The Acoustic Group
CONSULTING ACOUSTICAL & VIBRATION ENGINEERING

trinity point
LAKE MACQUARIE

ACOUSTICAL CRITERIA
TRINTY POINT MARINA AND MIXED USE DEVELOPMENT
44.4732.R2:MSC

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CONTENTS

APPENDICES

1.0 INTRODUCTION

There is a Part 3a Concept Plan approval issued by the Minister for Planning for a tourist, commercial, residential and marina development at Trinity Point, Lake Macquarie.

It is proposed by way of a 75W modification to amend the approved Concept Plan for the various stages of the planned development.

The Marina and Mixed-Use Development was the subject of an Acoustic Assessment prepared by Arup Acoustics that identified project specific noise targets.

The Minister's Approval for the Concept Plan referred to the Arup Acoustics Report and nominated amendments to the general Principle for Acoustics that reflect the acoustic targets nominated in the report.

Since the Concept Plan Approval a number of the EPA source documents have been changed.

The purpose of this report is to provide revised noise targets that address the required amendments (that are based on ambient background levels) and utilise current noise data rather than data from 2007.

This report sets the noise targets to apply for the whole project to which the proposed Development Applications will refer.

It is necessary to identify that in July 2008 The Acoustic Group was retained by Lake Macquarie City Council to undertake a review of the Environmental Assessment of the Concept Plan that was in the process of determination. That review identified amendments required/suggested for the acoustic assessment of which some of those suggestions were incorporated a modified report that was attached to the application.

Before undertaking the subject review on behalf of the Applicant, approval was required from the Council to ensure there would be no conflict of interest in The Acoustic Group preparing the subject document. The Council agreed that with the appropriate declaration as to our previous involvement there would be no conflict in undertaking the assessment.

2.0 THE SITE

The development site is located on the shore of Bardens Bay on Morisset Peninsula in Lake Macquarie, south east of the town of Morisset as shown in Appendix A.

The current approved development is shown in the upper figure of Appendix B is to incorporate:

- a 188 berth floating marina and associated services
- a breakwater jetty structure
- repair and maintenance facilities associated with the marina, and commercial and tourist accommodation

The amended Concept Plan is proposing to eliminate the marina repair and maintenance facilities. On a noise basis the elimination of the marina repair and maintenance facilities gives rise to a significant reduction in potential noise emission throughout the day. It also proposes a similar capacity of hospitality uses with the addition of a marquee option, and also proposes an increase in the number of serviced apartments and residential apartments in the scheme.

The amended project, shown in the lower figure of Appendix B1, will involve 3 site precincts described briefly below;

1. The Tourist/Commercial Precinct; located at the northern end of the site will generally consist of:

    - Restaurant 200 seats plus up to approx. 170 outdoors (some weather protected)
    - Function Room 300 seats plus external marquee on lawn (200 seats) and able to be divided into multiple functions.
    - Café 40 seats plus approximately 30 outdoors
    - Precinct landscaping, green lawns and landscaping, and outdoor pool
    - 63 room hotel with small business centre, pool, day spa and gym, and ancillary shops/commercial premises
    - Administration areas

- On grade and basement parking, and connecting driveways
- Shared pathways connecting adjacent site precincts

2. The Tourist/Residential Precinct; located at the central and southern end of the site will generally consist of:

    - Around 250 apartments comprising a variety of housing and unit types and for a combination of short stay and permanent residents (tbc)
    - Precinct landscaping
    - Basement parking and connecting driveways
    - Shared pathway linking sundial, grotto, to commercial precinct
    - Basement gym and pool

3. The Marina; located off the northern end of the tourist/commercial precinct will generally consist of:

    - 188 berth marina with associated services, jetties, gangways and breakwater (staged across two stages, 94 berths per stage, but with sub staging)
    - Small Marina Office and Chandlery with Marina User facilities (toilets, showers, Lounge facilities (Stage 1)
    - Ongrade parking (staged) and access
    - Associated services such as sewage, water, electricity and infrastructure including fuel and waste management
    - Precinct landscaping (Stage 1)

3.0 ARUP ACOUSTICS CRITERIA

The Arup Acoustic report considered various noise concepts internal occupied spaces, EPA industrial, road traffic and construction noise targets and LAB noise targets for licensed premises summarised on Table 12 below:

Noise Source	Criteria	Reference
Internal Background Noise	Various L_{Aeq} when in use	AS2107:2000
Industrial Noise	Day:$L_{Aeq,15min}$ ≤ 39 dB Evening: $L_{Aeq,15min}$ ≤ 39 dB Night: $L_{Aeq,15\ min}$ ≤ 39 dB	Industrial Noise Policy
Function Room Noise	Before 12.00 am:$L_{A10,15\ min}$ ≤ 39 dB After 12.00 am:$L_{A10,15\ min}$ ≤ 34 dB	Industrial Noise Policy, Liquor Administration Board
Road Traffic Noise	Day: $L_{Aeq,(1h)}$ ≤ 55 dB Night: $L_{Aeq,(1h)}$ ≤ 50 dB	Environmental Criteria for Road Traffic Noise
Construction Noise	Stage 1: $L_{A10,15\ min}$ ≤ 39 dB Stage 2/3/4: $L_{A10,15min}$ ≤ 44 dB	Environmental Noise Control Manual
Helicopter Noise	$L_{Aeq,\ in\ operation}$ ≤ 55 dB $L_{max,\ in\ operation}$ ≤ 82 dB	Environmental Noise Control Manual

(Arup Acoustics) Table 12: Overview of Noise Criteria

The Concept Plan Approval addresses noise emission from the site in terms of EPA limits.

The Concept Plan Approval nominated general EPA criteria from the INP, the relevant construction noise criteria, the ENCM (for road traffic) and the inclusion of the sleep arousal criteria for the marina.

The Concept Plan Approval identifies that the EPA criteria applies to the entire site.

The LAB criteria only apply to noise emission from the licensed areas to residential receivers not ancillary to the licensed areas. For accommodation associated with the Hotel and Function Centre (including restaurant, café, function room and marque (that contains licensed areas, the accommodation is not required to comply with the LAB criteria.

Since the Approval the EPA have released additional policy documents and the LAB has been replaced by the Office of Liquor, Gaming and Racing that would lead to the Arup Acoustics summary table to be amended as shown below.

Noise Source	Criteria	Reference
Internal Background Noise	Various L_{Aeq} when in use	AS2107:2000
Industrial Noise	Day:$L_{Aeq,15min}$ ≤ RBL (bgn) + 5 dB Evening: $L_{Aeq,15min}$ ≤ RBL (bgn) +5 dB Night: $L_{Aeq,15\ min}$ ≤ RBL (bgn) + 5 dB	Industrial Noise Policy
Sleep Arousal	Night $L_{1,1\ minute}$ ≤ background + 15 dB(A)	Noise Guide for Local Government
Function Room Noise	Before 12.00 am:$L_{A10,15\ min}$ ≤ bgn + 5 dB in octave bands After 12.00 am:$L_{A10,15\ min}$ ≤ bgn + 0 dB in octave bands	Office of Liquor Gaming & Racing
Road Traffic Noise	Day: $L_{Aeq,(1h)}$ ≤ 55 dB Night: $L_{Aeq,(1h)}$ ≤ 50 dB	NSW Road Noise Policy
Construction Noise	Background + 10 dB(A) and L_{Aeq} 75 dB	Interim Construction Noise Guidelines
Helicopter Noise	$L_{Aeq,15\ min\ on\ ground}$ ≤ RBL (bgn) + 5 dB	Industrial Noise Policy

(Arup Acoustics) Table 12: Amended Overview of Noise Criteria

The above criteria refer to the background level that is expected to be different at existing residential receivers to that recorded by Arup Acoustics on the subject site, thereby requiring for this assessment, additional measurements on site and off site.

4.0 NOISE MEASUREMENTS

The Arup Acoustics assessment relied upon the results of noise logger measurements conducted on the subject site in October 2007, supplemented by attended measurements towards the nearest residential boundary to the north-west of the site.

Due to the site being removed from major arterial roads and it self being setback from existing residential dwellings, the assessment revealed relatively low ambient backgrounds where a Rating Background Level of 34 dB(A) was obtained for the day and evening periods, reducing to 34 dB(A) at night.

The report identified that at the subject site noise from the Vales Point Power Station across Lake Macquarie to the south of the development was a noise source, although the assessment notes that no impact of the power station was observed.

Our recent site visit indicated noise from the power station to contain a dominant low-frequency characteristic both in the day and night.

On the basis of ambient measurements provided in the Arup Acoustics report there was an assumption that the levels recorded on site would apply to the surrounding environment but did not include any supplementary measurements on the opposite side of the bay to confirm that fact.

The ambient levels recorded on site are appropriate for a greenfield site. However, in established residential areas there is generally a self-generated ambient background level. Utilising the ambient levels recorded on the site could give rise to an underestimate of the background level that exists at nearby existing residential areas.

For the purpose of the subject investigation and to address the additional acoustic requirements provided in the Approval for the Concept Plan three unattended noise loggers were used for the investigation with one logger located on site and two located off site.

Appendix C1 identifies by the yellow circles the logger locations used in the previous study to show that they remained entirely on the subject site.

For the purpose of this investigation one logger was located at the rear of 7 Lake View Avenue, Brightwater on the opposite side of the bay and having an uninterrupted view of the site.

The second logger was located at the rear of 57A Lakeview Road, Morisset Park and represents the nearest residential dwelling to the northern portion of the subject site. The logger site is in the vicinity of the attended measurements undertaken in the previous study.

Logger 5 represents the south-eastern corner of the site, being significantly removed from residential properties and is expected to reveal a similar levels that recorded in the previous study.

In addition to the unattended noise logger measurements, attended measurements were conducted on 23rd July 2014 at locations on the subject site identified in Appendix C2 as locations A-D. Additional attended measurements were carried out at the western end of Lake View Avenue, Brightwater, in proximity to location logger three.

Measurements during the night-time period on the same day were conducted at the western end of Lake View Avenue Brightwater and at locations A and D on the subject site.

4.1 Unattended Noise Monitoring

The unattended noise monitoring was carried out between 23rd July, 2014 and 1st August, 2014 in accordance with the Australian Standards AS1055 “Acoustics – Description and Measurement of Environmental Noise” and with the procedures set out Appendix B of EPA’s *Industrial Noise Policy* (the “INP”).

Unattended noise monitoring at location 3 and 4 utilised Acoustic Research Laboratory monitors Type EL-215 (serial numbers number 194599 and 1946004 respectively). The noise monitor was calibrated at the start and end of the measurement period using a Rion NC-73 Calibrator. No significant drift in calibration occurred.

At logger location 5, being on south-eastern corner of the site, monitoring was carried out using a SVAN 957 sound level meter (serial number 12312) with the calibration reference signal checked prior to and after measurements using a Bruel & Kjaer Sound Level Calibrator Type 4321. No significant drift in in calibration occurred.

The logger stores statistical noise descriptors for each 15-minute sample. At the end of the measurements the stored data was downloaded onto a computer for subsequent analysis.

Appendix B of the INP identifies a procedure for processing the ambient background level data to derive a single number for the background that is described as the Rating Background Level (the "RBL").

Appendix D provides the results for monitoring conducted at location 3 in Lake View Avenue, Brightwater

Appendix E provides the results for Location 4 at 57A Lakeview Road, Morisset Park whilst Appendix F provides the results for the on-site logger location identified as Logger 6.

Table 1 summarises the ambient noise levels measured at the logger monitoring locations, split into day, evening and night time periods. For completeness the ARUP logger results are included in the table.

TABLE 1: Measured Ambient Noise Levels

Logger	Noise Descriptor	Time of Day		
		Day (7am-6pm)	Evening (6pm-10pm)	Night (10pm-7am)
3	Rating Background Noise Level (dB(A) L_{90})	35	34	33
	Ambient Noise Level dB(A) $L_{eq(Period)}$*	46	42	39
4	Rating Background Noise Level (dB(A) L_{90})	32	32	30
	Ambient Noise Level dB(A) $L_{eq(Period)}$*	49	44	43
5	Rating Background Noise Level (dB(A) L_{90})	37	33	32
	Ambient Noise Level dB(A) $L_{eq(Period)}$*	45	40	42
ARUP	Rating Background Noise Level (dB(A) L_{90})	34	34	30
	Ambient Noise Level dB(A) $L_{eq(Period)}$*	47	38	35

The Rating Background Levels identified in Table 1 above indicate that with respect to the subject site (logger location 5) higher background levels during the day, similar background levels in the evening and marginally higher levels at night when compared to the assessment for the original Concept Plan.

With respect to the existing residential premises in proximity to the subject site the latest results are consistent with the previous measurements. However, for the properties to the east of the site (logger 3 it Brightwater) the day and evening Rating Background Levels are similar the night-time levels being marginally higher.

The difference in the night-time background levels is relevant as to the operation of plant and equipment that will continue throughout the night and as such alters the acoustic design concepts with respect to the intrusive noise targeted background + 5 dB(A).

With respect to ambient Leq noise levels (being the cumulative average noise level) a similar pattern exists for the day and evening periods between the previous and latest results, whereas the night-time ambient Leq is higher for the night-time results.

However in dealing with the amenity noise target the design levels relate to the industrial noise present in the environment, not the overall noise level. The Arup Acoustics report suggested there was no industrial noise at the residential locations and nominated industrial noise contributions below the measured ambient Leq levels.

Our site visits indicated the Vales Point Power Station at times marginally influences the background level and as such needs to be considered when determining the amenity noise targets.

4.2 Attended Noise Monitoring

To supplement the logger data and ascertain the acoustic environment of the area, attended noise monitoring was undertaken using a Brüel & Kjær 2250 (s/n 2274764) and a Brüel & Kjær 2260 (s/n 1772289) sound level meters on 23rd July 2014. The sound level meters were calibrated at the start and end of each measurement period using a Brüel & Kjær Sound Level Calibrator Type 4230 or 4231. No significant drift in calibration occurred.

The attended noise measurements were conducted in accordance with the Australian Standards AS1055 “Acoustics – Description and Measurement of Environmental Noise” and with *Appendix B* of the EPA’s INP.

For the attended measurements the Enhanced Logging module on the sound level meter was used to record the A-weighted level of time (10 times a second) so as to generate the time splice graph (being a graph of the variation of the dB(A) level over each 15-minute sample period) set out in Appendix G. The results clearly identify the variation in the noise environment as a result of various noise sources affecting each site.

The statistical results of the measurements in terms of the A-weighted level and the octave bands are tabled in Appendix G, being separated into daytime measurements from the night time (pre-midnight) measurements.

The attended measurement results agree with the logger results.

5.0 ACOUSTIC CRITERIA

The amended Arup Acoustics Table 12 (shown on page 5) sets out the noise targets as required by the Approval for the current Concept Plan, taking into account the change in various EPA policy documents since the Arup report was issued.

The Approval for the current Concept Plan relates to EPA noise targets and as such ignores the LAB/OLGR criteria and internal noise targets for mechanical plant.

With respect to noise emission from the operational site the noise targets are basically the same in terms all the assessment criteria but with minor changes to the project specific targets that would apply at residential receivers.

The Approval for the current Concept Plan advised that the EPA noise targets would apply to the entire development rather than individually applied to different components of the development.

Due to the relatively low ambient background levels for the subject site, whilst not acknowledged in the Arup Acoustics report, the Approval identifies that specific noise controls will be required for the development to achieve the nominated targets.

5.1 Intrusive Noise Targets

From the rating background levels set out in Table 1 the intrusive noise target for the entire development is shown in Table 2 below. The intrusive noise target of individual components of the development does not apply to other components of the development.

TABLE 2: Intrusive Noise Criteria

Residential Area	Time of Day	Intrusive Noise Target dB(A)$L_{eq(15\ min)}$
Brightwater (Logger 3)	Day Time (7am – 6pm)	40
	Evening (6pm – 10pm)	39
	Night (10pm – 7am)	38
Morisset Park (Logger 4)	Day Time (7am – 6pm)	37
	Evening (6pm – 10pm)	37
	Night (10pm – 7am)	35

5.2 Amenity Noise Targets

Table 2.1 of the INP sets out the following acceptable amenity noise levels as a result of industrial noise sources. By reference to the notes to Table 2.1 in the INP, that classifies the types of receivers, the existing residential properties to the west and north west of the site are removed from road traffic and would be classified as "Rural" as nominated in the Arup Acoustics assessment.

However, for Brightwater the nature of the existing residential development utilises a corridor road through the area that would lead to those locations being classified as "Suburban".

The amenity noise targets from the INP are shown below.

TABLE 3: Amenity Target from Table 2.1 of the INP

Land Type / Receiver Location	Time of Day	Amenity Noise Objective dB(A)$L_{eq(Period)}$	
		Acceptable	Maximum
Rural	Day Time (7am – 6pm)	50	55
	Evening (6pm – 10pm)	45	50
	Night (10pm – 7am)	40	45
Suburban	Day Time (7am – 6pm)	55	60
	Evening (6pm – 10pm)	45	50
	Night (10pm – 7am)	40	45

From our site visits the Vales Point Power Station is audible at the site and in Brightwater as a low frequency hum. Whilst the power station does not influence the background level in the day and evening periods it would appear to marginally influence the background level at night.

Under the requirements of Table 2.2 of the INP the amenity target for night time operations requires a minor correction for Brightwater to give a design amenity target of 39 dB(A).

The Morisset Park location (logger 4) was not found to be influenced by the power station as the topography at the southern end of the subject site was providing some acoustic shielding.

5.3 Sleep Disturbance Noise Targets

The Approval for the current Concept Plan identifies that, in addition to the intrusive noise limit and the amenity noise limit from the EPA's INP, the EPA's relevant Construction Nosie Criteria and Road Traffic Criteria there is also a requirement to consider the sleep arousal criterion specifically for the operation of the marina.

The sleep arousal criterion does not appear in the EPA's INP but is set out in the EPA's *Noise Guide for Local Government* (NGLG).

Under the NGLG, potential sleep disturbance impacts should be considered for intermittent noise generated after 10 pm.

The NGLG identifies a sleep disturbance target of background + 15 dB(A) outside a bedroom window when assessed as a L_{Amax} or an $L_{1,\ 1\ minute}$.

Whilst sleep disturbance is not identified in the INP, the 2006 Application Notes to the INP refers to the *EPA's Environmental Criteria for Road Traffic Noise* (the "ECRTN").The ECRTN refers to a range of investigation into sleep disturbance from road traffic, ultimately relying upon the EPA sleep arousal criterion of background + 15 dB(A) when measured as an $L_{1,\ 1\ minute}$ outside a bedroom window. This criterion would apply to the marina.

The ECRTN has been replaced by the *NSW Road Noise Policy* that provides a slightly different concept to an absolute level.

Under the RNP where road traffic has the potential for sleep disturbance impacts a two stage test is carried out:

- The L1 noise level of any specific noise source should not exceed the background noise level (L90) by more than 15 dB(A) outside a resident's bedroom window between the hours of 10 pm and 7 am. If the noise events are within this night time period, then sleep disturbance impacts are unlikely and no further analysis is needed.

- If noise events can potentially exceed the sleep disturbance criteria, then an impact assessment is required to be carried out taking into account the level and frequency of noise events during the night, existing noise sources, etc. This test takes into account the noise level and number of occurrences of each event with the potential to create a noise disturbance.

From the above it is necessary to identify the threshold level for evaluating potential sleep disturbance impacts from road traffic movements off site. The planter areas in Trinity Point Drive restrict the speed of traffic and the maximum noise levels from such traffic.

With respect to on site traffic movements they are not on a road and therefore not under the road traffic sleep criterion. The majority of traffic movements and parking on the development site will be under cover with the exception of the marina car park that is at grade.

The marina car park use at night would be assessed under the NGLG as part of the marina assessment. Under the Approval, the sleep disturbance criterion that is applicable to the marina will vary throughout the night as does the background, i.e. the sleep arousal criterion is based upon the actual background throughout the night and not the rating background level.

Utilising the Logger results set out in Appendices D and E the sleep disturbance criteria for residents to the north-west and west of the marina is set out in Table 4 for before midnight and after midnight.

TABLE 4: Sleep Disturbance Criteria

Location	Background Noise Level dB(A)L_{90}	Sleep Arousal Limit dB(A) $L_{1(1min)}$
Logger 3 (Brightwater)	38 (before midnight)	53
	33 (after midnight)	48
Logger 4 (Morisset Park)	34 (before midnight)	49
	30 after midnight)	45

5.4 Traffic on Public Streets

The Arup Acoustics report considered road traffic noise from the development in terms of the EPA's *Environmental Criteria for Road Traffic Noise* (ECRTN) document.

The ECRTN has been replaced by the *NSW Road Noise Policy (RNP)*.

Under the requirement of Table 3 in the RNP for existing residences affected by additional traffic on existing local roads generated by the land use development the following overall traffic noise levels are recommended:

TABLE 5: Criteria for Traffic Noise for Local Roads

Road Type	Time of Day	Traffic Noise Level Roads
Local Road	Day (7am to 10pm)	55 dB(A) $L_{eq(1hr)}$
	Night (10pm to 7am)	50 dB(A) $L_{eq(1hr)}$
Sub-arterial Roads	Day (7am to 10pm)	60 dB(A) $L_{eq(18hr)}$
	Night (10pm to 7am)	55 dB(A) $L_{eq(9hr)}$

The existing traffic noise levels shown for Loggers 4 & 5 in Appendices F & G reveal ambient traffic noise to be well under the recommended levels.

It is noted that Trinity Point Drive has planter areas to accommodate trees along the road that limits the potential speed in that street that in turn will reduce the noise impact of the additional traffic from the development.

5.5 **Construction Noise**

The Arup Acoustics assessment nominated for construction noise the noise criteria set out in Chapter 171 of the Environmental Noise Control Manual. However, that document has been discontinued for some time and with respect to construction noise the EPA has issued the *Interim Construction Noise Guideline* (ICNG) that would be applicable to the subject development.

The ICNG nominates different criteria to the ENCM with the acknowledgement that in some circumstances the previous acoustical criteria were unrealistic and could not be achieved if developments were to proceed.

TABLE 6: Construction Noise Targets

Time of Day	Management level LAeq (15 min)	How to apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.

Time of Day	Management level LAeq (15 min)	How to apply
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2.

5.6 Project Specific Criteria

From the above the following EPA project specific acoustic criteria will apply to the entire development (either the current approval or the proposed modifications) for the nearest residential receivers in proximity to or opposite the development.

TABLE 7: Project Specific Noise Criteria

Assessment Area	Noise Descriptor	Time of Day		
		Day (7am – 6pm)	Evening (6pm – 10pm)	Night (10pm – 7am)
Brightwater (Logger 3)	Intrusive Noise Objective dB(A)$L_{eq(15\ min)}$	37	37	35
	Amenity Noise Objective dB(A)$L_{eq(Period}$	55	45	39
	Sleep Disturbance Criteria	N/A	N/A	49 (10.00- midnight) 45 (midnight to 7am)
	Construction Noise	42/75	42	NA
Morisset Park (Logger 4)	Intrusive Noise Objective dB(A)$L_{eq(15\ min)}$	40	39	38
	Amenity Noise Objective dB(A)$L_{eq(Period}$	50	45	40
	Sleep Disturbance Criteria	NA	NA	48 (10.00- midnight) 43 (midnight to 7am)
	Construction Noise	45/75	39	NA

5.7 Project Noise Components

Table 7 sets out the EPA project specific targets referred to in the Approval for the Concept Plan in terms of the entire development.

As identified above the criteria applicable to noise emitted from licensed premises does not fall under the EPA project specific goals and is covered separately by more stringent criteria (in octave bands) issued by the Office of Liquor, Gaming and Racing. The OLGR criteria apply to individual licensed premises and not the entire development which therefore requires a different assessment for those sections of the development.

