HEGGIES
AUSTRALIA

REPORT 10-3015-R1
Revision 3

Vincentia Master Plan
Noise Impact Assessment

PREPARED FOR

Forbes Rigby
278 Keira Street
WOLLONGONG NSW 2500

25 JANUARY 2006

Vincentia Master Plan

Noise Impact Assessment

PREPARED BY:

Heggies Australia Pty Ltd
ABN 29 001 584 612
Level 2, 2 Lincoln Street Lane Cove NSW 2066 Australia
(PO Box 176 Lane Cove NSW 1595 Australia)
Telephone 61 2 9427 8100 Facsimile 61 2 9427 8200
Email sydney@heggies.com.au Web www.heggies.com.au

DOCUMENT CONTROL

Reference	Status	Date	Prepared	Checked	Authorised
10-3015-R1	Revision 3	25 January 2006	John Sleeman	Glenn Homes	Glenn Homes
10-3015-R1	Revision 2	13 January 2006	John Sleeman	Glenn Homes	Glenn Homes
10-3015R1	Revision 1	10 February 2005	John Sleeman	David Lindsey	David Lindsey
10-3015R1	Revision 0	6 September 2004	John Sleeman	David Lindsey	David Lindsey

TABLE OF CONTENTS

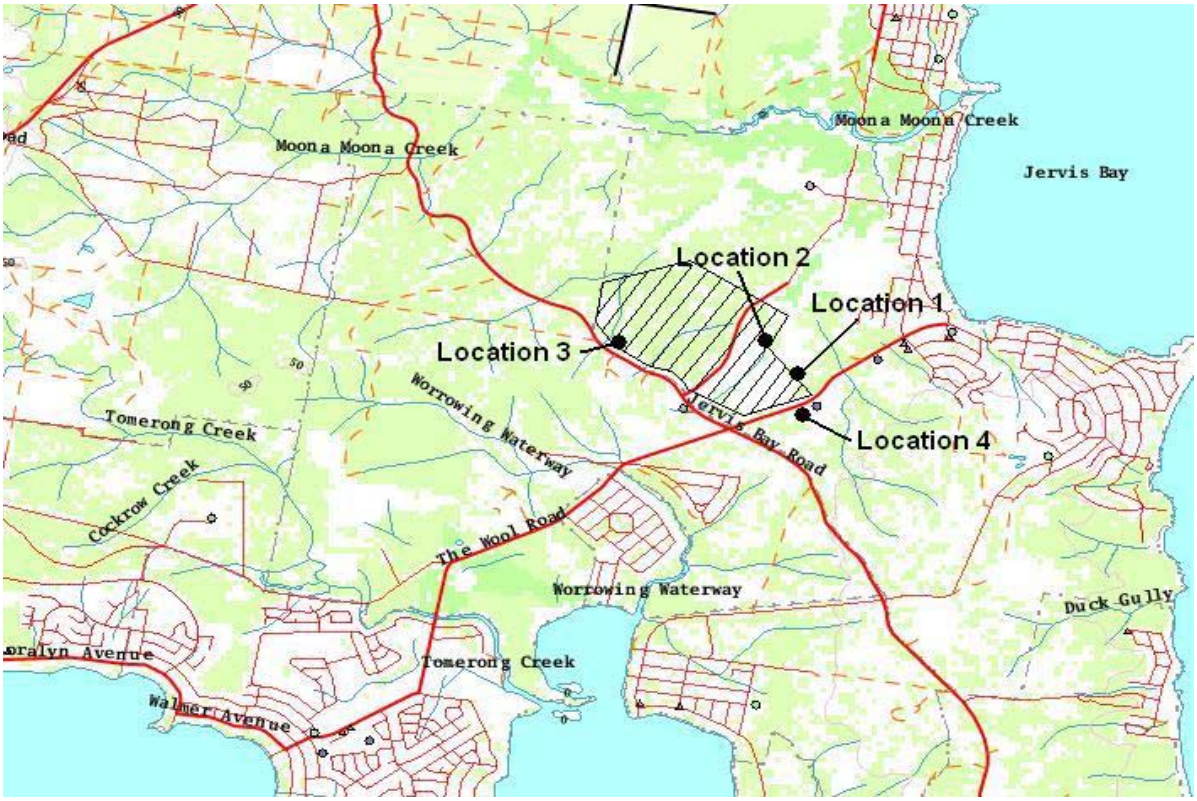
1 INTRODUCTION

An urban development is planned, located north of the intersection of Naval College Road and The Wool Road, Vincentia. The urban development will comprise retail, commercial and residential uses. The site is currently undeveloped bushland, bordered to the east by an existing leisure centre, to the north and west by bushland, and rural residential to the south on the opposite side of Naval College Road. Further east and opposite The Wool Road is Vincentia High School and Primary School. In particular the December 2005 revision of the development will include the following elements:

- Approximately 604 free standing dwellings generally located north of Naval College Road. These are located in two residential groupings, Village West and Village Central.
- Approximately 136 multi unit dwellings generally located north of The Wool Road. These are located in a smaller grouping on the eastern side of the site being Village East.
- A retail, commercial centre.

Heggies Australia (Heggies) has been commissioned to assess the implications of the development in relation to the future ambient noise environment of the entire site. An ambient noise survey was carried out to establish the general ambient noise environment, and existing traffic noise levels. The assessment has been conducted with the aid of computer noise modelling, validated through the on-site noise measurements. Using the results of the noise modelling, the impact of traffic noise from Naval College Road, and The Wool Road has been determined.

Figure 1 Location Plan and Noise Monitoring Locations



2 EXISTING ACOUSTICAL ENVIRONMENT

Ambient noise levels have been monitored using unattended noise-logging equipment located at four locations surrounding the site, as shown in **Figure 1**. The purpose of the monitoring was to establish the existing noise levels at various positions as a reference for both general ambient levels on the site, and traffic noise impacting on the perimeter. The four locations selected are:

- Location 1 - at the north eastern site boundary adjacent to the existing community centre. Noise levels at this location were affected by mechanical plant noise from the community centre.
- Location 2 – internal site location. This location was chosen to be distant from traffic, residences and the community centre. Noise levels are indicative of a quiet undeveloped area unaffected by traffic or other external sources.
- Location 3 – Naval College Road. This location was 15 m north of Naval College Road, approximately 1 km west of the Naval College Road/Wool Road intersection. The noise levels are affected by traffic on Naval College Road.
- Location 4 – Wool Road. This location was 15 m east of Wool Road, approximately 400 m north of the Naval College Road/Wool Road intersection. The noise levels are affected by traffic on Wool Road.

The measurements were carried out using ARL noise loggers Type EL 215 located on site from Thursday 4 December to Saturday 13 December 2003. The noise loggers continuously recorded noise levels over the entire nine day period, and calculated relevant statistical noise levels for each 15 minute period.

2.1 Measurement Results

The results of the noise logging are presented in **Appendix C** in the form of statistical noise descriptors (logged at the end of each 15-minute period). The statistical descriptors shown on the graphs are described below:

L_{A90} The L_{A90} noise level is the average minimum background sound level or simply the background level. The L_{A90} is the level of noise exceeded for 90% of the sample time (15 minutes).

L_{A10} The noise level exceeded for 10% of the sample time (15-minute) and is frequently referred to as the average maximum noise level.

L_{A1} The noise level exceeded for 1% of the sample time (15-minute) and representative of the highest noise level events, (eg passing heavy vehicles, aircraft etc).

L_{Aeq} The L_{Aeq} is the energy-average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time varying sound.

The results of the noise monitoring have been processed with reference to the procedures contained in the NSW Government's Industrial Noise Policy (Jan 2000) (INP), which is administered by the Department of Environment and Conservation (DEC). The results establish representative noise levels that occur at residences.

The Rating Background Noise Level (RBL) is the background noise level used for assessment purposes at the nearest potentially affected residence. It is the median of the daily background noise levels during each assessment period, being day, evening and night. RBL levels ($L_{A90\ (15minute)}$) and L_{Aeq} noise levels are presented in Table 1.

