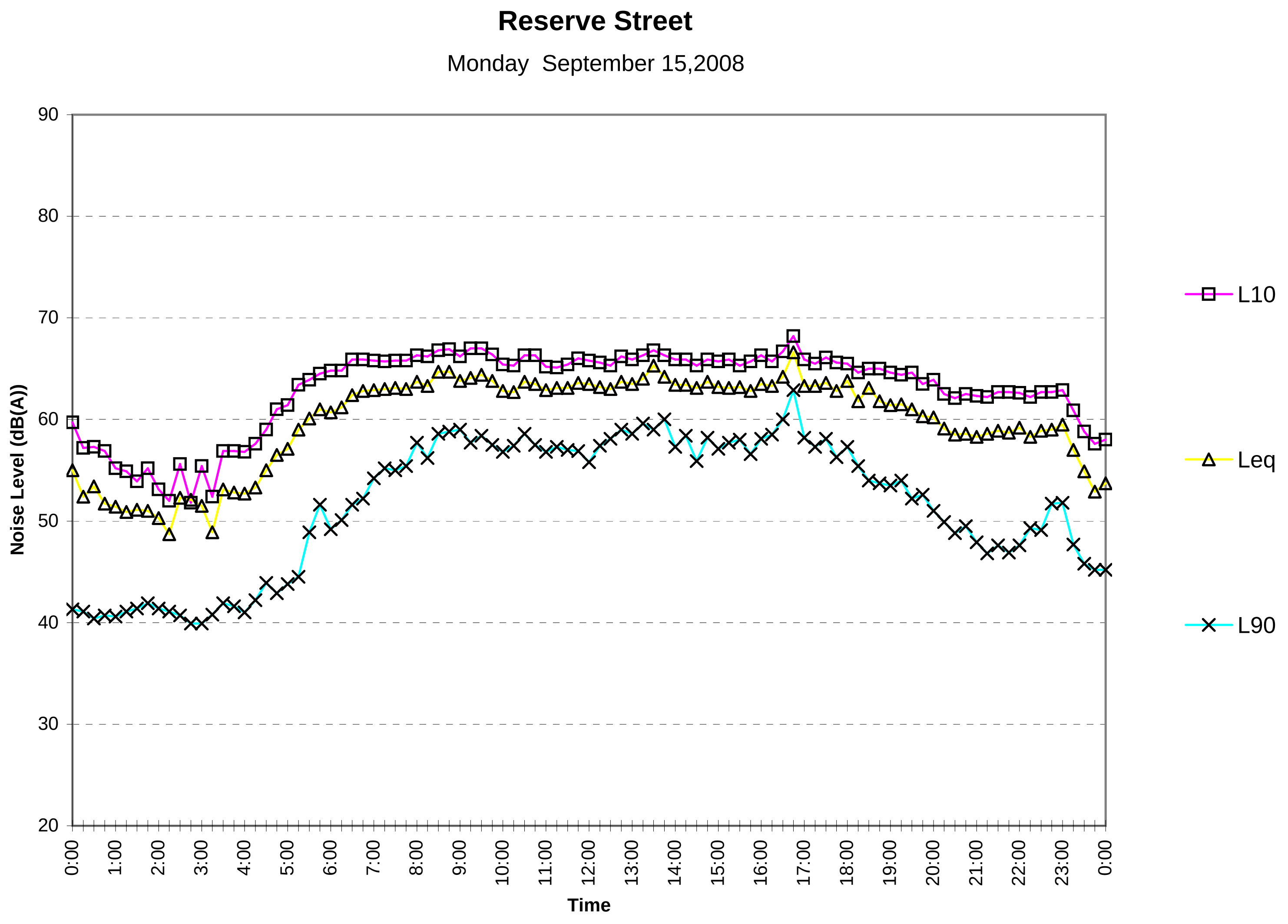

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