The octave band ambient background level measurements provided in Appendix G identify the basis of the OLGR criteria and will need to be addressed in the separate development applications for the components of the development that contain licensed premises.

The application of the OLGR criteria needs to identify affected residential boundary that is not ancillary to the licensed premises. That is, the accommodation areas associated with the hotel, function centre or associated serviced apartments are not subject to the OLGR criteria for license activities in the hotel and function centre.

However, if the commercial areas of the development involve different entities that do not fall under the one liquor license or are not incorporated as a total solution then consideration needs to be undertaken as to affected residential boundaries of adjoining components that form part of the subject development.

For example, the two nearest and perhaps three apartment buildings to the commercial precinct will form part of guest accommodation to the hotel and function centre, and therefore would not have the OLGR criteria applied to the hotel and function centre (including restaurant).

In terms of the EPA project criteria the construction criteria applies to any construction work on site to existing residential premises. Therefore with respect to the various stages of the construction same criteria will apply for each stage.

In terms of the intrusive noise target and the amenity noise targets set out in Table 6 compliance with the intrusive noise target will result in compliance with the amenity noise target. With the elimination of the marina maintenance facilities the principal noise emission source becomes mechanical plant associated with the individual stages that will be related to air-conditioning plant, and additional mechanical plant associated with cool rooms and mechanical services that are not specifically related to air-conditioning.

It is envisaged that mechanical plant associated with the residential component of the development would produce lower noise emission levels than for the commercial component and therefore in terms of a cumulative noise impact the intrusive noise target allocated for the commercial component is set at a higher level and therefore the residential component.

Investigation of other marina developments reveals negligible noise from mechanical equipment associated with the marina (pumps and electrical substation) resulting noise contributions significantly below the design target.

On the basis of the intrusive noise targets set out in Table 6 the mechanical plant will need to be designed for more stringent criteria being the night time period and as such automatically achieve compliance with the day time criteria.

On the basis of maintaining the overall noise targets following intrusive noise targets for the individual components of the development have been determined.

TABLE 8: Intrusive Noise Targets for Project Stages

Assessment Area	Component	Time of Day			
		Day (7am – 6pm)	Evening (6pm – 10pm)	Night (10pm - midnight)	Night (midnight – 7am)
Brightwater (Logger 3)	Overall Intrusive Noise Objective dB(A) $L_{eq(15\ min)}$	37	37	37	35
	Commercial (including function centre, restaurants and cafe)	32	32	32	30
	Hotel and Serviced Apartments	31	31	31	29
	Marina and associated retail	31	31	31	29

Assessment Area	Component	Time of Day			
		Day (7am – 6pm)	Evening (6pm – 10pm)	Night (10pm - midnight)	Night (midnight – 7am)
	Residential Apartments	29	29	29	27
Morisset Park (Logger 4)	Overall Intrusive Noise Objective dB(A) $L_{eq(15\ min)}$	40	39	39	38
	Commercial (including function centre, restaurants and cafe)	35	34	34	33
	Hotel and Serviced Apartments	35	34	34	33
	Marina and associated retail	35	34	34	33
	Residential Apartments	25	25	25	25

The sleep arousal criterion is not a cumulative impact and applies to each of the individual areas. Dependent upon the determination of the relationship of serviced apartments and residential accommodation to the licensed areas the sleep arousal criterion may or may not apply to those areas.

However, the sleep arousal criterion would apply to any outdoor areas of the commercial or hotel components that operate at night with respect to existing residential premises.

Similarly noise from the marina at night would also be governed by the sleep arousal criterion. In a practical sense the marina operations will be governed by a noise management plan that will be contained in the operational management plan for the marina to address those issues.

6 CONCLUSION

The acoustic assessment prepared by Arup Acoustics that accompanied the Concept Plan provided preliminary information that indicated the quiet nature of the subject area that as a consequence would require specific noise control measures to satisfy the relevant acoustic criteria imposed upon the development.

Since the preparation of that report the EPA have issued a number of documents to replace those identified in the Arup report. In general the overall noise targets do not change with respect to continuous noise emitted from the subject site but as identified in the Approval for the Concept Plan the development is to comply with the relevant EPA targets noting that the noise targets apply to the entire development, rather than individual components that could see a cumulative increase under that assessment method.

The Approval for the Concept Plan identified the need for the inclusion of the EPA's sleep arousal criterion, specifically for the marina.

To address the additional matters concerning acoustics raised in the Approval for the Concept Plan this report contains additional ambient monitoring as an update of the previous report and inclusion of the relevant EPA documents/criteria that would apply to the overall project.

An amended Concept Plan has eliminated the marina maintenance facilities, which automatically reduces noise emission from the development, and proposed an increase in serviced apartments and residential apartments and clarifies capacities of hospitality uses.

To facilitate the progress of staged development applications this report provides in Tables 6 and 7 the overall project specific noise targets that apply to the entire development (as approved or as modified).

For the intrusive noise target the major source of noise emission will be that associated with mechanical plant for which the different components of the development have been allocated noise design targets set out in Table 8.

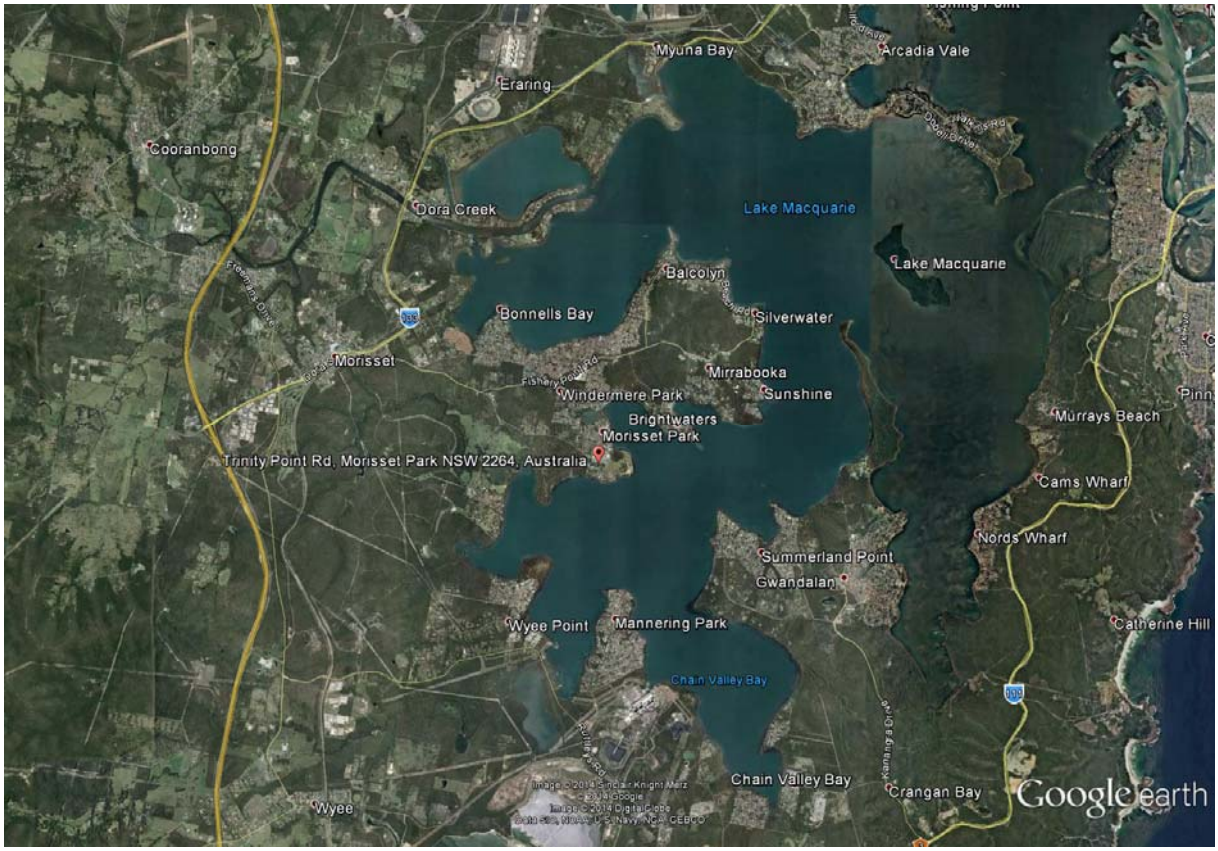
The use of the criteria set out in Tables 6, 7 & 8 is to be used for the noise assessment for future development applications without the need to reproduce the ambient noise data and assessment procedures identified in and appended to this report.

Yours faithfully,

THE ACOUSTIC GROUP PTY LTD

STEVEN E. COOPER

APPENDIX A: Site Location

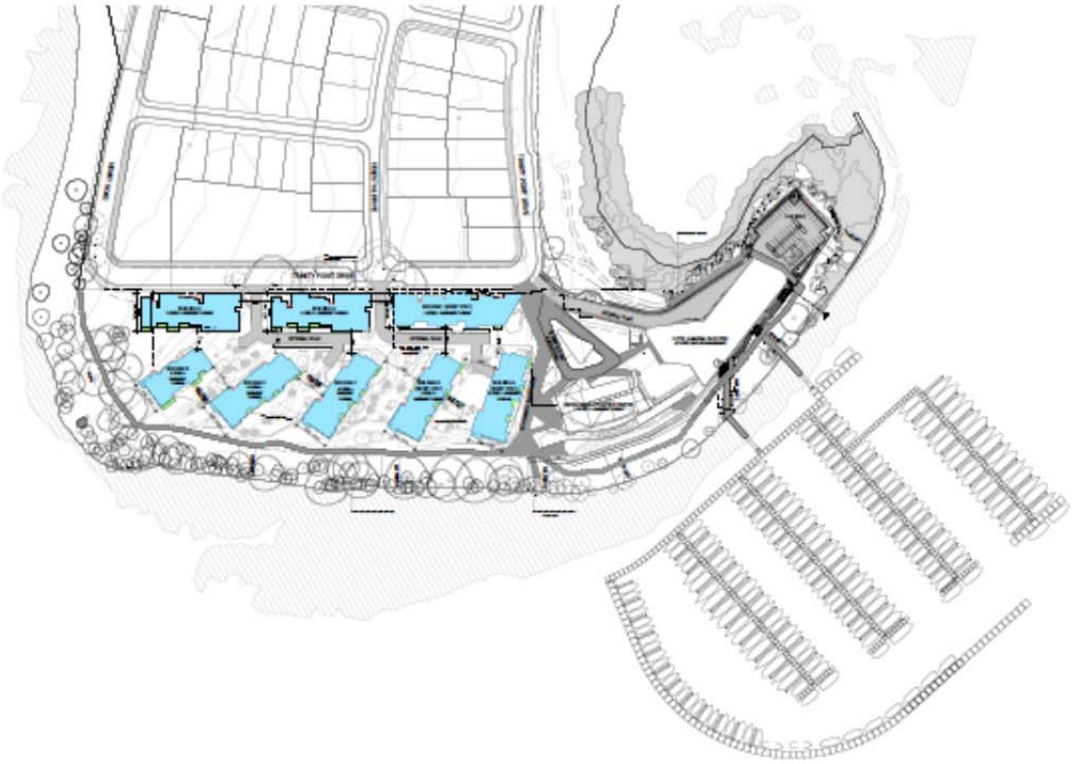


CONTEXT PLAN

KEY

1 Site
2 Lake Macquarie State Recreation Area
3 Barden Park
4 Sunshine Park
5 Bonnells Bay Shopping Centre
6 Koompahtoo Aboriginal Reserve

APPENDIX B: Approved and Proposed Layouts



APPENDIX C: Logger and Measurement Locations

ARUP Logger Locations

TAG Logger Locations


D
C
B
A
Henry Rd
Image © 2014 Sinclair Knight Merz
© 2014 Google
Google earth

APPENDIX D: Logger Results – Location 3

Location 3

Job Number: 44.4732.R2
Instrumentation: ARL Logger
Logger Location: rear of 7 Lake View Ave, Brightwater
Free Field: yes
Monitoring Period: Wednesday 23 July 2014 to Friday 1 August 2014

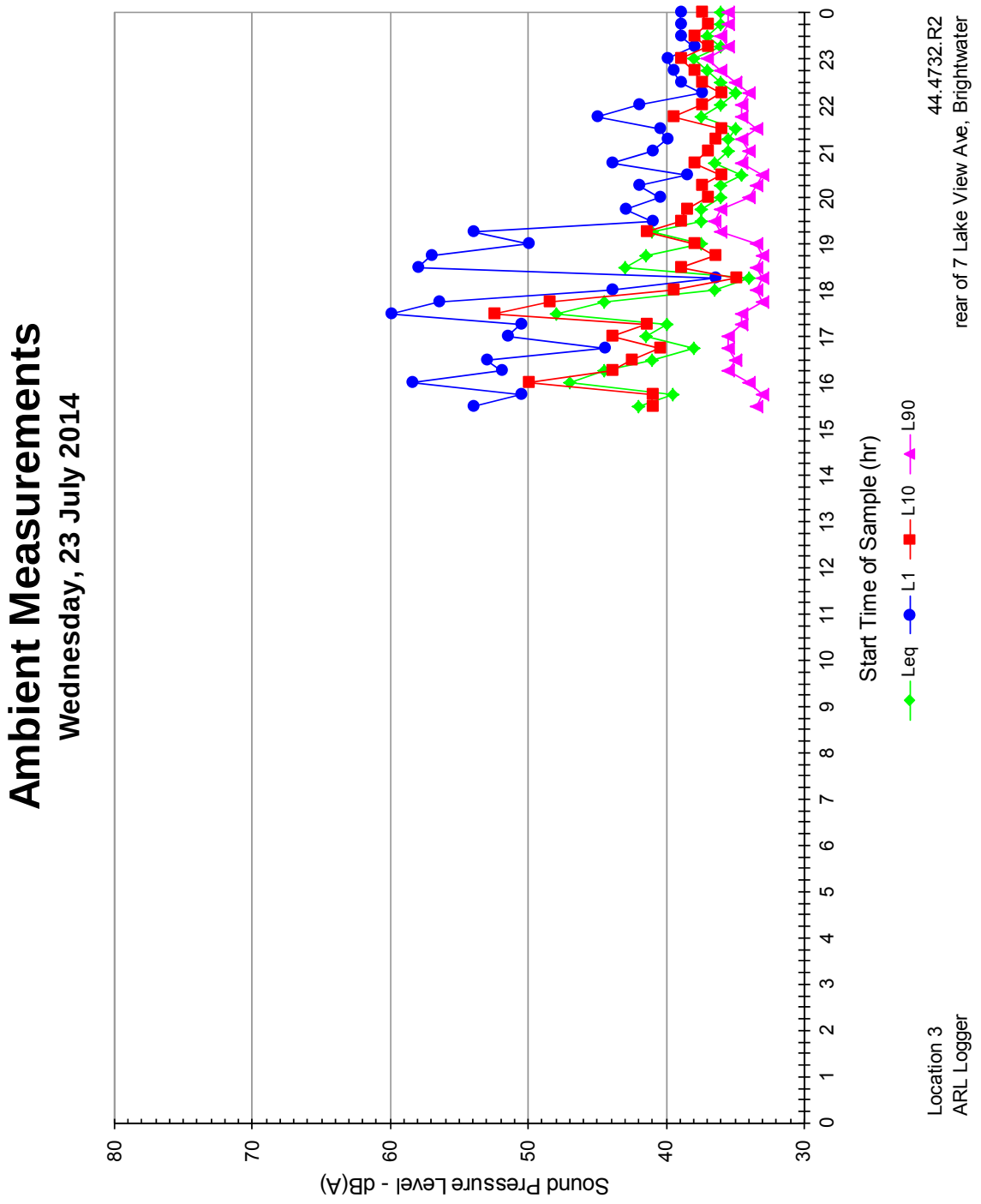
BACKGROUND AND AMBIENT NOISE MONITORING RESULTS
NSW EPA's INDUSTRIAL NOISE POLICY , 2000

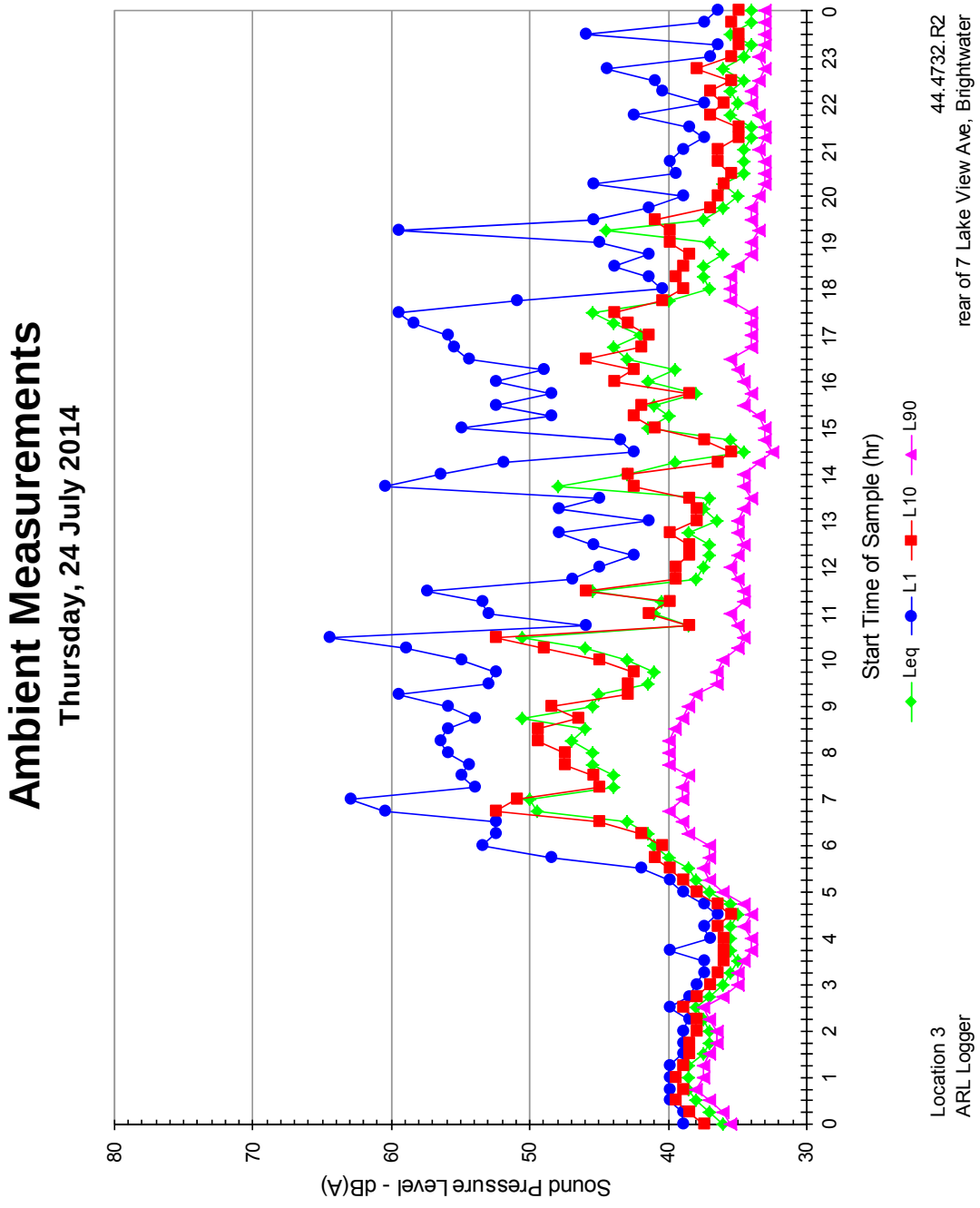
Day	L90 Background Noise Levels			Leq Ambient Noise Levels		
	Day 7am - 6pm	Evening 6pm - 10pm	Night 10pm - 7am	Day 7am - 6pm	Evening 6pm - 10pm	Night 10pm - 7am
Wednesday 23 July 2014	*	33.0	34.0	*	38.0	39.2
Thursday 24 July 2014	33.5	33.0	33.0	44.0	37.4	38.4
Friday 25 July 2014	37.0	34.0	32.0	46.2	42.2	40.8
Saturday 26 July 2014	35.5	36.5	35.5	44.8	42.0	39.9
Sunday 27 July 2014	33.5	33.5	33.5	45.1	36.7	42.1
Monday 28 July 2014	32.5	34.0	33.0	47.0	39.5	37.6
Tuesday 29 July 2014	35.0	33.5	32.0	46.2	46.8	38.0
Wednesday 30 July 2014	34.5	33.5	33.0	45.2	38.4	37.6
RBL Median	**34.8**	**33.5**	**33.0**	-	-	-
Log Average	**-**	**-**	**-**	**45.7**	**41.9**	**39.4**