Table 1 Measured Ambient Noise Levels

Location	Noise Level - dBA re 20 µPa					
	Daytime 0700 hrs - 1800 hrs		Evening 1800 hrs – 2200 hrs		Night-time 2200 hrs - 0700 hrs	
	RBL	LAeq	RBL	LAeq	RBL	LAeq
Location 1 – Community Centre	43	52	44	49	41	46
Location 2 – Centre of the Site	38	47	40	51	36	46
Location 3 – Naval College Road	38	62	38	57	35	56
Location 4 – The Wool Road	46	64	39	60	32	57

Commercial and industrial noise is assessed for each of the day (i.e. 7:00am to 6:00 pm), evening (6.00 pm to 10.00 pm) and night-time (i.e. 10.00 pm to 7.00 am) periods in accordance DEC INP.

The NSW Government's Environmental Criteria for Road Traffic Noise (Dec 1999) (ECRTN) recommends assessment of road traffic noise over the day (i.e. 7:00 am to 10:00 pm) and night-time periods (i.e. 10:00 pm to 7:00 am). The noise logger results have also been processed in accordance with these procedures. Traffic predominantly affects locations 3 and 4, with the survey results reflecting the total road traffic noise presented in Table 2.

Table 2 Measured LAeq Noise Levels

Location	LAeq (1 hour) [1] Noise Level - dBA re 20 µPa [1]	
	Daytime 0700 hrs – 1800 hrs	Night-time 2200 hrs - 0700 hrs [2]
Location 3 - Naval College Road	63	61
Location 4 - The Wool Road	65	61

Note 1. The LAeq is the equivalent continuous noise level, and is based on the logarithmic average of the 15 minute samples in each assessment period. The average maximum hourly value over the time period is shown.
2. The night-time average maximum hourly level was due to relatively high levels recorded in the 6am to 7am period.

3 NOISE CRITERIA

The residential component of the development will potentially be impacted by traffic noise from Naval College and/or The Wool Road. In addition, noise generated by mechanical plant or water features should comply with DEC's INP.

3.1 Traffic Noise

The DEC ECRTN represents the NSW Government's noise design goals for the assessment of road traffic noise.

The ECRTN document presents recommended road traffic noise criteria for various types of road and land use developments. The relevant criteria relating to new residential land use developments affected by 'collector' road traffic noise is summarised in **Table 3** for residences and **Table 4** other sensitive land uses.

Table 3 DEC's Guidelines for Road Traffic Noise at Residences

Type of Development	Criteria		
	Day (7am to 10pm)	**Night (10pm to 7am)**	**Where Criteria are Already Exceeded**
New residential land use developments affected by collector traffic noise.	$L_{Aeq(1hour)}$ 60 dBA	$L_{Aeq(1hour)}$ 55 dBA	Where feasible and reasonable, existing noise levels should be reduced to meet the noise criteria via judicious design construction of the development. Locations, internal layouts, building materials and construction should be chosen so as to minimise noise impacts.
Land use developments with potential to create additional traffic on collector road.	$L_{Aeq(1hour)}$ 60 dBA	$L_{Aeq(1hour)}$ 55 dBA	Where feasible and reasonable, existing noise levels should be mitigated to meet the noise criteria. via judicious design construction of the development. In all cases, traffic arising from the development should not lead to an increase in existing noise levels by more than 2 dB.

Definitions: New residential development affected by traffic noise – addresses the acceptable level of road traffic noise impact for new residential developments.
Land use developments with potential to create additional traffic – addresses the acceptable level of traffic noise impact for existing residences.

Table 4 DEC's Guidelines for Road Traffic Noise at Sensitive Land Uses

Sensitive Land Use	Criteria		
	Day (7am to 10pm)	**Night (10pm to 7am)**	**Noise Mitigation Measures**
Active recreation (for example, golf courses).	Collector and Local Roads: $L_{Aeq(1hour)}$ 60 dBA		Where existing levels of traffic noise exceed the criteria, all feasible and reasonable noise control measures should be evaluated an applied. Where this has been done and the internal or external criteria (as appropriate) cannot be achieved, the proposed road or land development should be designed as not to increase existing road traffic noise levels by more than 0.5 dB(A) for new roads, and 2 dB(A) for redeveloped roads, or land use developments with potential to create additional traffic.
Passive recreation and school playgrounds	Collector and Local Roads: $L_{Aeq(1hour)}$ 55 dBA		

3.2 Commercial and Industrial Noise Criteria

The development is proposed to comprise commercial elements which potentially will produce noise from mechanical services, such as exhaust fans, and air-conditioning equipment. In addition there is a water feature which is expected to generate a degree of noise as well.