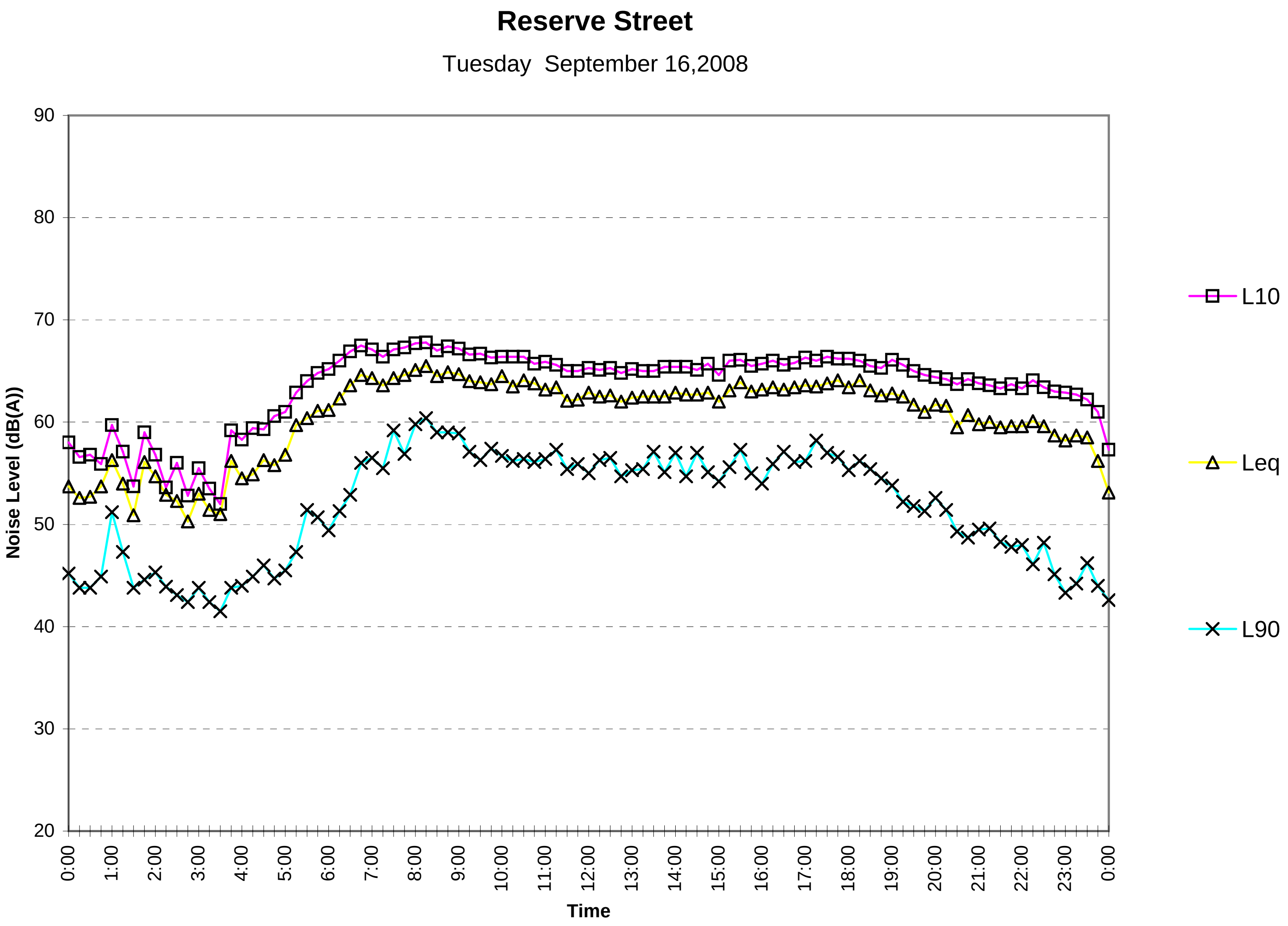

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Time
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