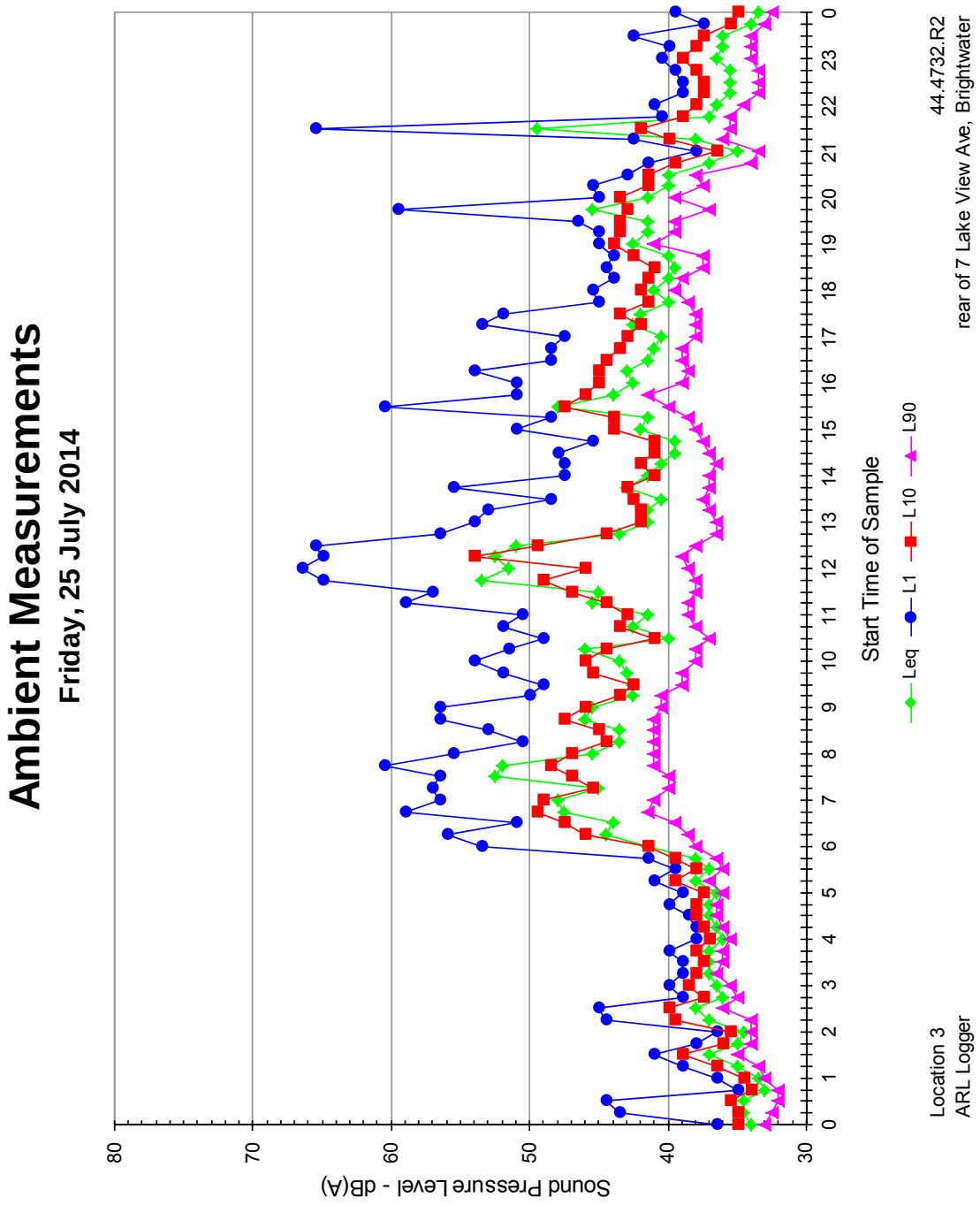
TRAFFIC NOISE MONITORING RESULTS
OEH's NSW ROAD TRAFFIC POLICY 2011

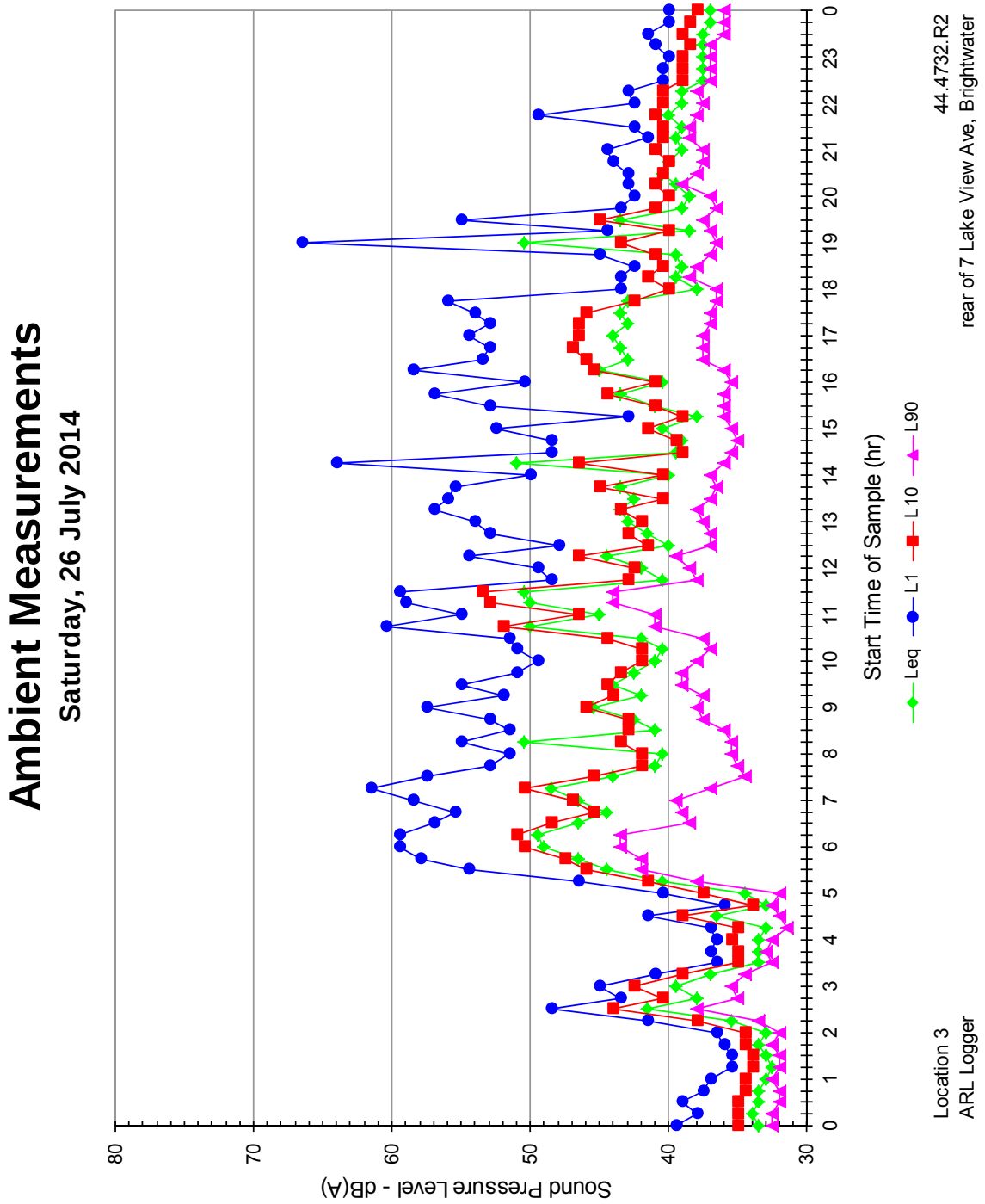
Day	Leq Ambient Noise Levels		Leq 1 Hr Noise Levels			
	Day 7am - 10pm	Night 10pm - 7am	Day - Max	Day - Min	Night - Max	Night - Min
Wednesday 23 July 2014	*	41.7	47.1	*	47.8	37.9
Thursday 24 July 2014	45.4	40.9	50.2	37.0	47.4	36.5
Friday 25 July 2014	48.0	43.3	53.2	42.4	50.3	35.5
Saturday 26 July 2014	46.7	42.4	50.5	41.5	48.4	38.8
Sunday 27 July 2014	46.4	44.6	50.8	38.4	52.8	36.9
Monday 28 July 2014	48.4	40.1	56.8	37.8	46.3	36.3
Tuesday 29 July 2014	48.8	40.5	54.7	37.8	45.8	35.7
Wednesday 30 July 2014	46.7	40.1	54.0	38.1	45.3	36.4
Thursday 31 July 2014	48.5	41.1	51.1	44.6	45.6	35.6
Friday 1 August 2014	*	*	48.1	*	*	*
Log Average	**47.5**	**41.9**	**52.6**	**40.6**	**48.5**	**36.8**

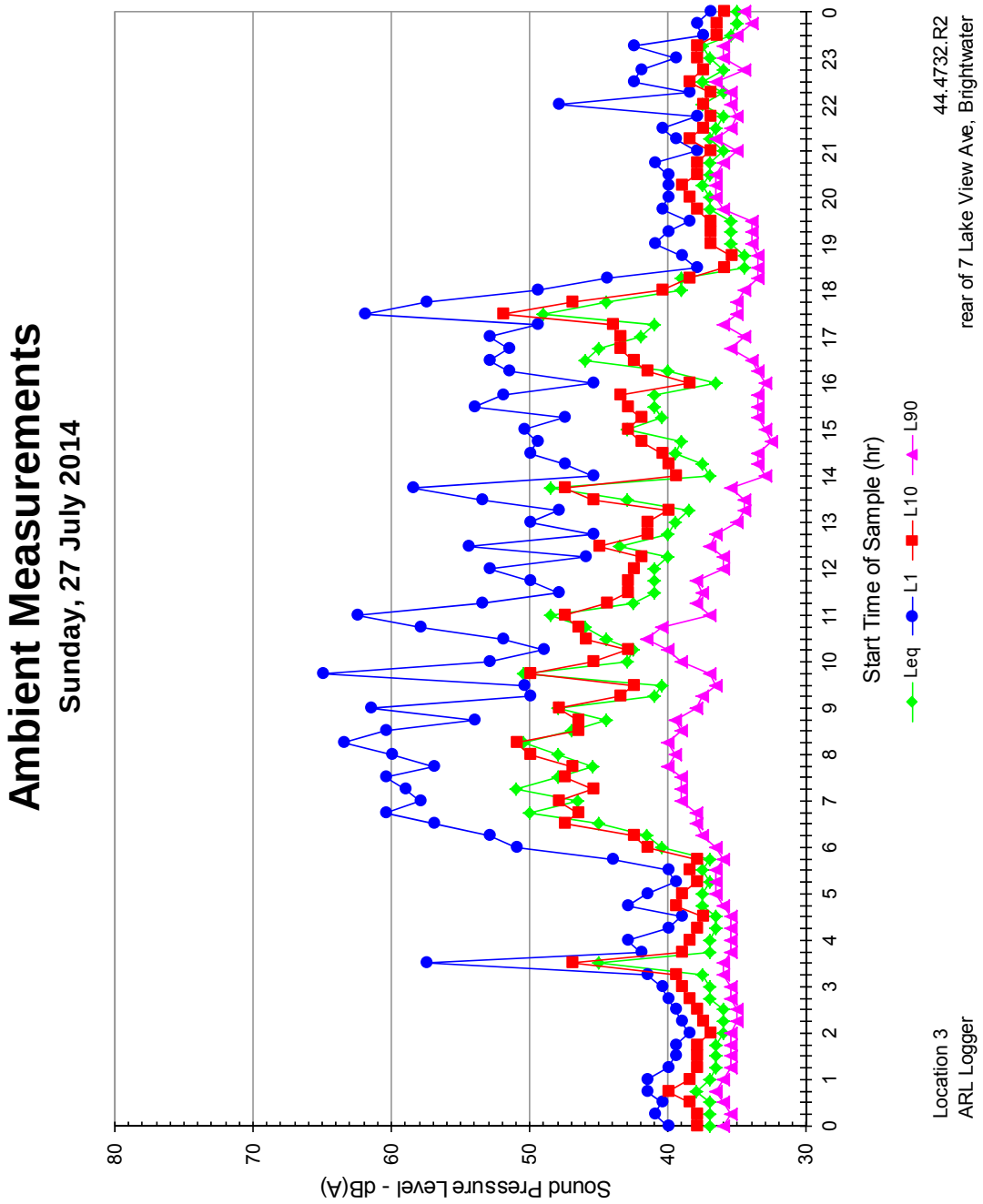
* indicates an incomplete set of data for a given time period
# Nighttime for a given day continues through to the following morning

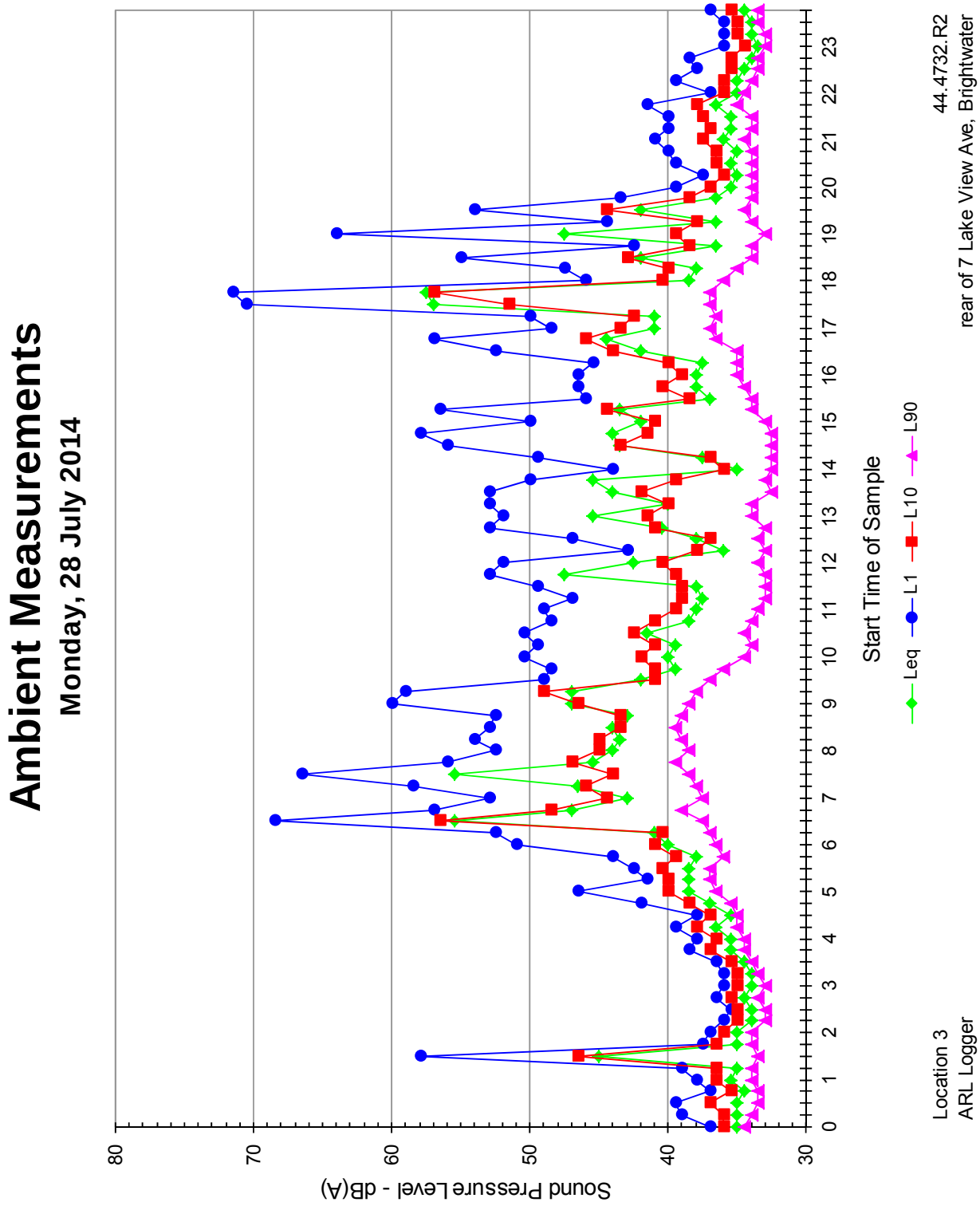

Ambient Measurements
Wednesday, 23 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0
Start Time of Sample (hr)
Leq
L1
L10
L90
44.4732.R2
rear of 7 Lake View Ave, Brightwater
Location 3
ARL Logger

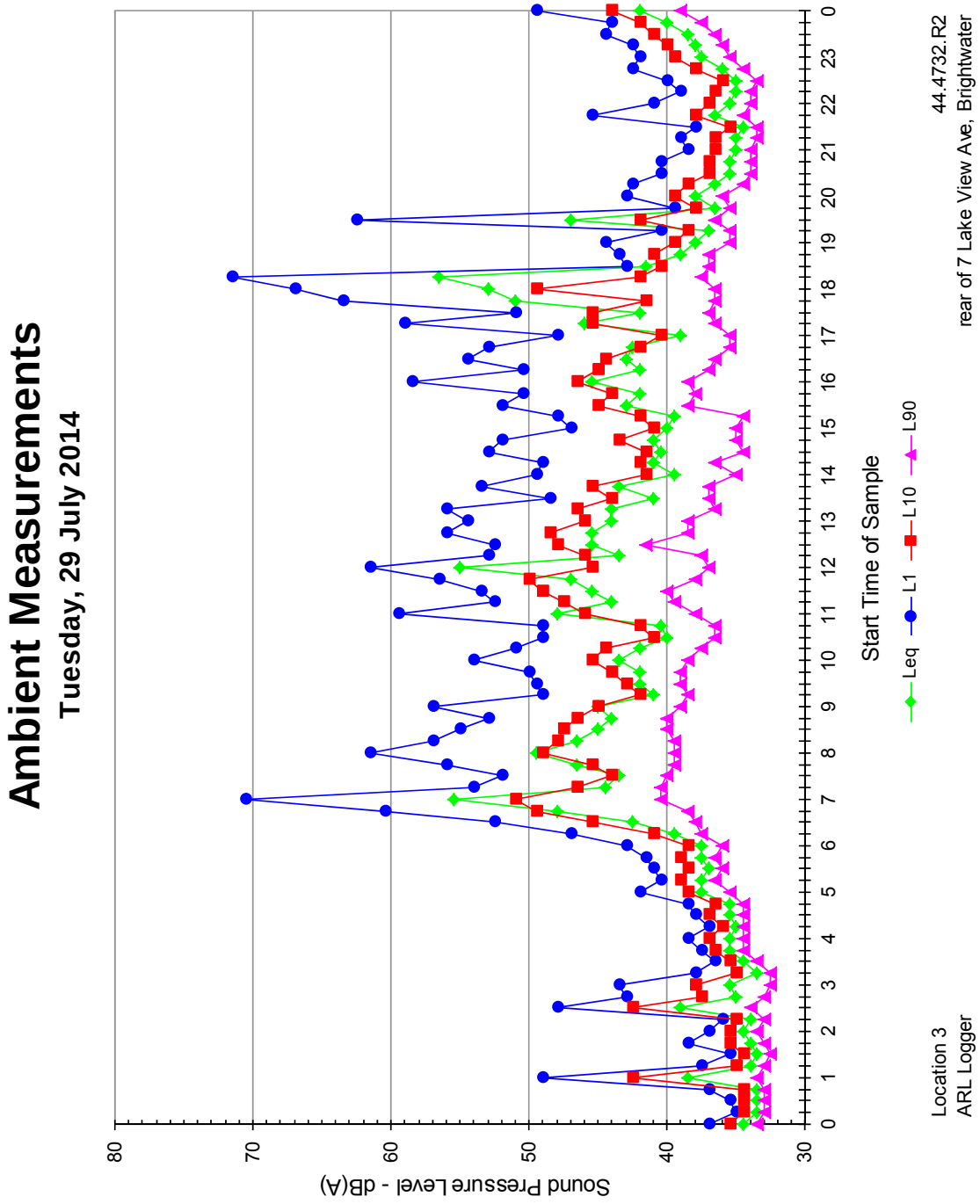

Ambient Measurements
Thursday, 24 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0
Start Time of Sample (hr)
Leq
L1
L10
L90
44.4732.R2
rear of 7 Lake View Ave, Brightwater
Location 3
ARL Logger

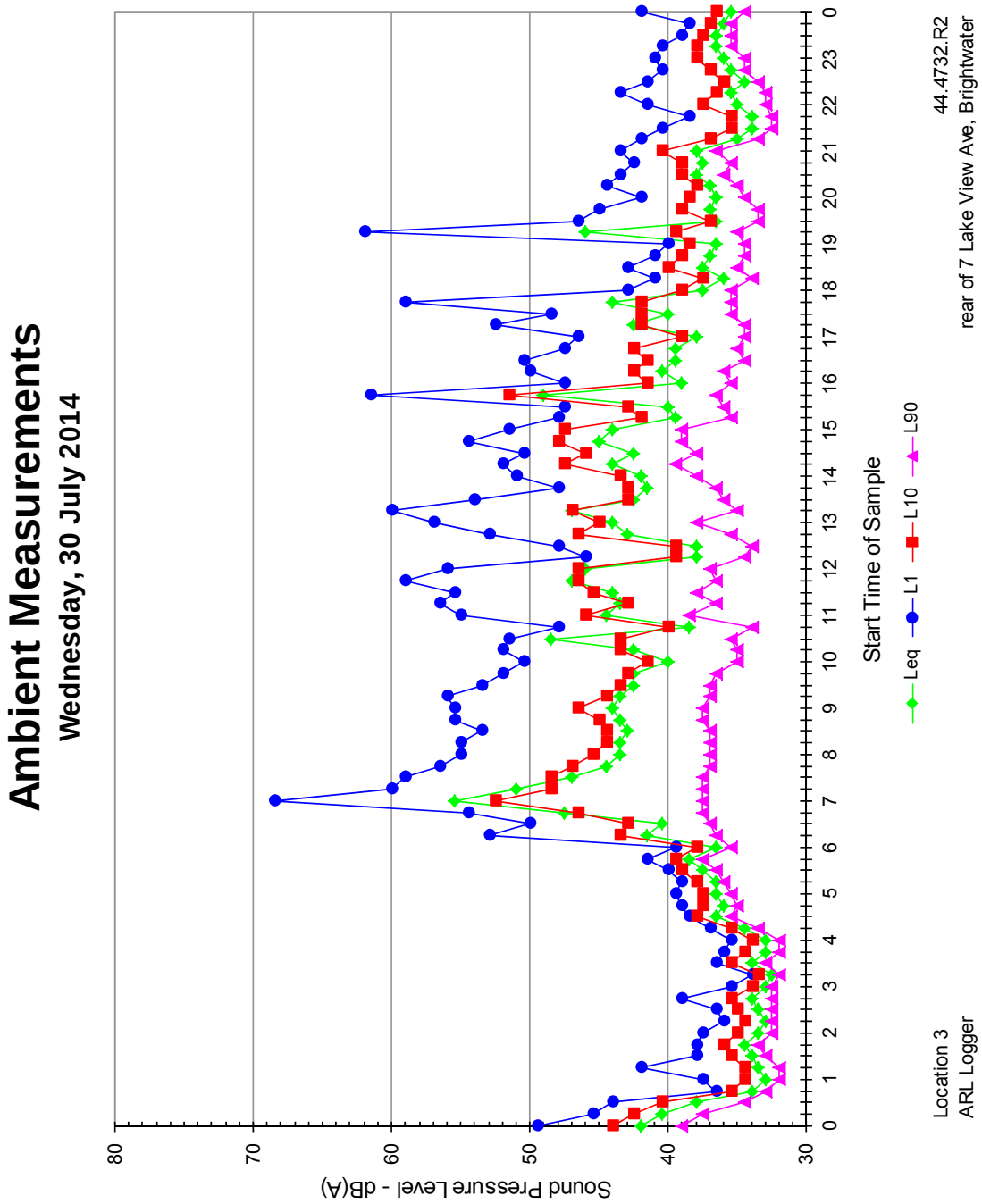

Ambient Measurements
Friday, 25 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0
Start Time of Sample
Leq
L1
L10
L90
44.4732.R2
rear of 7 Lake View Ave, Brightwater
Location 3
ARL Logger

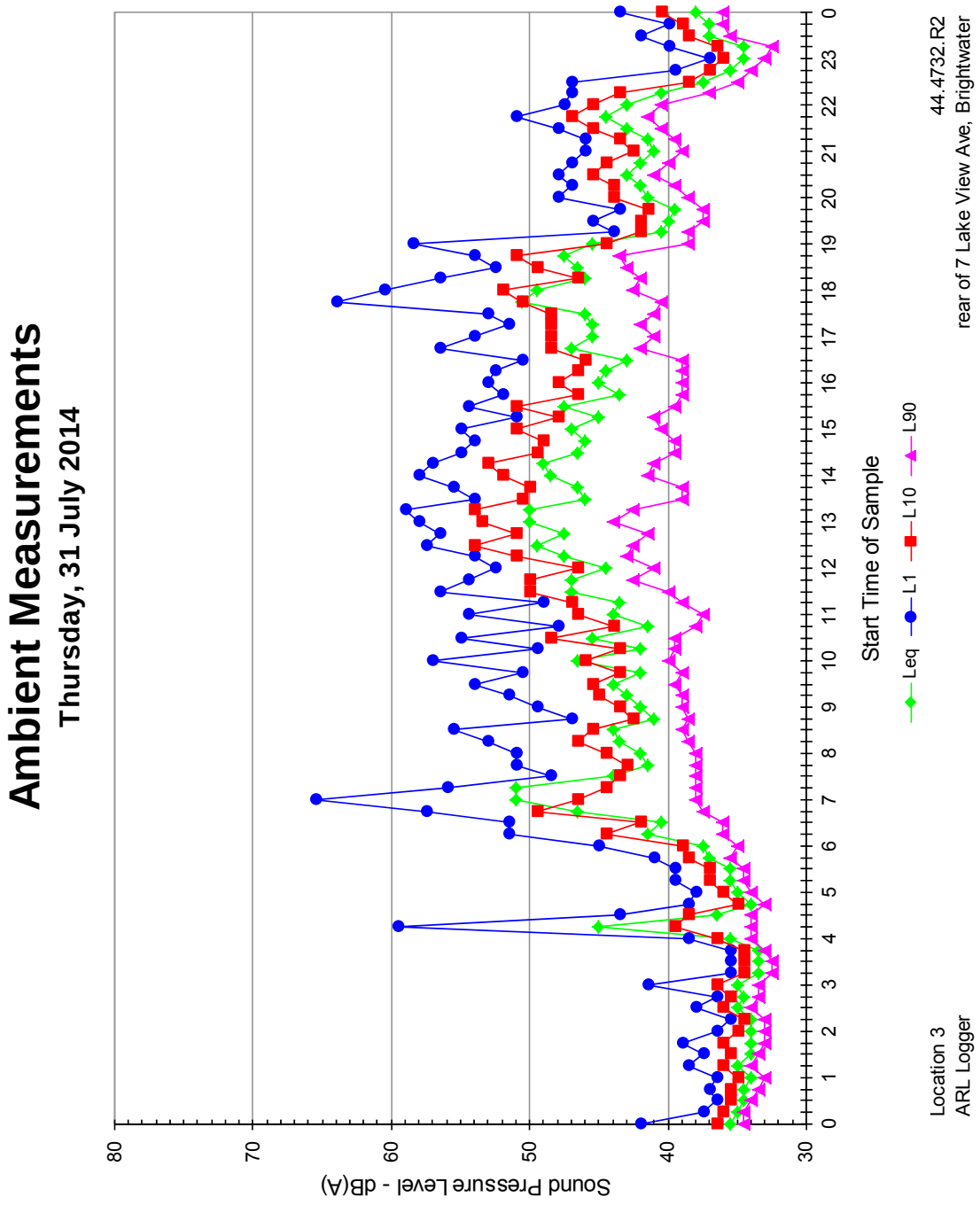

Ambient Measurements
Saturday, 26 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0
Start Time of Sample (hr)
Leq
L1
L10
L90
44.4732.R2
rear of 7 Lake View Ave, Brightwater
Location 3
ARL Logger

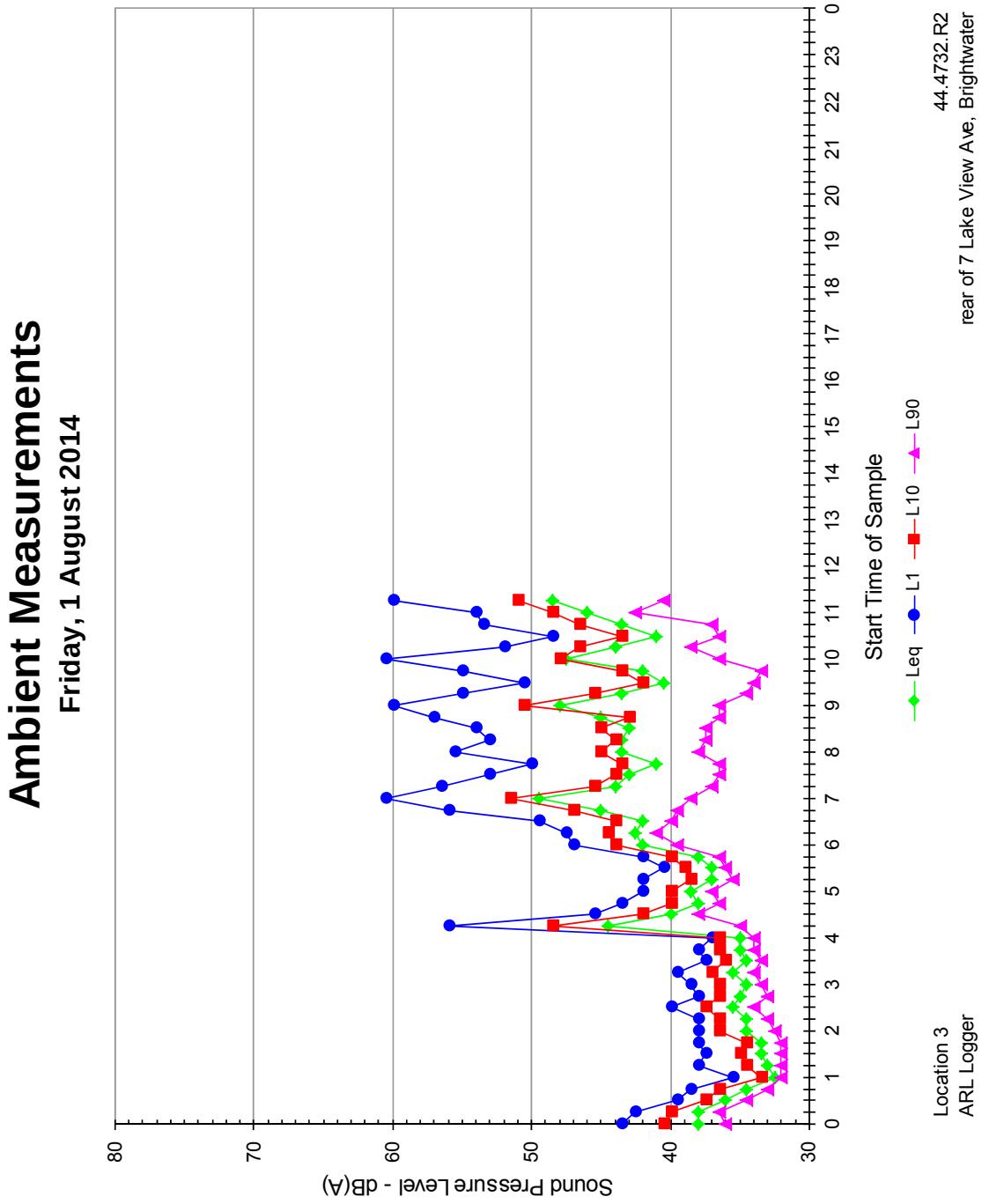

Ambient Measurements
Sunday, 27 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0
Start Time of Sample (hr)
Leq
L1
L10
L90
Location 3
ARL Logger
44.4732.R2
rear of 7 Lake View Ave, Brightwater


Ambient Measurements
Monday, 28 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Start Time of Sample
Leq
L1
L10
L90
44.4732.R2
rear of 7 Lake View Ave, Brightwater
Location 3
ARL Logger


Ambient Measurements
Tuesday, 29 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0
Start Time of Sample
Leq
L1
L10
L90
44.4732.R2
rear of 7 Lake View Ave, Brightwater
Location 3
ARL Logger


Ambient Measurements
Wednesday, 30 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Start Time of Sample
Leq
L1
L10
L90
44.4732.R2
rear of 7 Lake View Ave, Brightwater
Location 3
ARL Logger


Ambient Measurements
Thursday, 31 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0
Start Time of Sample
Leq
L1
L10
L90
44.4732.R2
rear of 7 Lake View Ave, Brightwater
Location 3
ARL Logger


Ambient Measurements
Friday, 1 August 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0
Start Time of Sample
Leq
L1
L10
L90
44.4732.R2
rear of 7 Lake View Ave, Brightwater
Location 3
ARL Logger

APPENDIX E: Measurement Results – Location 4

Location 4

Job Number: 44.4732.R2
Instrumentation: SVAN 957 Logger s/n 12313
Logger Location: rear of 57a Lakeview Rd, Morriset
Free Field: yes
Monitoring Period: Wednesday 23 July 2014 to Friday 1 August 2014

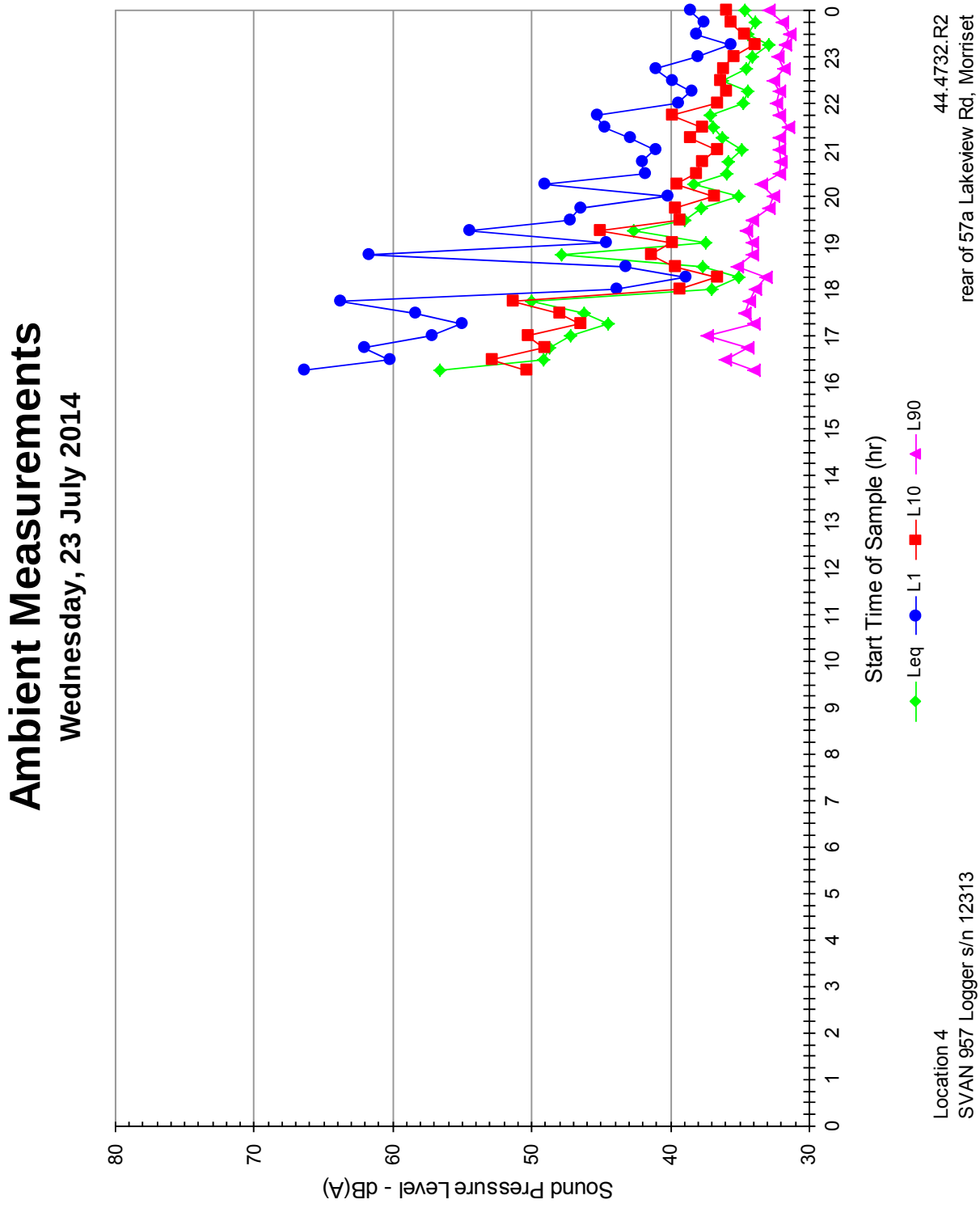
BACKGROUND AND AMBIENT NOISE MONITORING RESULTS
NSW EPA's INDUSTRIAL NOISE POLICY , 2000

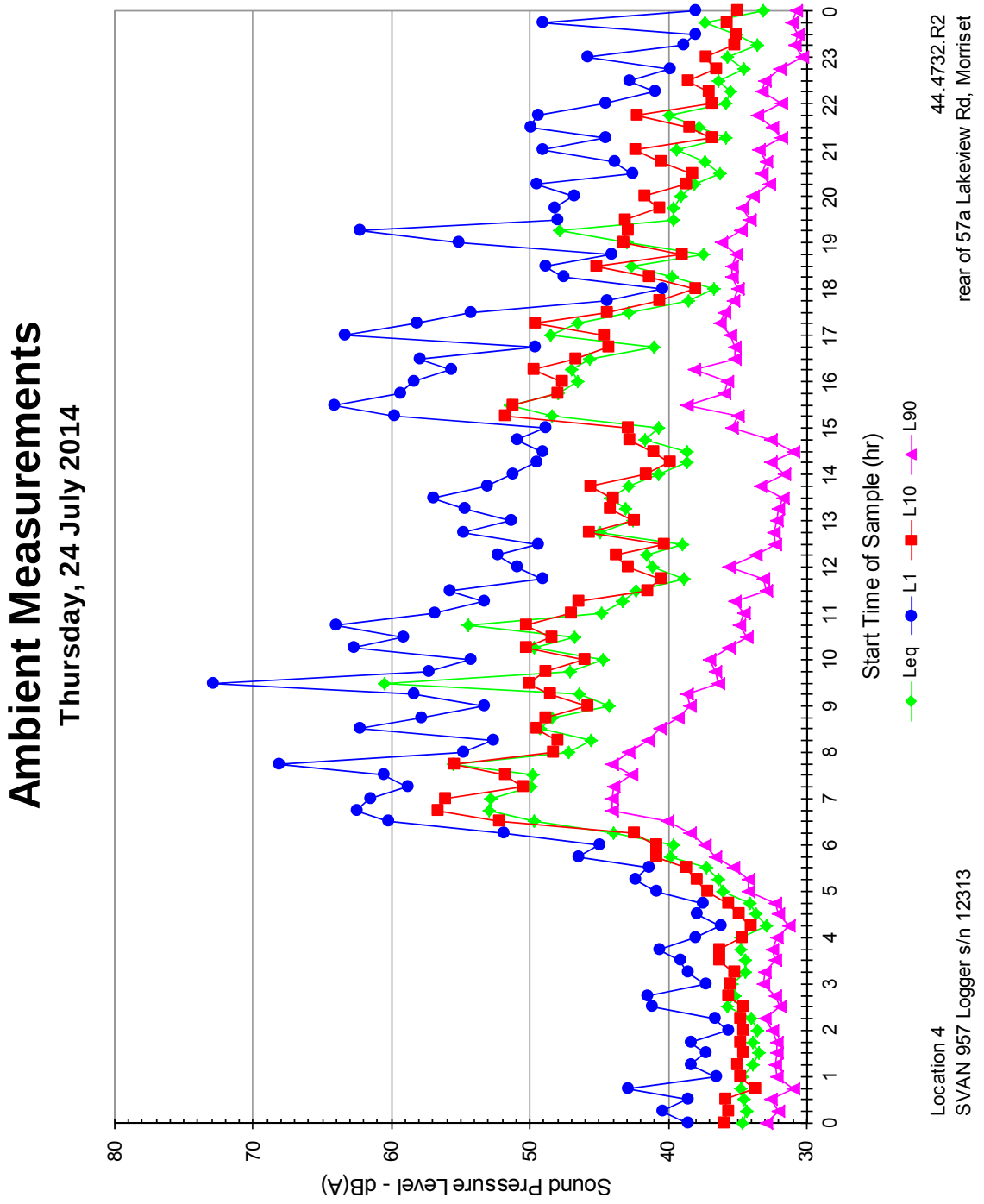
Day	L90 Background Noise Levels			Leq Ambient Noise Levels		
	Day 7am - 6pm	Evening 6pm - 10pm	Night 10pm - 7am	Day 7am - 6pm	Evening 6pm - 10pm	Night 10pm - 7am
Wednesday 23 July 2014	*	32.0	31.7	*	39.7	40.7
Thursday 24 July 2014	32.2	31.8	29.4	49.0	40.8	38.2
Friday 25 July 2014	38.4	32.2	29.4	48.8	47.2	45.2
Saturday 26 July 2014	35.2	34.7	30.1	52.8	46.6	41.7
Sunday 27 July 2014	31.2	32.2	28.0	49.9	39.6	38.4
Monday 28 July 2014	31.2	32.3	27.8	48.2	42.8	33.5
Tuesday 29 July 2014	29.1	34.5	34.5	45.6	44.3	48.5
Wednesday 30 July 2014	32.3	33.0	32.0	46.4	39.6	38.2
RBL Median	**32.3**	**32.3**	**30.1**	-	-	-
Log Average	**-**	**-**	**-**	**49.2**	**43.6**	**42.6**

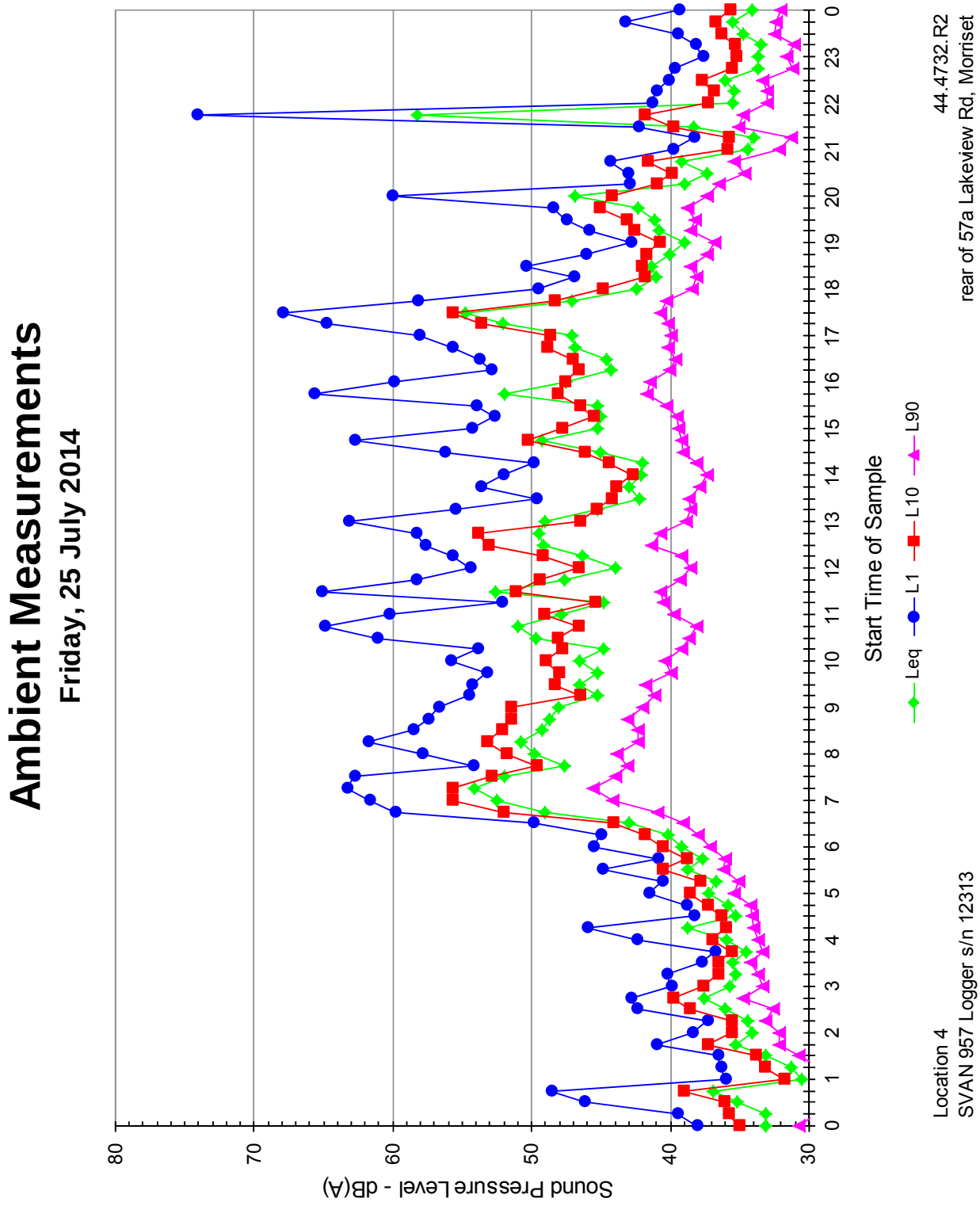
TRAFFIC NOISE MONITORING RESULTS
OEH's NSW ROAD TRAFFIC POLICY 2011

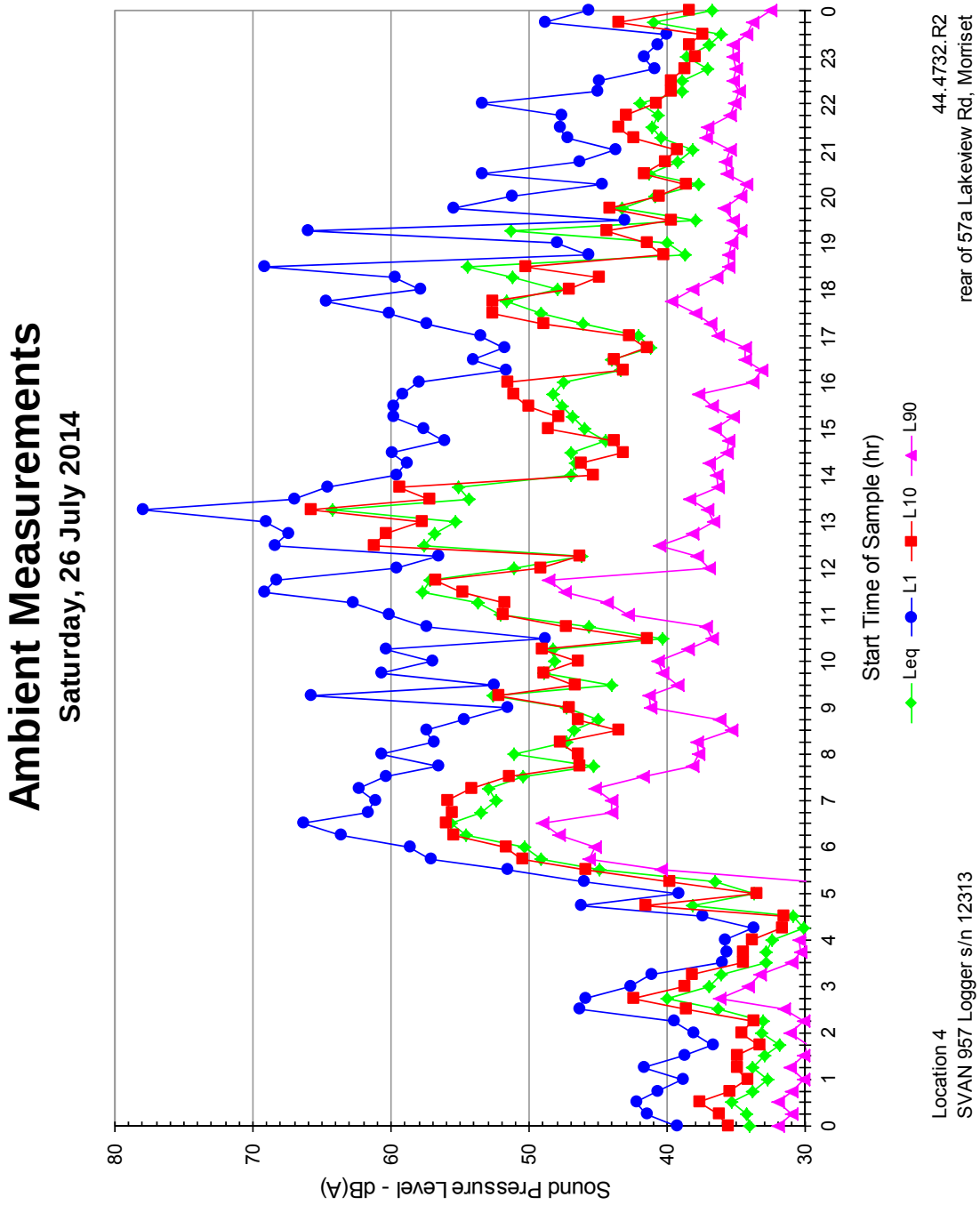
Day	Leq Ambient Noise Levels		Leq 1 Hr Noise Levels			
	Day 7am - 10pm	Night 10pm - 7am	Day - Max	Day - Min	Night - Max	Night - Min
Wednesday 23 July 2014	*	43.2	54.4	*	51.6	36.4
Thursday 24 July 2014	50.4	40.7	57.4	40.3	47.2	35.5
Friday 25 July 2014	50.9	47.7	54.8	43.5	56.4	35.4
Saturday 26 July 2014	54.3	44.2	62.0	42.5	52.1	37.0
Sunday 27 July 2014	51.2	40.9	58.2	38.7	48.1	33.7
Monday 28 July 2014	49.8	36.0	54.2	39.6	38.6	33.5
Tuesday 29 July 2014	47.8	51.0	53.4	34.8	55.5	44.6
Wednesday 30 July 2014	47.9	40.7	55.5	37.6	46.3	36.0
Thursday 31 July 2014	50.2	42.5	55.9	43.8	45.8	36.0
Friday 1 August 2014	*	*	53.0	*	*	*
Log Average	**50.8**	**45.1**	**56.8**	**41.0**	**51.6**	**38.1**