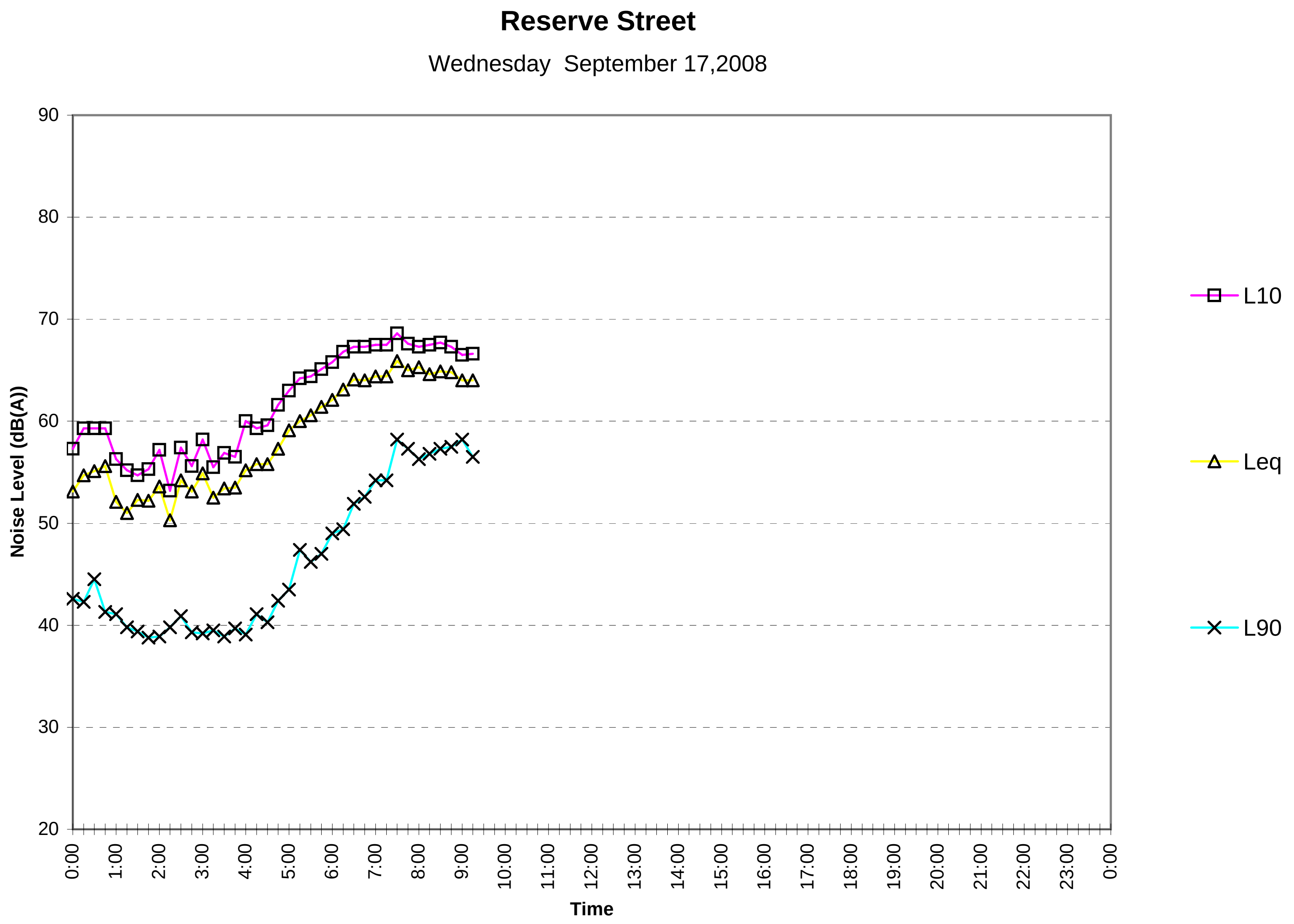

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