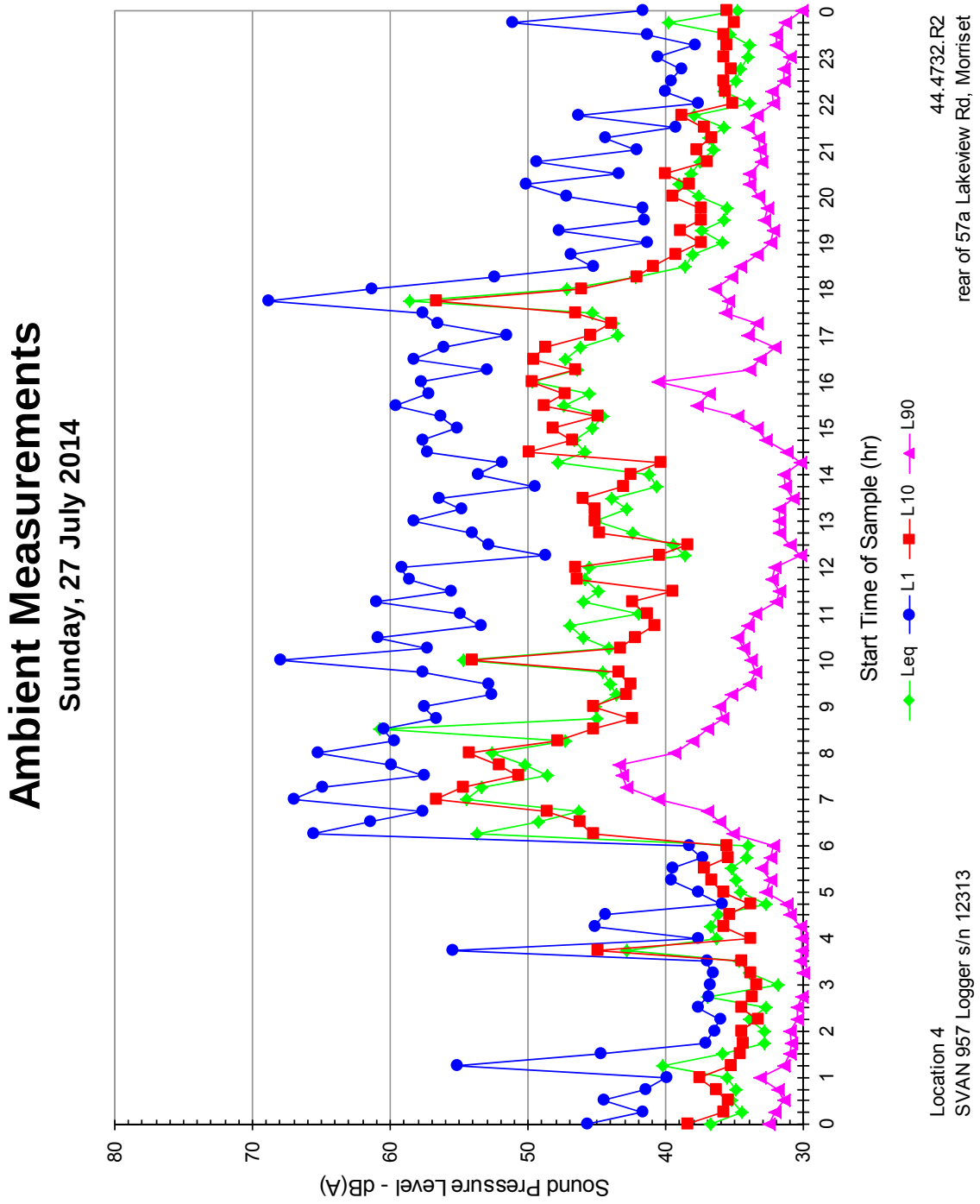
* indicates an incomplete set of data for a given time period
# Nighttime for a given day continues through to the following morning

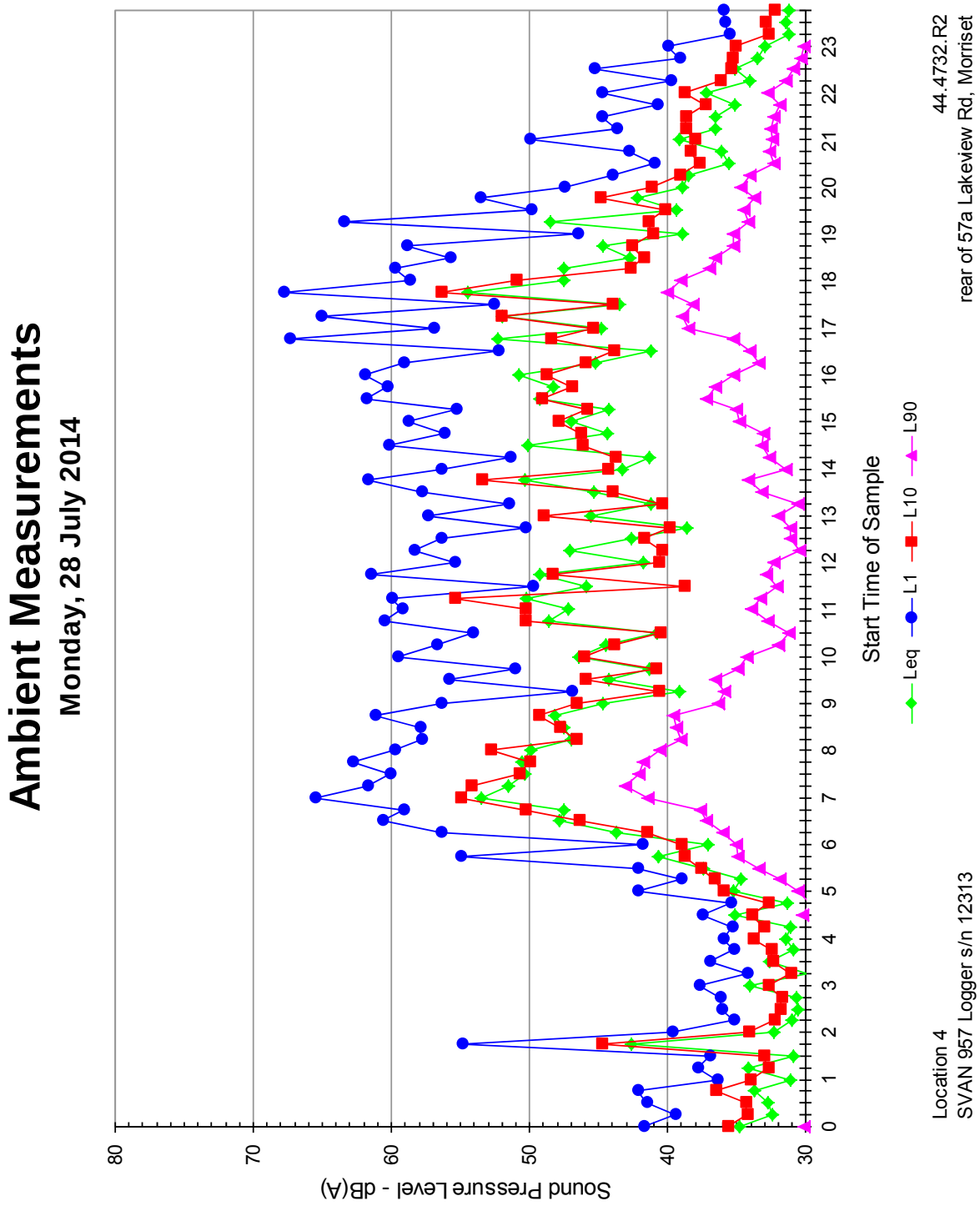

Ambient Measurements
Wednesday, 23 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
Start Time of Sample (hr)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0
Leq
L1
L10
L90
44.4732.R2
rear of 57a Lakeview Rd, Morriset
Location 4
SVAN 957 Logger s/n 12313

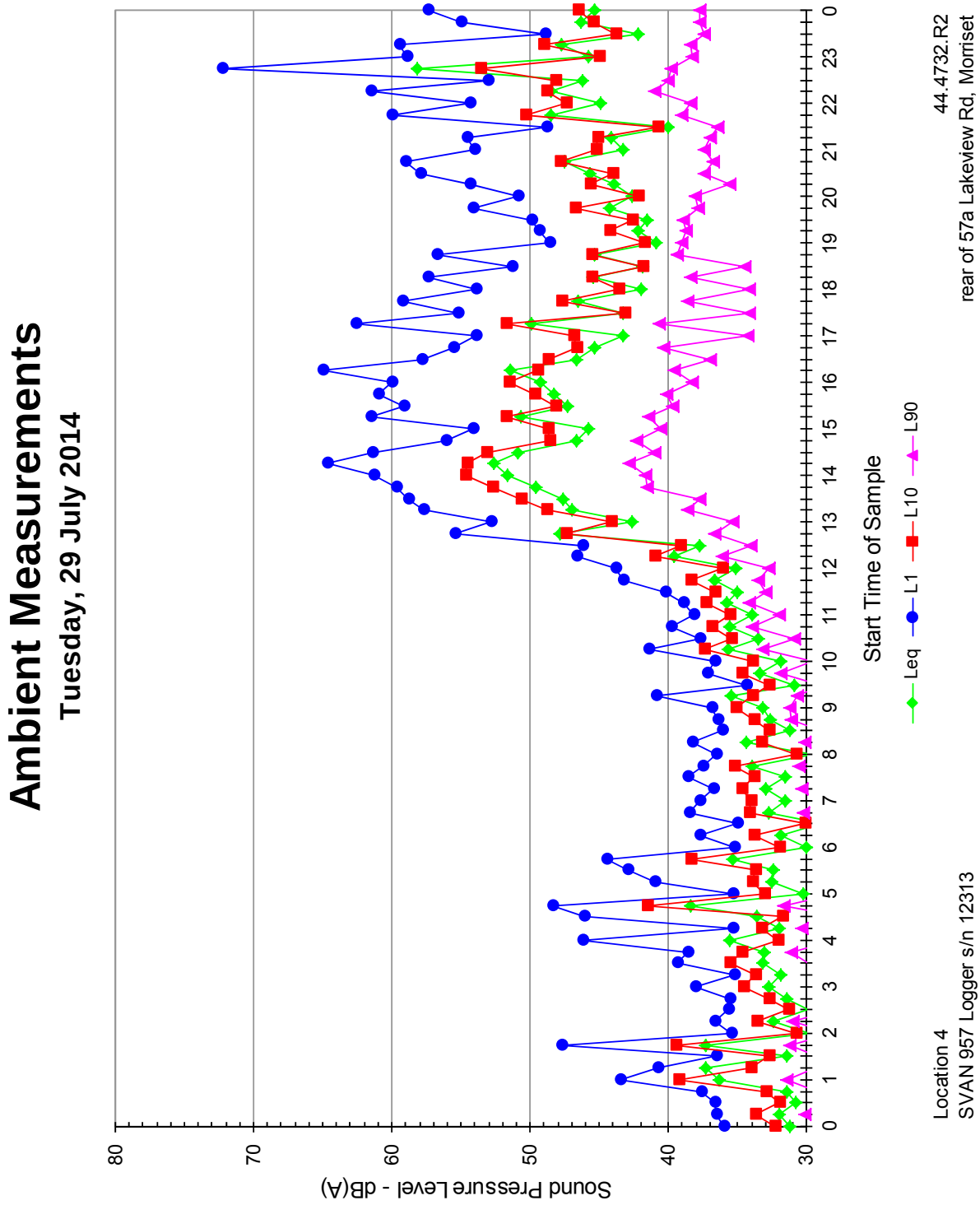

Ambient Measurements
Thursday, 24 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0
Start Time of Sample (hr)
Leq
L1
L10
L90
44.4732.R2
rear of 57a Lakeview Rd, Morriset
Location 4
SVAN 957 Logger s/n 12313

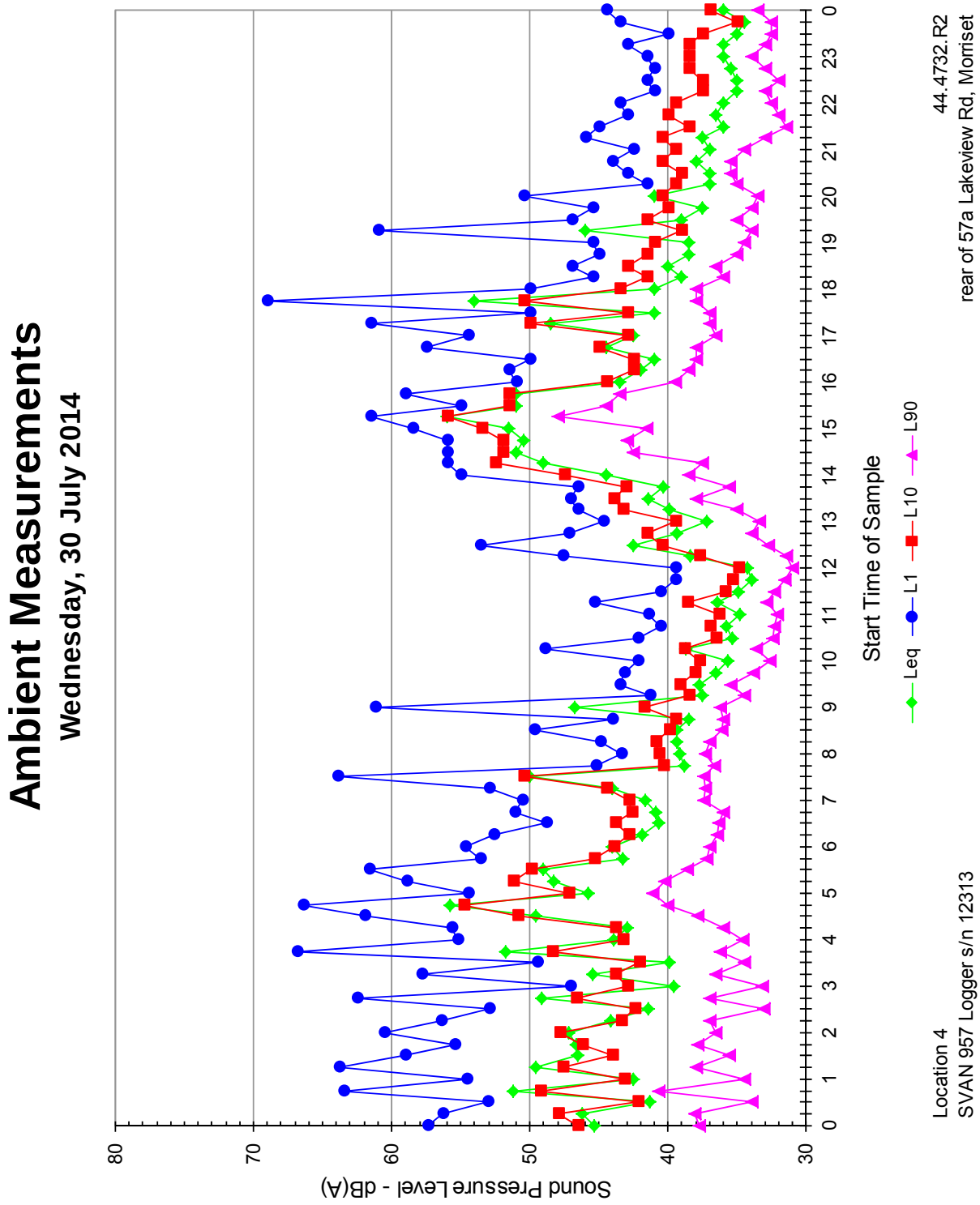

Ambient Measurements
Friday, 25 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Start Time of Sample
Leq
L1
L10
L90
44.4732.R2
rear of 57a Lakeview Rd, Morriset
Location 4
SVAN 957 Logger s/n 12313

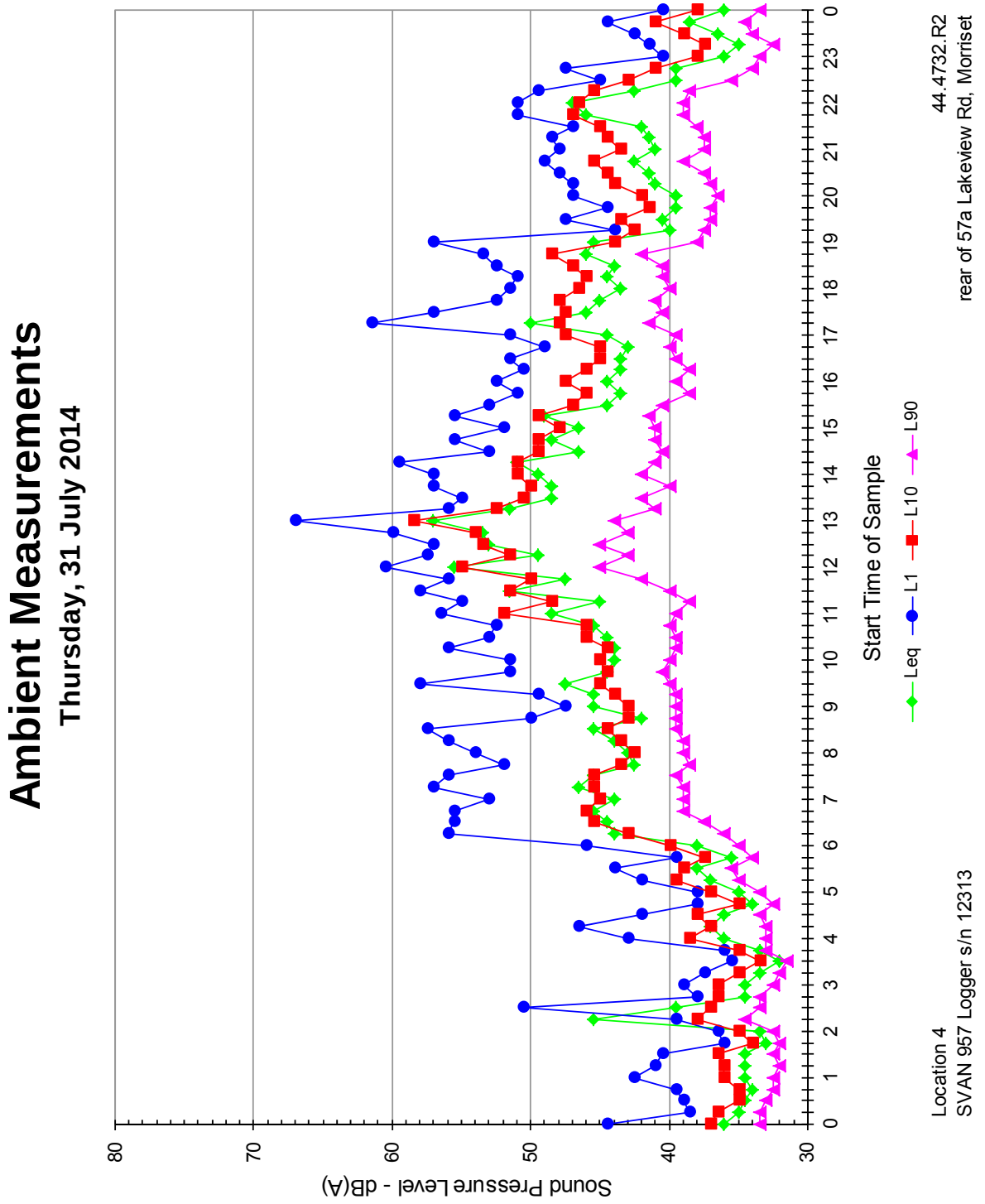

Ambient Measurements
Saturday, 26 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
Start Time of Sample (hr)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0
Leq
L1
L10
L90
44.4732.R2
rear of 57a Lakeview Rd, Morriset
Location 4
SVAN 957 Logger s/n 12313

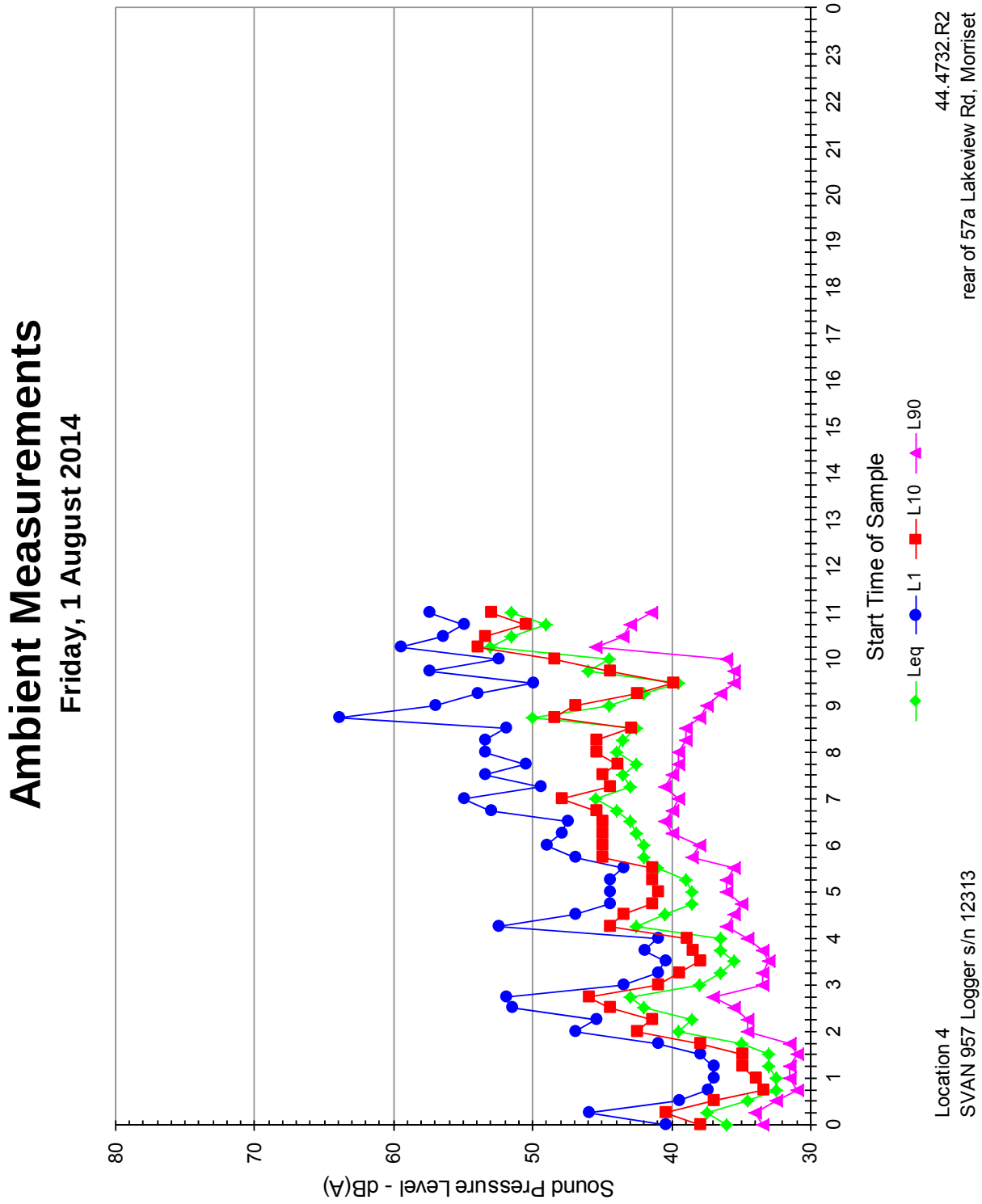

Ambient Measurements
Sunday, 27 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
Start Time of Sample (hr)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0
Leq
L1
L10
L90
44.4732.R2
rear of 57a Lakeview Rd, Morriset
Location 4
SVAN 957 Logger s/n 12313


Ambient Measurements
Monday, 28 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Start Time of Sample
Leq
L1
L10
L90
44.4732.R2
rear of 57a Lakeview Rd, Morriset
Location 4
SVAN 957 Logger s/n 12313


Ambient Measurements
Tuesday, 29 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Start Time of Sample
Leq
L1
L10
L90
44.4732.R2
rear of 57a Lakeview Rd, Morriset
Location 4
SVAN 957 Logger s/n 12313


Ambient Measurements
Wednesday, 30 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0
Start Time of Sample
Leq
L1
L10
L90
44.4732.R2
rear of 57a Lakeview Rd, Morriset
Location 4
SVAN 957 Logger s/n 12313


Ambient Measurements
Thursday, 31 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0
Start Time of Sample
Leq
L1
L10
L90
44.4732.R2
rear of 57a Lakeview Rd, Morriset
Location 4
SVAN 957 Logger s/n 12313


Ambient Measurements
Friday, 1 August 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0
Start Time of Sample
Leq
L1
L10
L90
44.4732.R2
rear of 57a Lakeview Rd, Morriset
Location 4
SVAN 957 Logger s/n 12313

APPENDIX F: Logger Results – Location 5

Location 4

Job Number: 44.4732.R2
Instrumentation: ARL Logger
Logger Location: SE corner of Trinity Point
Free Field: yes
Monitoring Period: Wednesday 23 July 2014 to Friday 1 August 2014

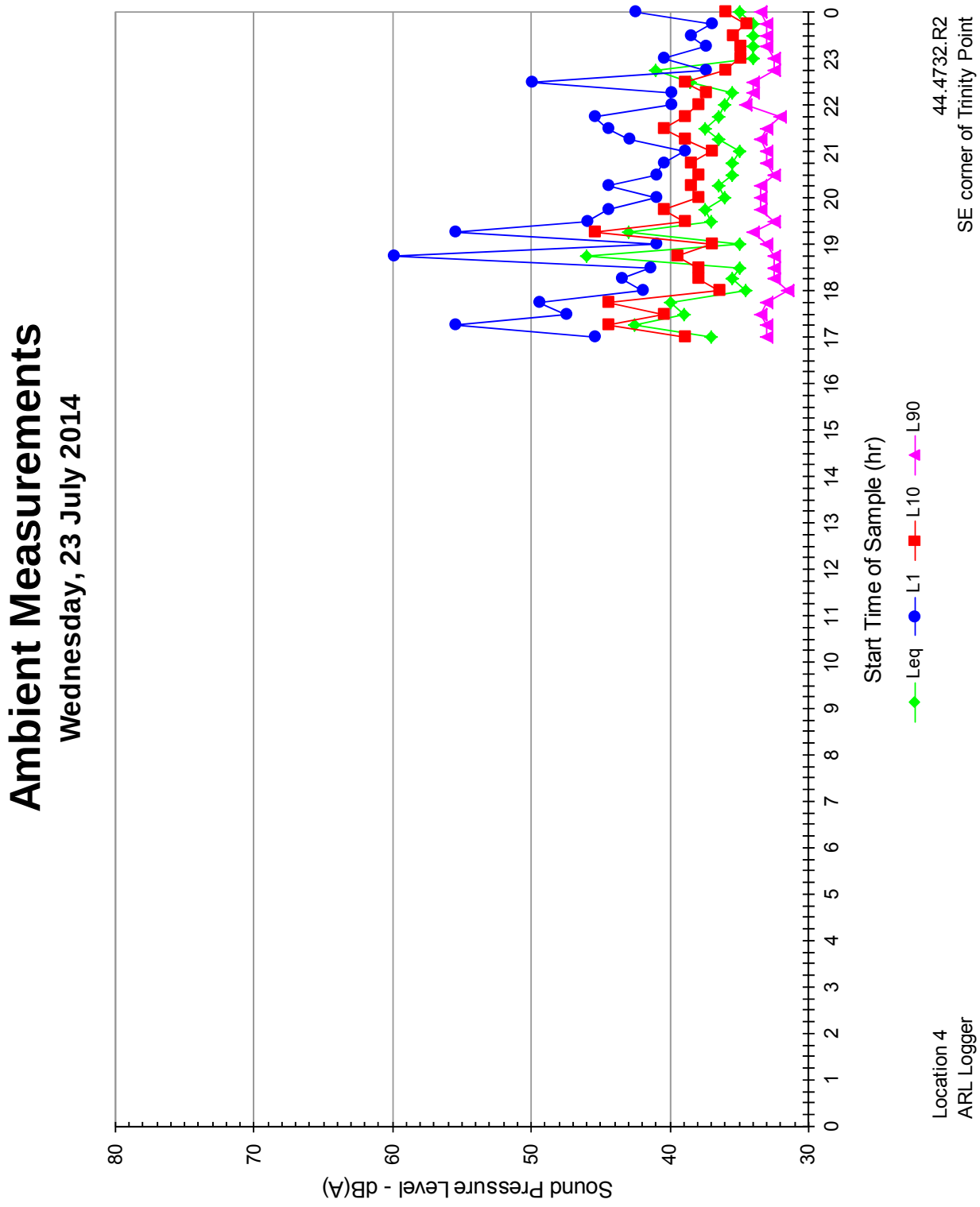
BACKGROUND AND AMBIENT NOISE MONITORING RESULTS
NSW EPA's INDUSTRIAL NOISE POLICY , 2000

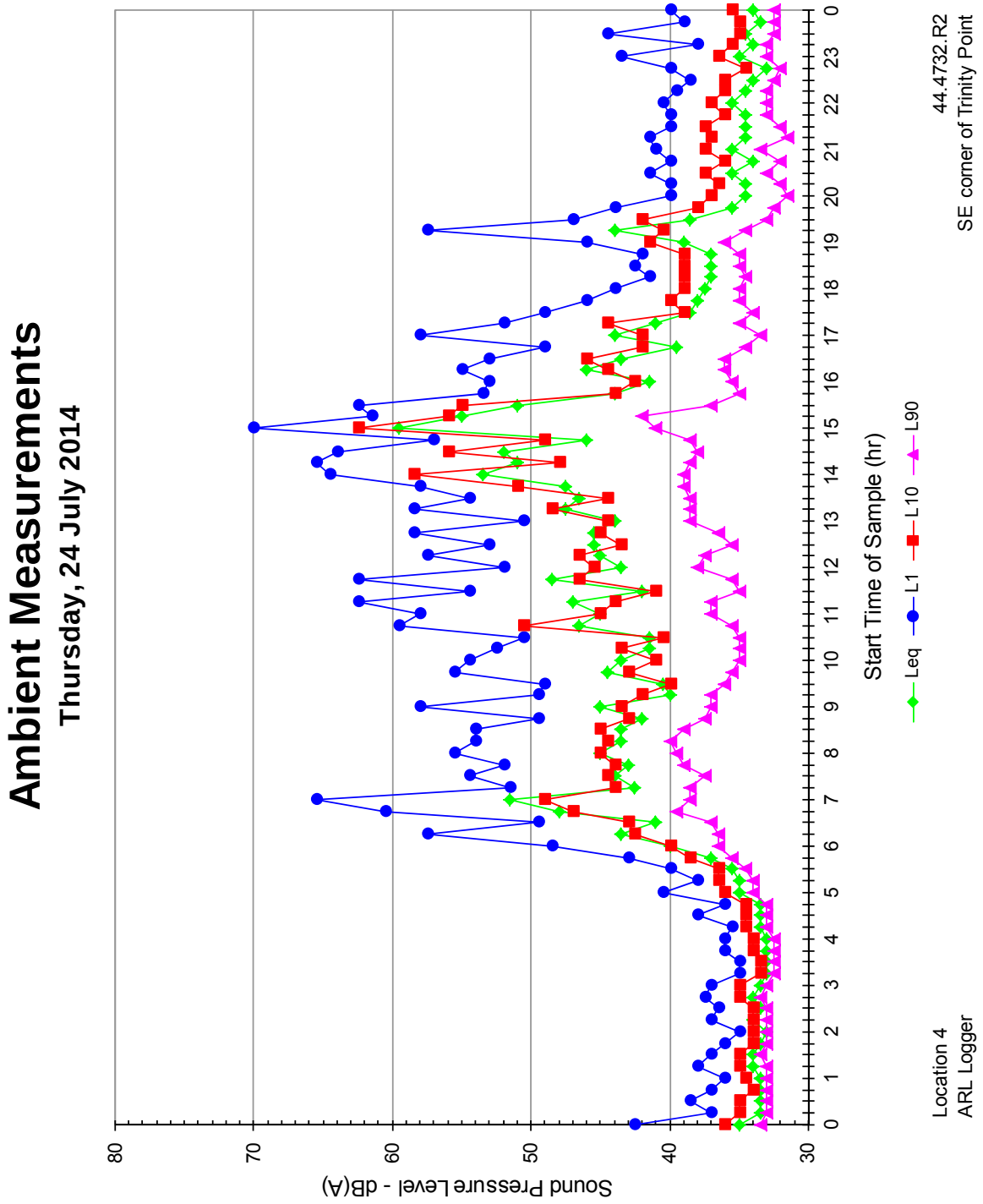
Day	L90 Background Noise Levels			Leq Ambient Noise Levels		
	Day 7am - 6pm	Evening 6pm - 10pm	Night 10pm - 7am	Day 7am - 6pm	Evening 6pm - 10pm	Night 10pm - 7am
Wednesday 23 July 2014	*	32.5	32.5	*	38.6	37.6
Thursday 24 July 2014	35.0	31.5	32.5	48.3	37.4	35.9
Friday 25 July 2014	37.5	33.0	31.0	44.3	41.3	48.9
Saturday 26 July 2014	36.0	35.5	33.0	49.7	38.5	39.3
Sunday 27 July 2014	34.5	32.0	33.0	44.3	36.4	36.5
Monday 28 July 2014	36.0	34.0	31.0	47.4	40.5	36.4
Tuesday 29 July 2014	37.5	34.5	31.5	47.8	41.0	40.6
Wednesday 30 July 2014	37.5	33.0	32.0	48.5	39.6	38.2
RBL Median	**36.8**	**33.0**	**32.0**	-	-	-
Log Average	**-**	**-**	**-**	**47.7**	**40.0**	**41.7**

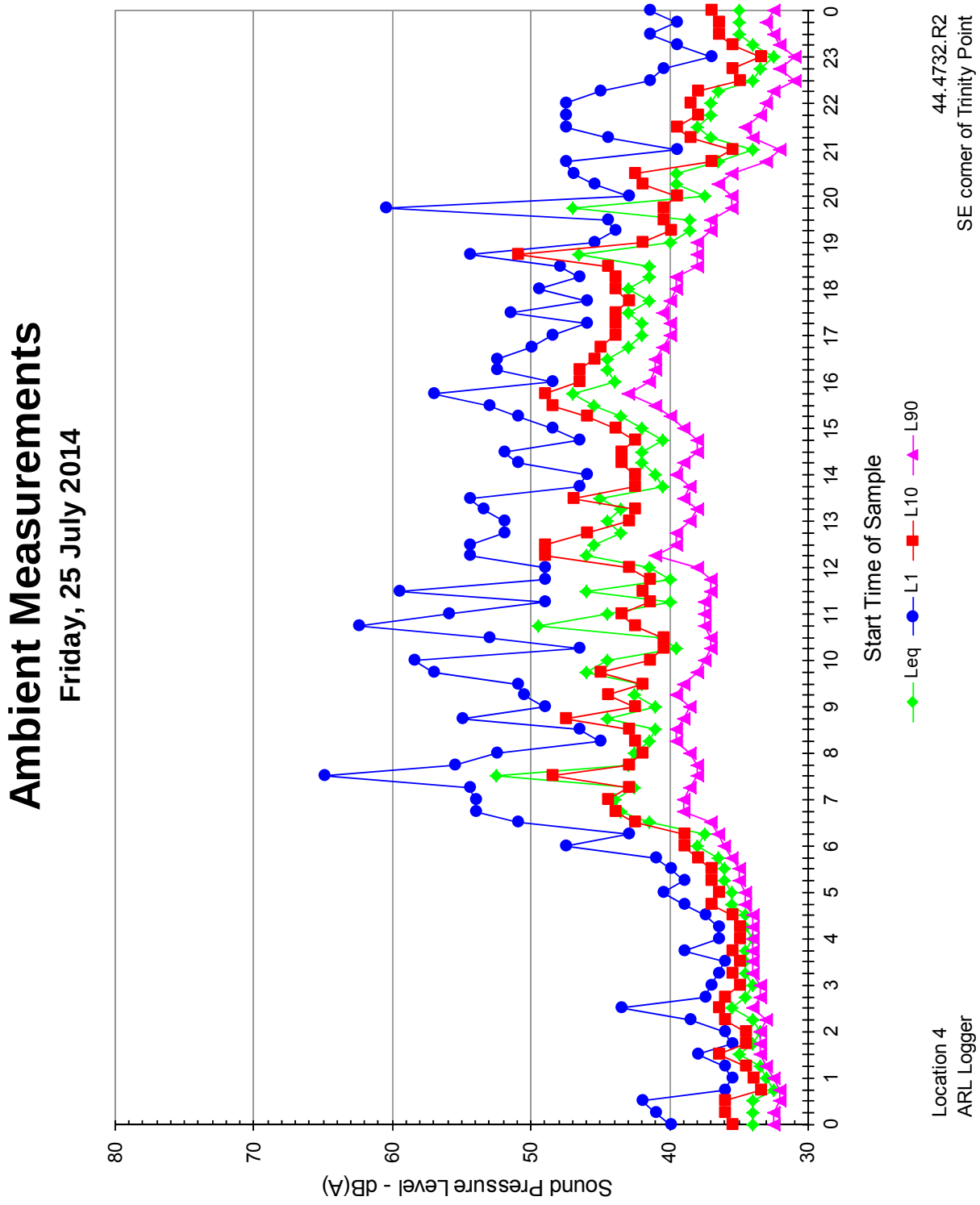
TRAFFIC NOISE MONITORING RESULTS
OEH's NSW ROAD TRAFFIC POLICY 2011

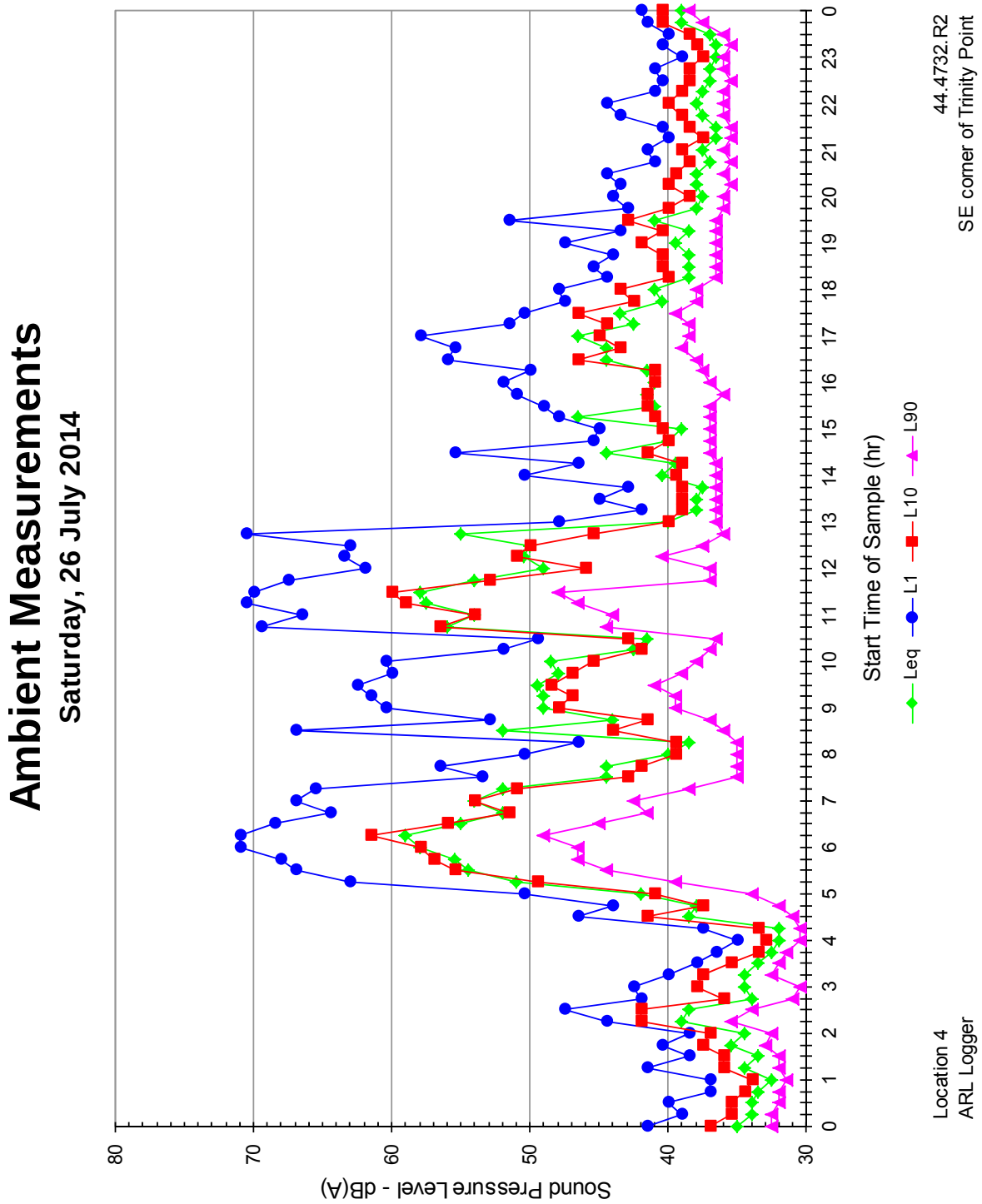
Day	Leq Ambient Noise Levels		Leq 1 Hr Noise Levels			
	Day 7am - 10pm	Night 10pm - 7am	Day - Max	Day - Min	Night - Max	Night - Min
Wednesday 23 July 2014	*	40.1	43.4	*	46.8	35.6
Thursday 24 July 2014	49.6	38.4	57.8	37.2	43.3	36.2
Friday 25 July 2014	46.2	51.4	50.3	39.2	59.3	36.3
Saturday 26 July 2014	51.0	41.8	58.8	39.5	47.7	37.6
Sunday 27 July 2014	45.7	39.0	50.1	37.8	43.4	36.1
Monday 28 July 2014	48.9	38.9	56.1	39.5	42.8	35.2
Tuesday 29 July 2014	49.3	43.1	53.4	39.6	49.5	36.3
Wednesday 30 July 2014	49.9	40.7	55.5	39.3	46.3	36.0
Thursday 31 July 2014	50.2	42.5	55.9	43.8	45.8	36.0
Friday 1 August 2014	*	*	53.0	*	*	*
Log Average	**49.2**	**44.2**	**55.0**	**39.9**	**51.2**	**36.2**

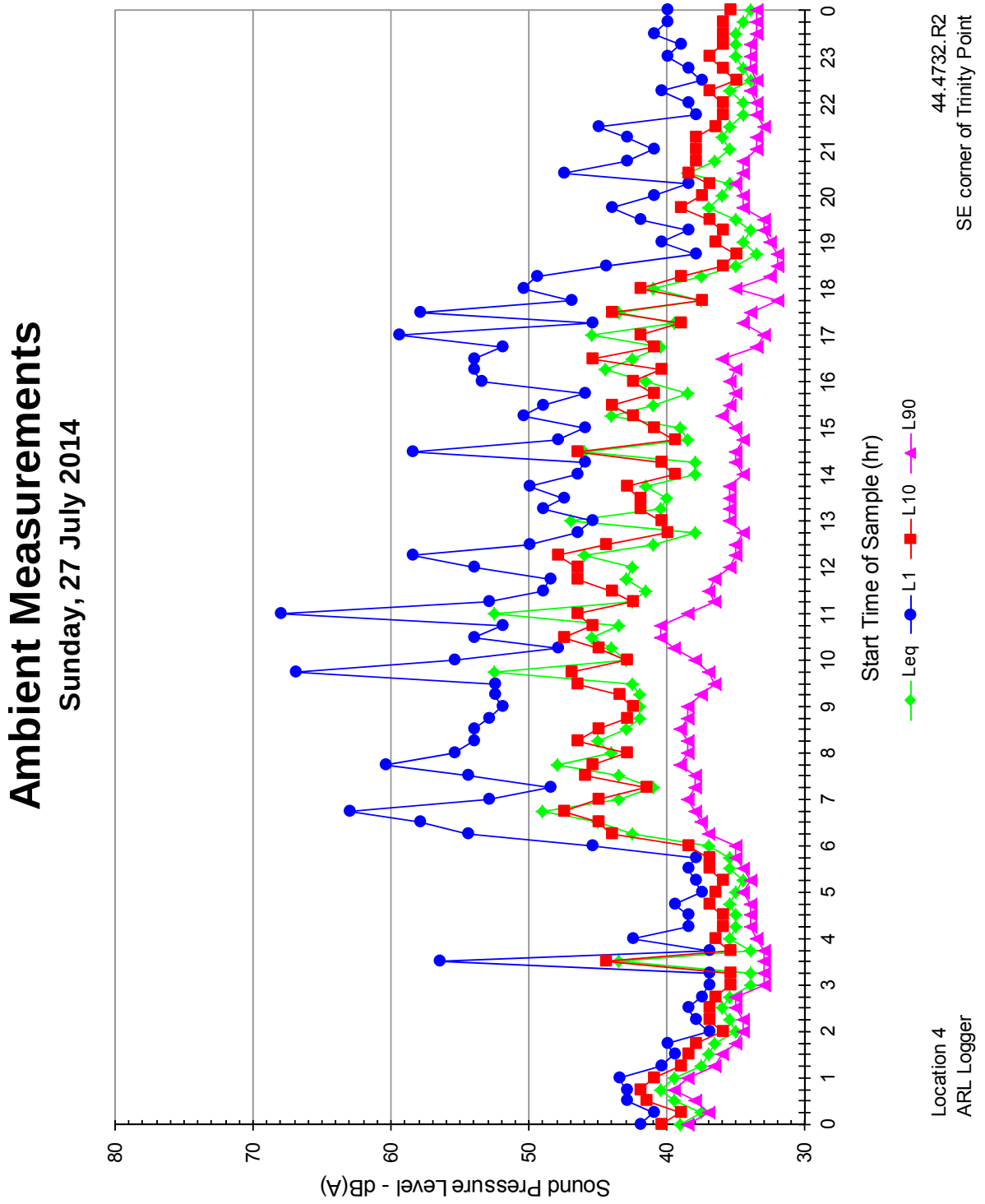
* indicates an incomplete set of data for a given time period
# Nighttime for a given day continues through to the following morning

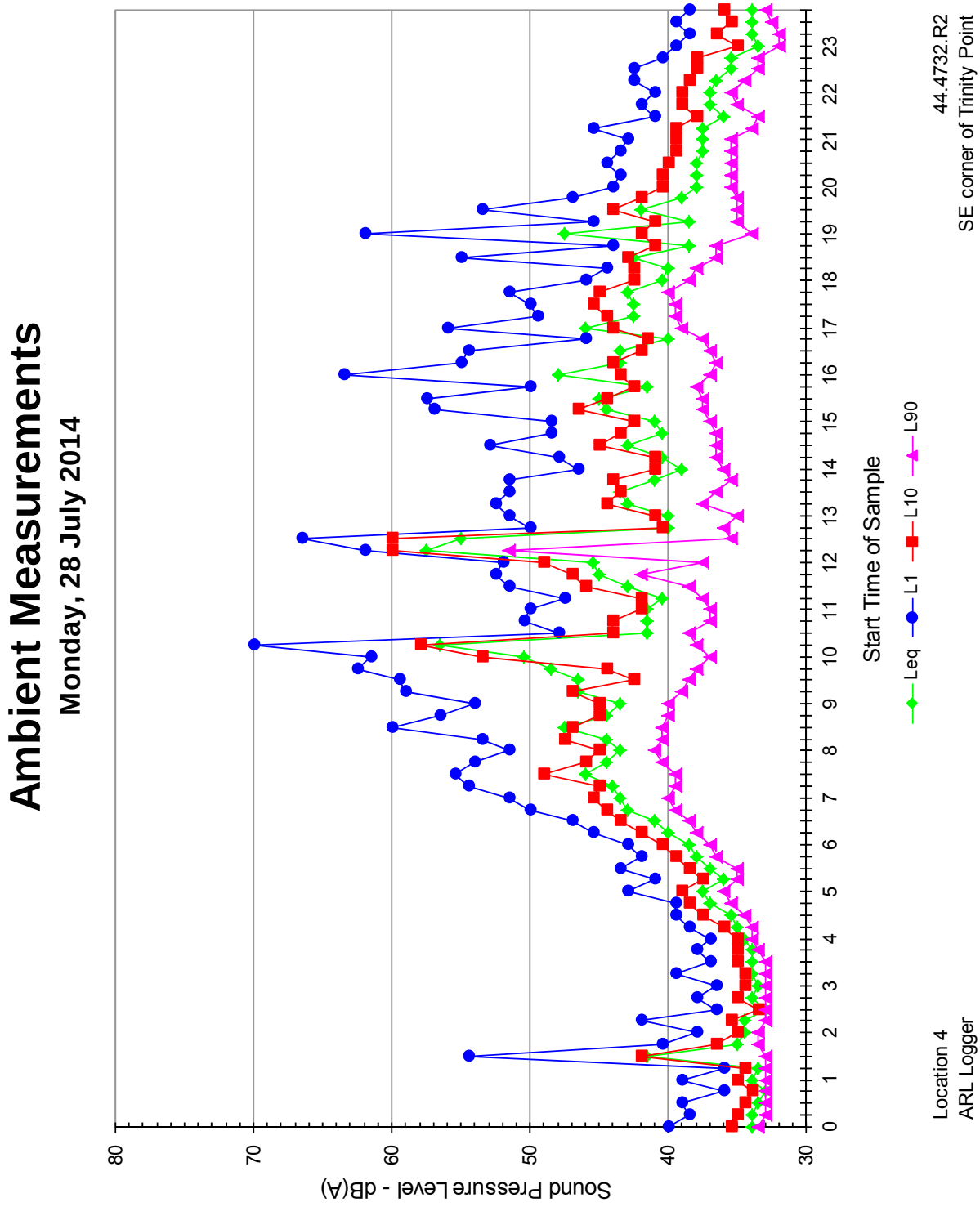

Ambient Measurements
Wednesday, 23 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0
Start Time of Sample (hr)
Leq
L1
L10
L90
44.4732.R2
SE corner of Trinity Point
Location 4
ARL Logger

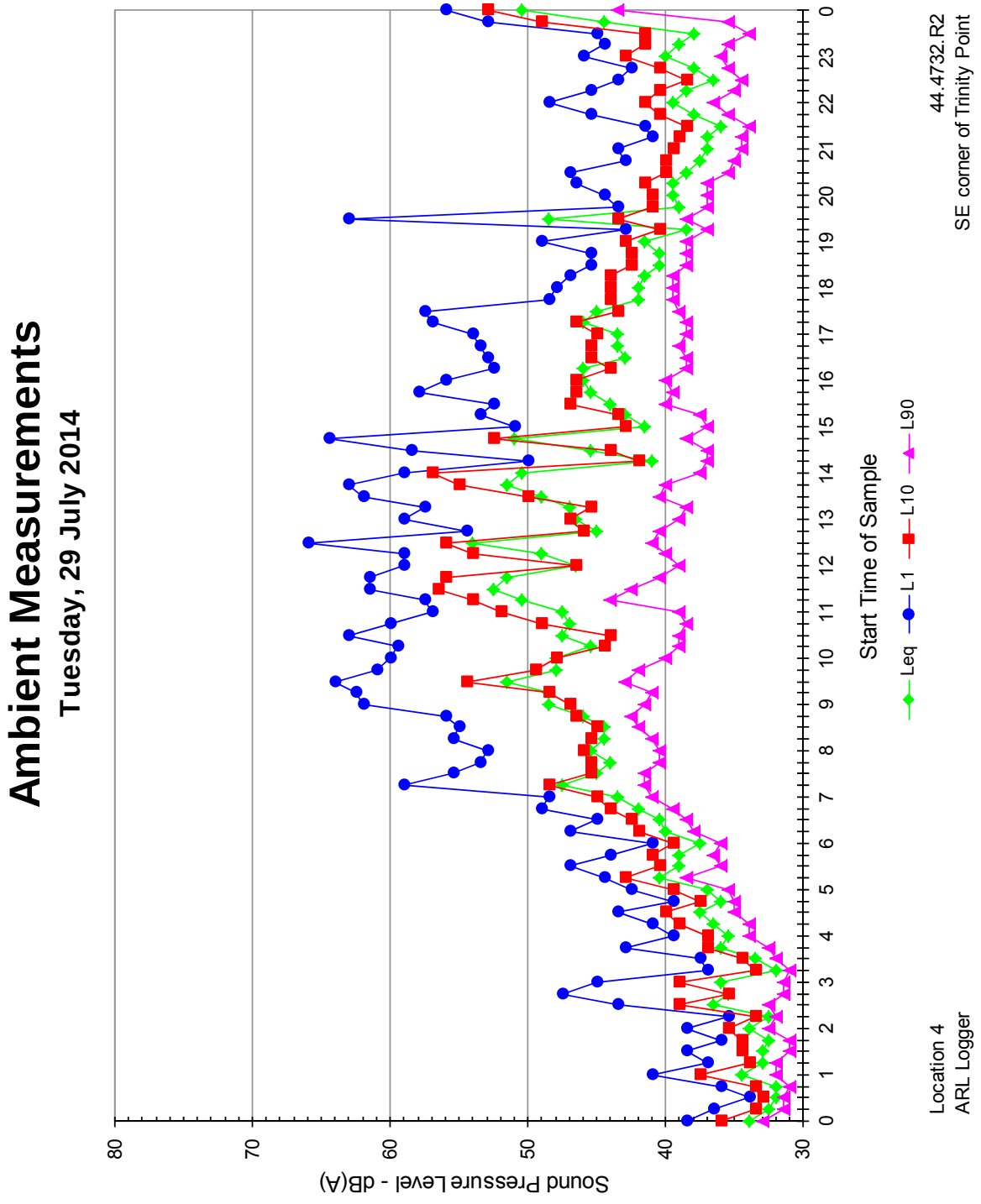

Ambient Measurements
Thursday, 24 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
Start Time of Sample (hr)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0
Leq
L1
L10
L90
44.4732.R2
SE corner of Trinity Point
Location 4
ARL Logger

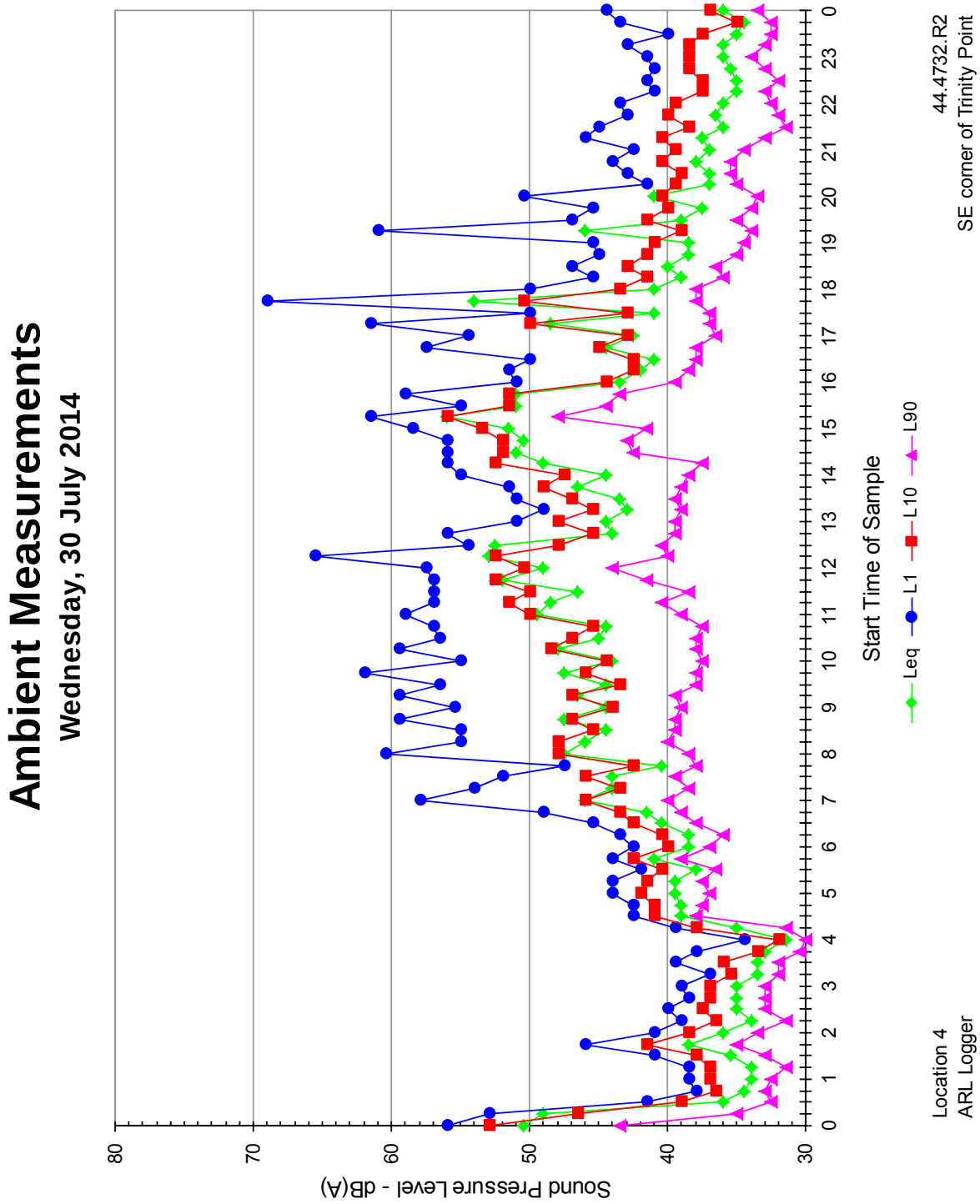

Ambient Measurements
Friday, 25 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
Start Time of Sample
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0
Leq
L1
L10
L90
44.4732.R2
SE corner of Trinity Point
Location 4
ARL Logger

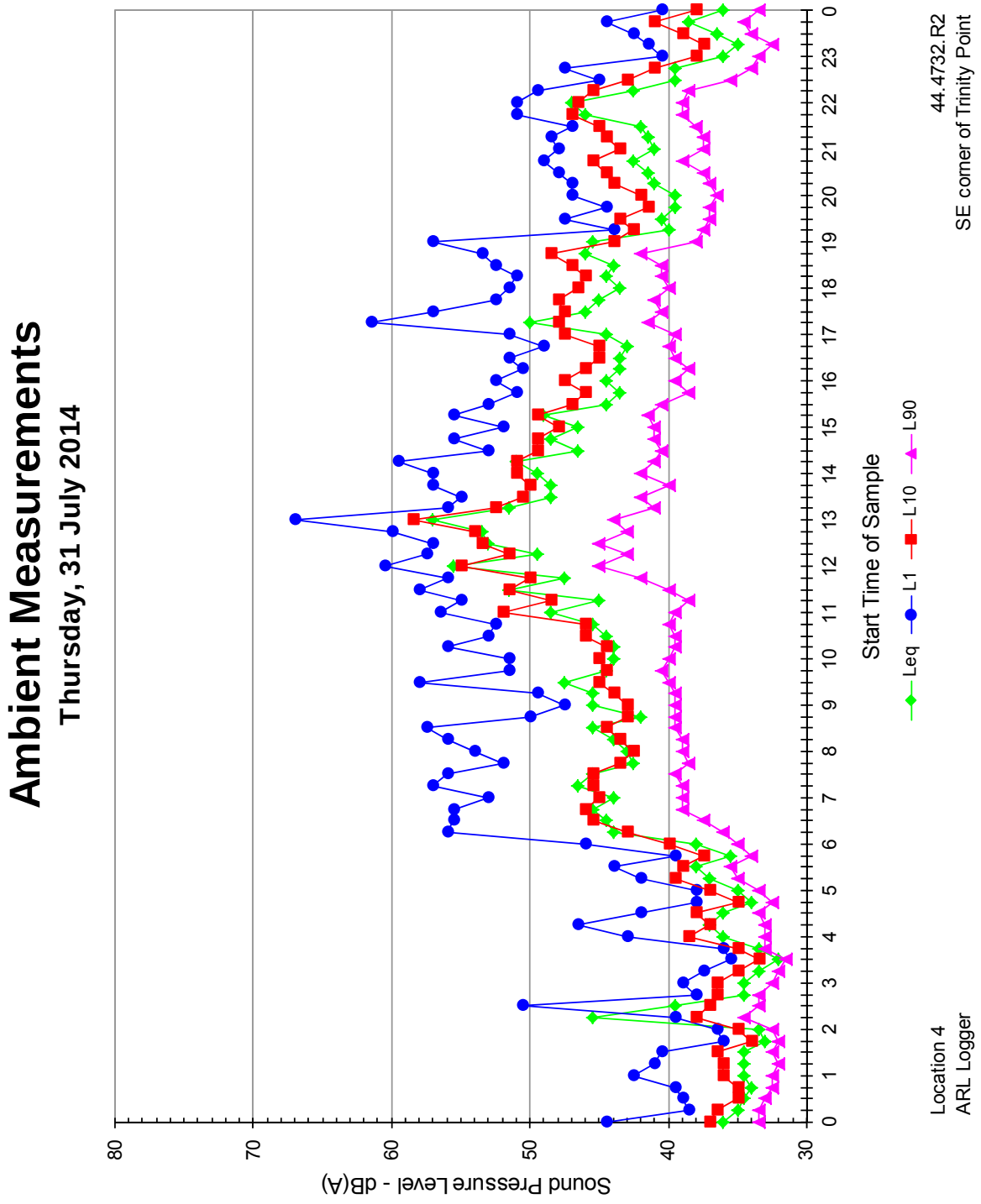

Ambient Measurements
Saturday, 26 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0
Start Time of Sample (hr)
Leq
L1
L10
L90
44.4732.R2
SE corner of Trinity Point
Location 4
ARL Logger

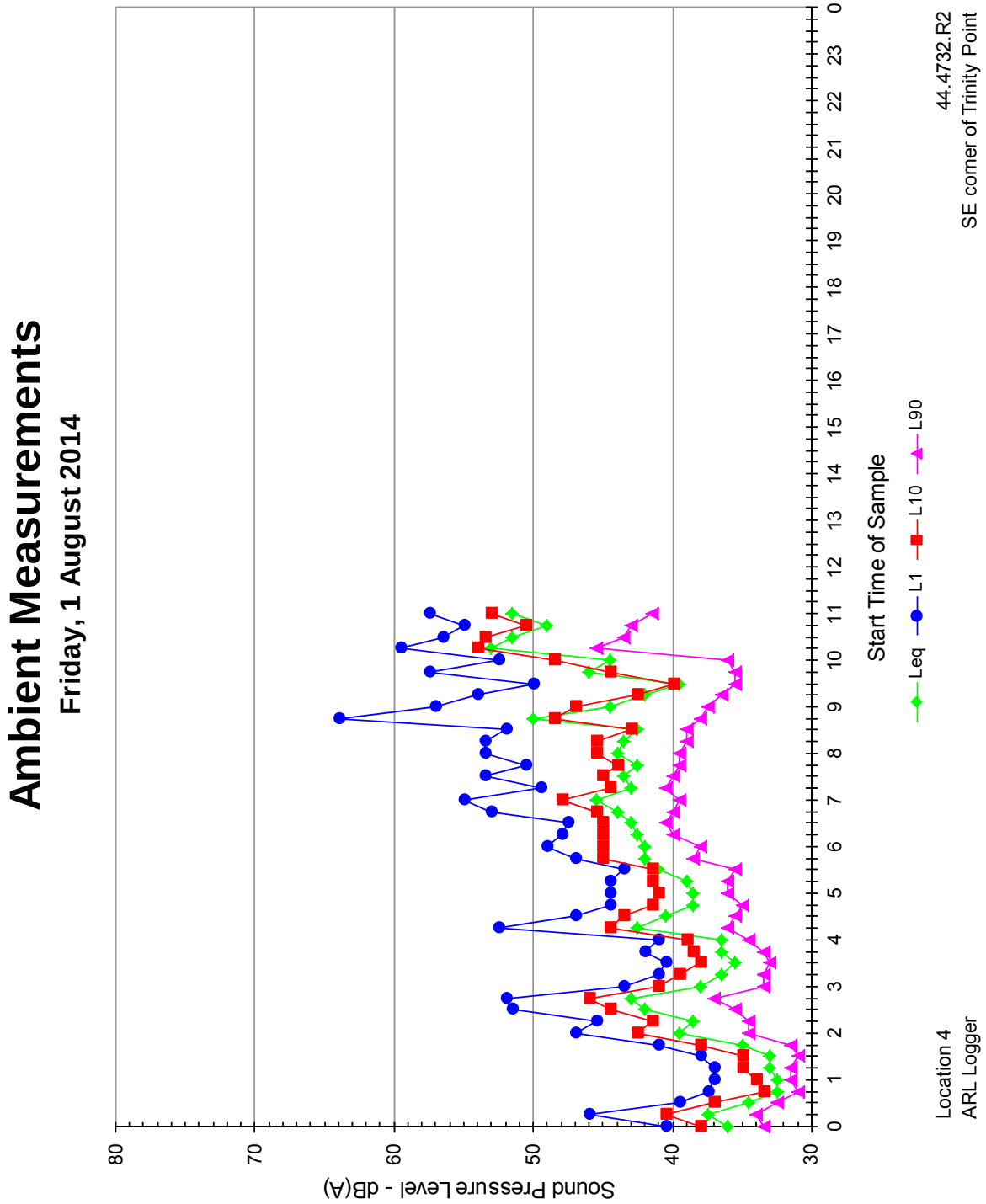

Ambient Measurements
Sunday, 27 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
Start Time of Sample (hr)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0
Leq
L1
L10
L90
44.4732.R2
SE corner of Trinity Point
Location 4
ARL Logger


Ambient Measurements
Monday, 28 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Start Time of Sample
Leq
L1
L10
L90
44.4732.R2
SE corner of Trinity Point
Location 4
ARL Logger


Ambient Measurements
Tuesday, 29 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0
Start Time of Sample
Leq
L1
L10
L90
44.4732.R2
SE corner of Trinity Point
Location 4
ARL Logger

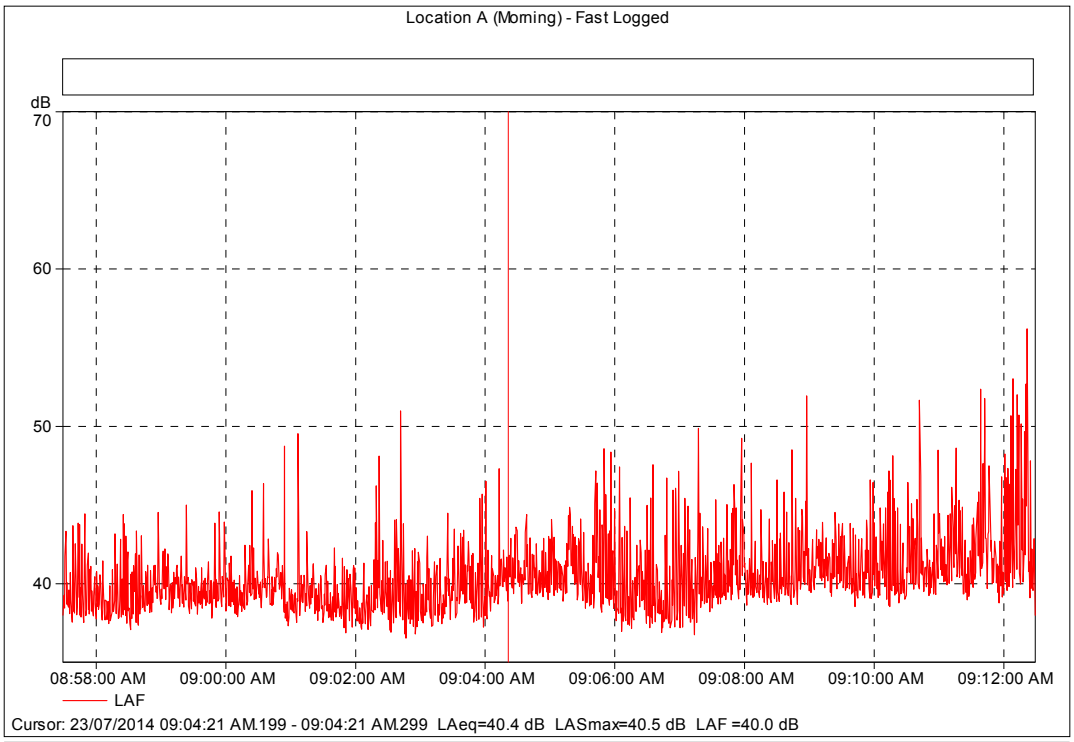

Ambient Measurements
Wednesday, 30 July 2014
44.4732.R2
SE corner of Trinity Point
Location 4
ARL Logger
Sound Pressure Level - dB(A)
80
70
60
50
40
30
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0
Start Time of Sample
Leq
L1
L10
L90

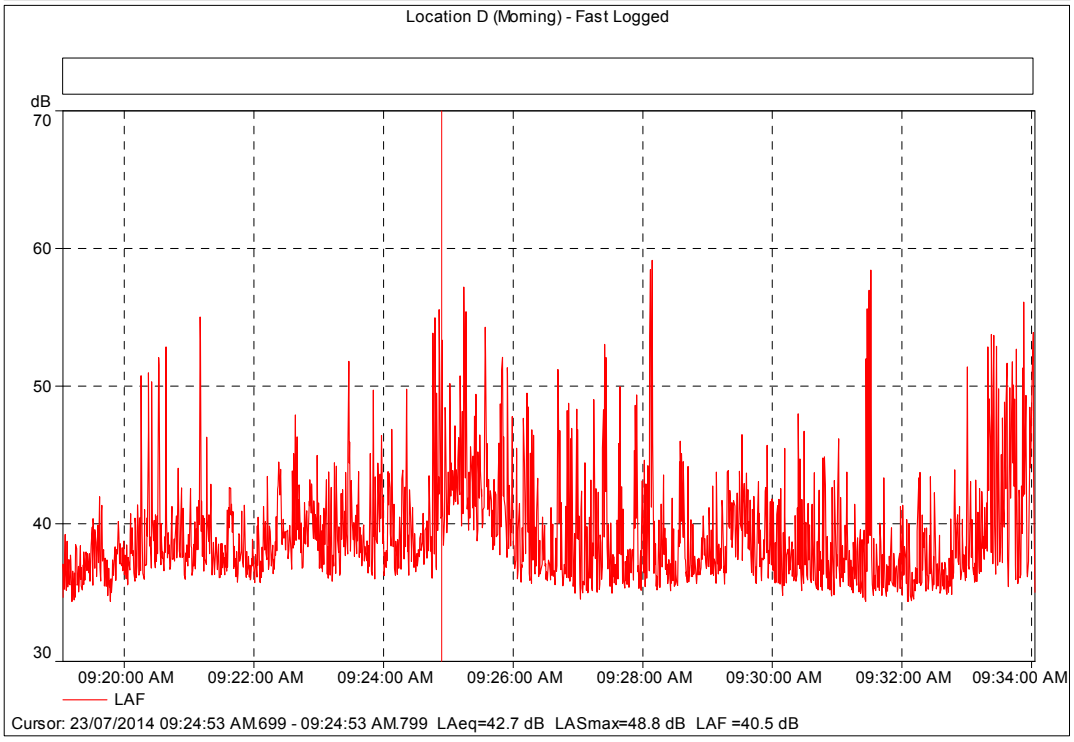

Ambient Measurements
Thursday, 31 July 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0
Start Time of Sample
Leq
L1
L10
L90
Location 4
ARL Logger
44.4732.R2
SE corner of Trinity Point

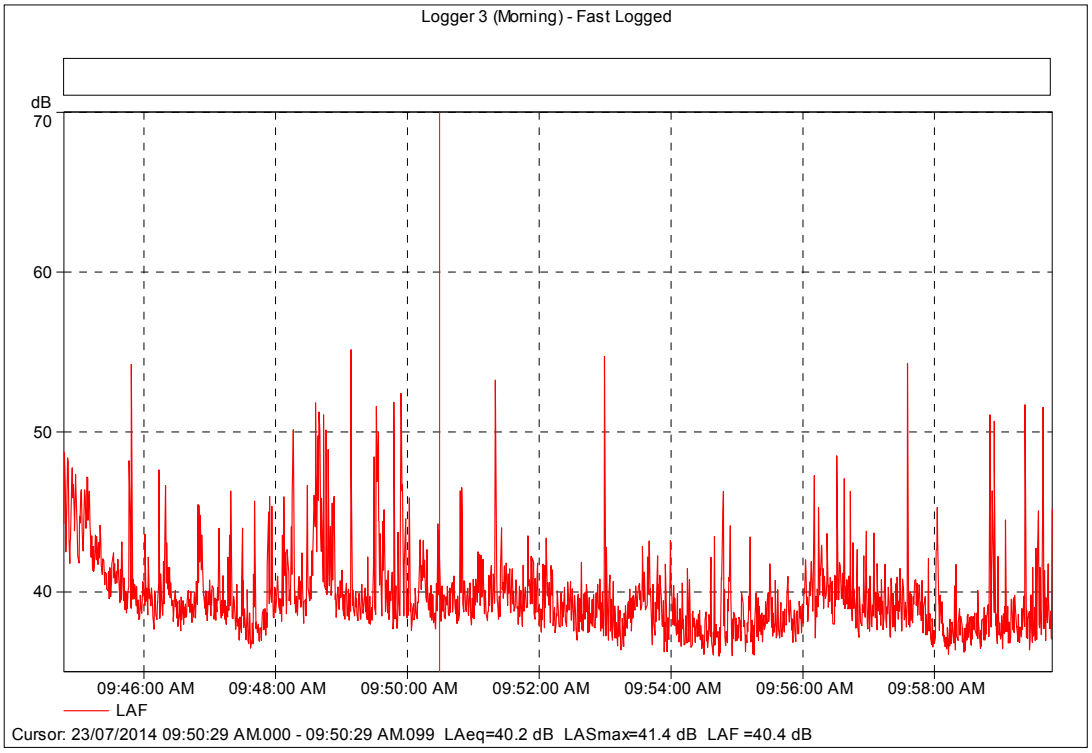

Ambient Measurements
Friday, 1 August 2014
Sound Pressure Level - dB(A)
80
70
60
50
40
30
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Start Time of Sample
Leq
L1
L10
L90
44.4732.R2
SE corner of Trinity Point
Location 4
ARL Logger

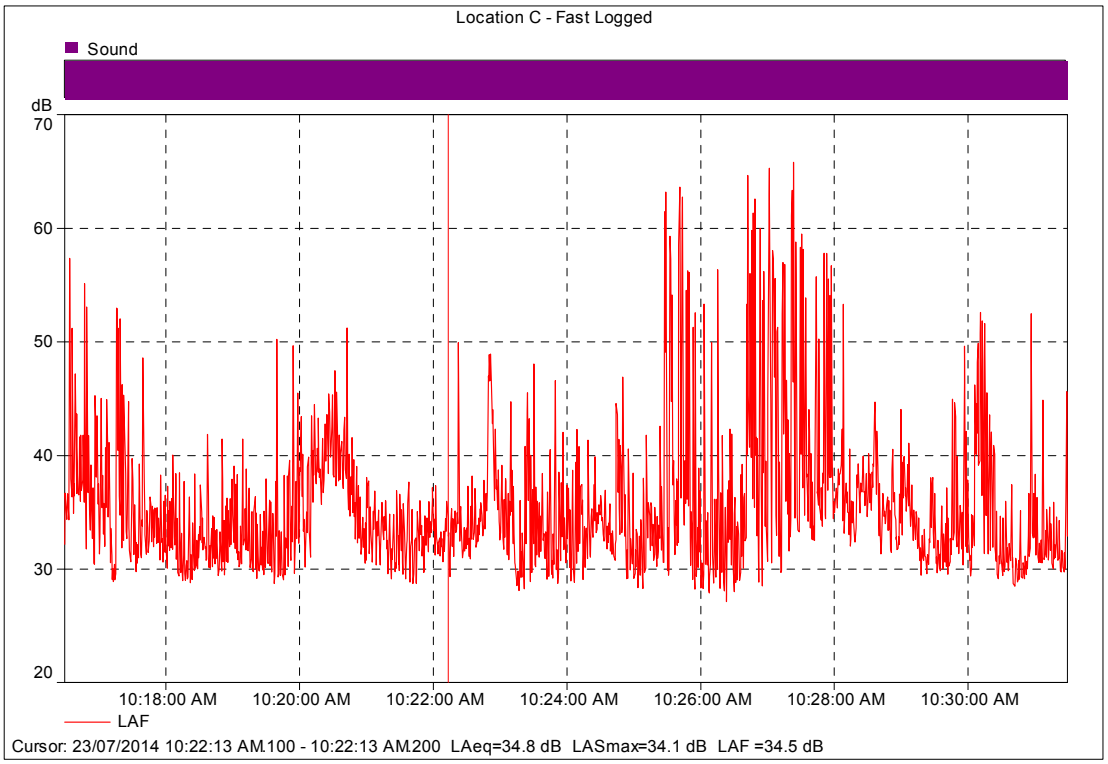
APPENDIX G: Attended Ambient Measurements

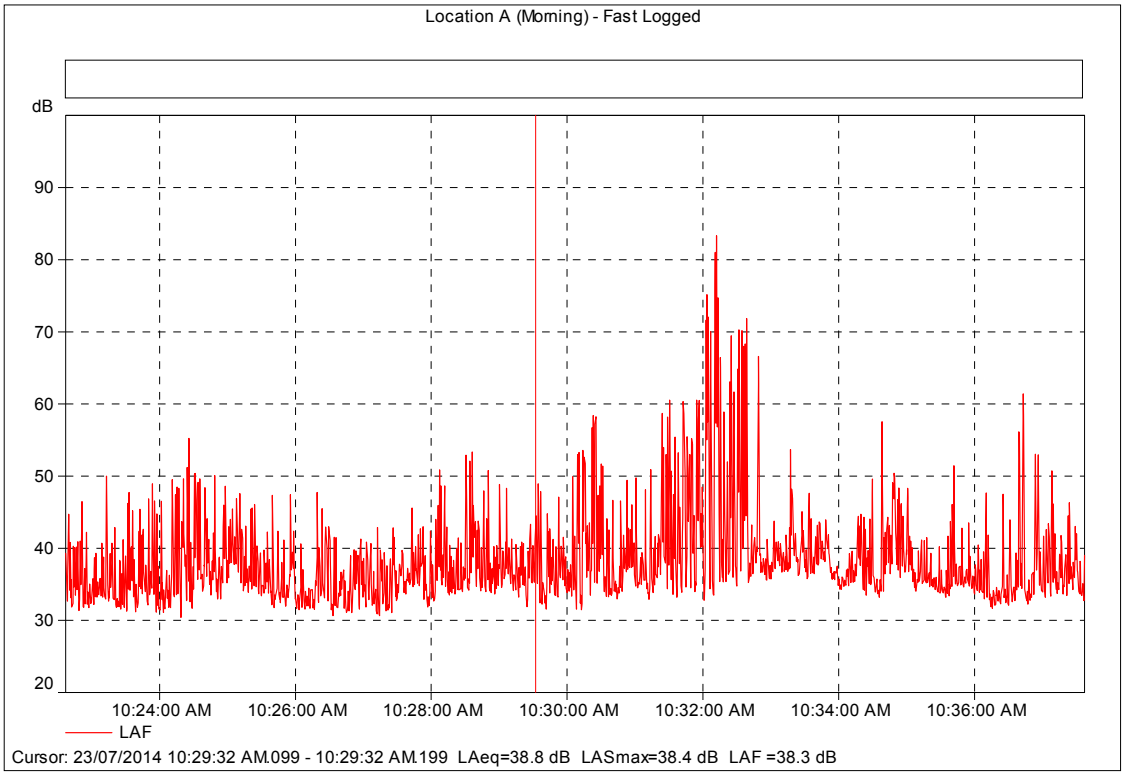
Daytime Measurements





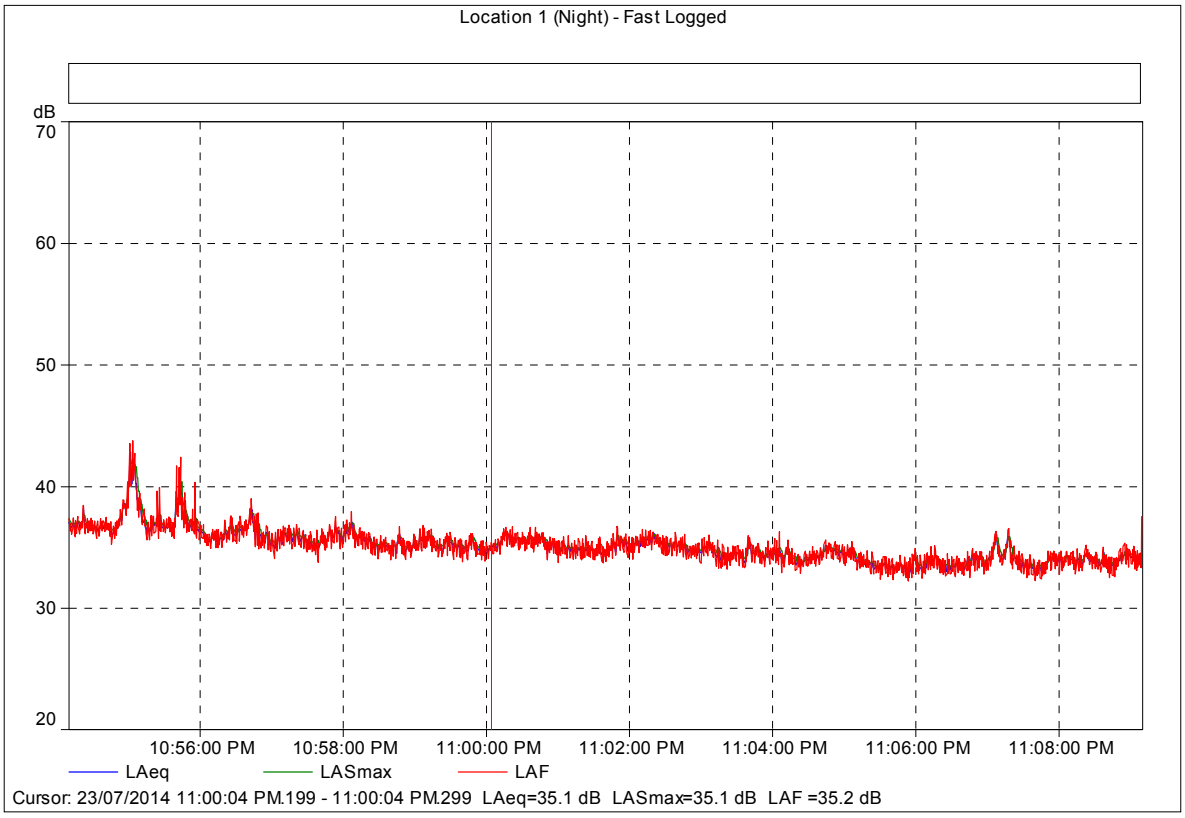

Logger 3 (Morning) - Fast Logged
dB
70
60
50
40
09:46:00 AM
09:48:00 AM
09:50:00 AM
09:52:00 AM
09:54:00 AM
09:56:00 AM
09:58:00 AM
LAF
Cursor: 23/07/2014 09:50:29 AM.000 - 09:50:29 AM.099 LAeq=40.2 dB LASmax=41.4 dB LAF =40.4 dB

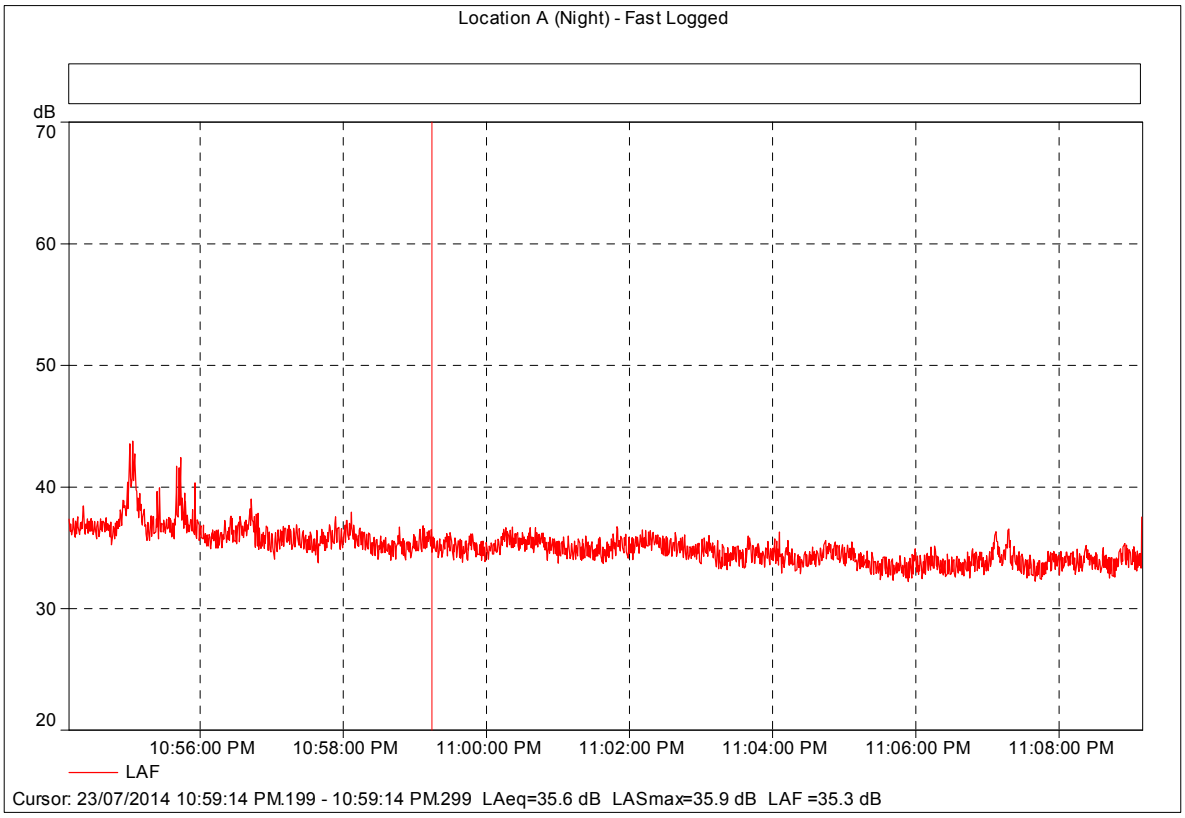

Location C - Fast Logged
Sound
dB
70
60
50
40
30
20
10:18:00 AM
10:20:00 AM
10:22:00 AM
10:24:00 AM
10:26:00 AM
10:28:00 AM
10:30:00 AM
LAF
Cursor: 23/07/2014 10:22:13 AM.100 - 10:22:13 AM.200 LAeq=34.8 dB LASmax=34.1 dB LAF =34.5 dB

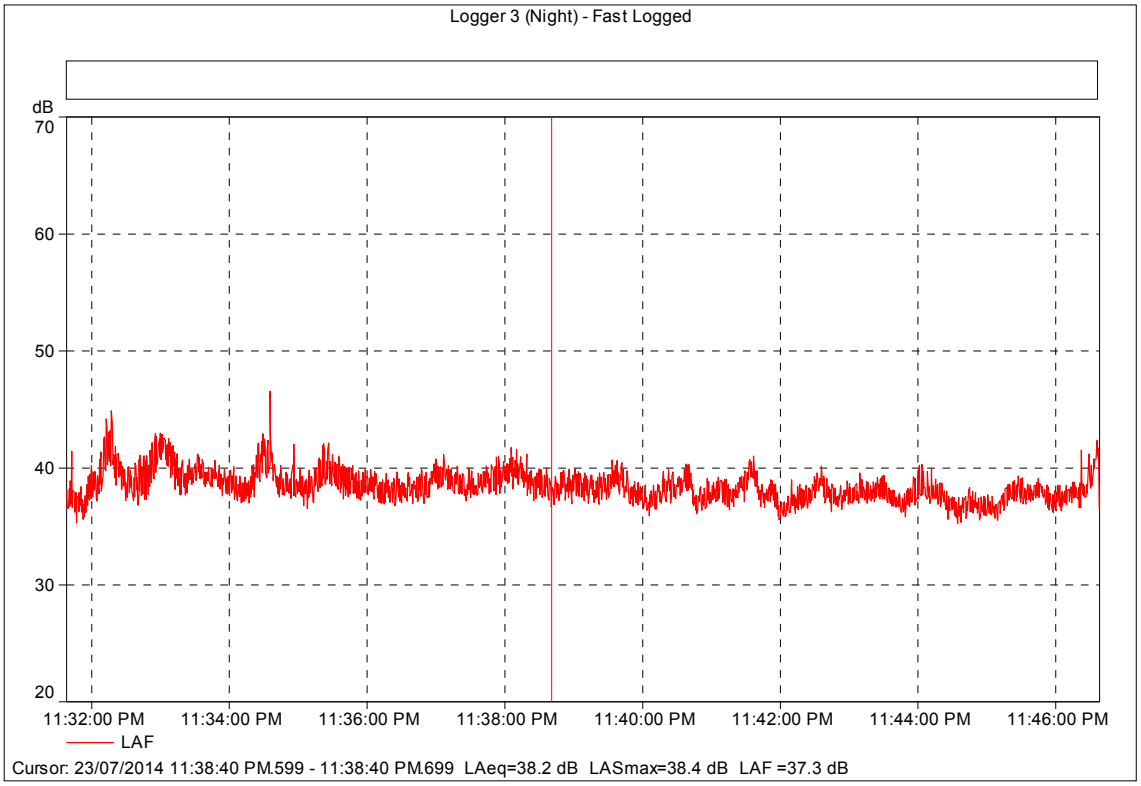


Location	Start Time		dB(A)	Octave Band Centre Frequency (Hz)								
				31	63	125	250	500	1k	2k	4k	8k
23rd June 2014												
A	08:57	L_{10}	43	58	61	54	44	35	33	34	36	24
		L_{eq}	41	56	59	52	42	34	31	31	32	21
		L_{90}	38	54	55	50	40	32	29	22	<20	<20
D	09:19	L_{10}	43	57	59	50	38	37	35	36	36	25
		L_{eq}	39	56	56	48	35	35	33	36	33	22
		L_{90}	36	53	52	45	33	32	29	22	<20	<20
3	09:45	L_{10}	42	58	58	53	44	36	34	32	29	<20
		L_{eq}	38	56	56	51	43	34	33	31	28	18
		L_{90}	38	53	52	48	39	32	29	23	<20	<20
C	10:16	L_{10}	42	57	53	43	31	32	35	38	35	25.0
		L_{eq}	44	55	52	42	29	31	33	42	40	24
		L_{90}	30	52	47	37	25	23	22	22	19	11
A	10:22	L_{10}	42	58	58	53	44	36	34	32	29	<20
		L_{eq}	53	56	53	45	34	33	38	49	48	37
		L_{90}	33	51	48	41	30	27	25	23	22	<20

Night


Location 1 (Night) - Fast Logged
dB
70
60
50
40
30
20
10:56:00 PM
10:58:00 PM
11:00:00 PM
11:02:00 PM
11:04:00 PM
11:06:00 PM
11:08:00 PM
LAeq
LASmax
LAF
Cursor: 23/07/2014 11:00:04 PM.199 - 11:00:04 PM.299 LAeq=35.1 dB LASmax=35.1 dB LAF =35.2 dB


Location A (Night) - Fast Logged
dB
70
60
50
40
30
20
10:56:00 PM
10:58:00 PM
11:00:00 PM
11:02:00 PM
11:04:00 PM
11:06:00 PM
11:08:00 PM
LAF
Cursor: 23/07/2014 10:59:14 PM.199 - 10:59:14 PM.299 LAeq=35.6 dB LASmax=35.9 dB LAF =35.3 dB



Location	Start Time		dB(A)	Octave Band Centre Frequency (Hz)								
				31	63	125	250	500	1k	2k	4k	8k
23rd June 2014												
D	22:34	L_{10}	35	55	60	46	31	32	28	21	<20	<20
		L_{eq}	34	54	58	44	29	34	27	17	15	15
		L_{90}	32	51	54	40	27	28	23	<20	<20	<20
A	22:54	L_{10}	38	57	63	48	38	30	27	<20	<20	<20
		L_{eq}	33	56	61	46	36	29	25	10	6	3
		L_{90}	34	54	58	44	34	27	22	<20	<20	<20
3	23:31	L_{10}	40	59	58	53	45	36	29	<20	<20	<20
		L_{eq}	36	57	56	51	43	35	27	11	5	-1
		L_{90}	37	55	53	49	40	33	25	<20	<20	<20