Criteria governing operational noise emissions are found in the DEC's INP. The policy is applicable to commercial as well as industrial noise sources and relevant for the assessment of operational noise both to residences with the development, and external to the development. The policy has the following broad objectives:

- Controlling intrusive noise impacts; and
- Maintaining noise level amenity for particular land uses over the medium to long-term.

Intrusive Noise Criterion

In setting an "Intrusive" noise goal, a statistically rigorous estimate of the ambient (background) L_{A90} noise level, termed the RBL, needs to be established at the nearest sensitive receivers. An "RBL plus 5 dBA" criterion is then applied to the 15-minute L_{Aeq} noise emissions of the noise source in question at the receivers of interest (normally at their property boundary).

- **Intrusive Design Goal**: $L_{Aeq(15minute)} \leq$ RBL + 5 dBA

Section 3.1 of the INP recommends that, where the RBL is found to be below 30 dBA, it is set at 30 dBA.

Amenity Criterion

The "Amenity" noise goal seeks to place a limit on noise emissions according to how existing industrial/commercial-related noise levels relate to recommended noise levels for the type of area involved, i.e. rural, suburban, urban, etc.

The resulting amenity criterion placed upon noise emissions of a new facility then depends upon whether existing industrial/commercial-related $L_{Aeq(period)}$ levels are lower or higher than the recommended amenity level.

In areas where existing industrial/commercial-related noise levels are already high, the amenity noise goal acts to limit new industrial noise emissions so that the cumulative impact of all industrial/commercial noise emissions does not increase.

Conversely, in areas where there is no existing industrial/commercial noise, the amenity noise goal would be set at a level which allows new industrial/commercial noise emissions up to recommended amenity levels for the area.

The area would be classified as 'Suburban' due to the influence of local traffic with characteristically intermittent flows or with some limited commerce or industry. DEC's recommended acceptable noise levels for residents located in a suburban area is:

- 55 dBA during the daytime period (7.00 am to 6.00 pm)
- 45 dBA during the evening period (6.00 pm to 10.00 pm)
- 40 dBA during the night-time period (10.00 pm to 7.00 am)

Existing ambient L_{Aeq} noise levels have been measured across the site.

Project-Specific Noise Goals

The intrusive and amenity noise criteria for residences located on (future) and adjacent (existing) to the site are presented in **Table 5**. These criteria are nominated for the purposes of assessment of potential noise impacts from the operation of the proposed commercial part of the complex.

Table 5 Project Specific Noise Assessment Criteria

Residential Receiver	Assessment Period	Ambient RBL	Intrusive Noise Goal $L_{Aeq(15minute)}$	Ambient L_{Aeq} Noise Level [1, 2]	Amenity Noise Goal $L_{Aeq(period)}$
Location 1	Day-time	43 dBA	48 dBA	< 49 dBA	55 dBA
	Evening	44 dBA	49 dBA	< 39 dBA	45 dBA
	Night-time	41 dBA	46 dBA	< 34 dBA	40 dBA
Location 2	Day-time	38 dBA	43 dBA	< 49 dBA	55 dBA
	Evening	40 dBA	45 dBA	< 39 dBA	45 dBA
	Night-time	36 dBA	41 dBA	< 34 dBA	40 dBA
Location 3	Day-time	38 dBA	43 dBA	< 49 dBA	55 dBA
	Evening	38 dBA	43 dBA	< 39 dBA	45 dBA
	Night-time	36 dBA	41 dBA	< 34 dBA	40 dBA
Location 4	Day-time	46 dBA	51 dBA	< 49 dBA	55 dBA
	Evening	39 dBA	44 dBA	< 39 dBA	45 dBA
	Night-time	32 dBA	37 dBA	< 34 dBA	40 dBA

Note 1. For Industrial sources
2. The small localised contribution from the leisure centre mechanical plant has been excluded

The project-specific goals for operational noise emissions from the proposed development are based on the lower of the intrusive and amenity criteria as follows:

- $L_{Aeq(15minute)}$ noise emissions from the facility should not exceed **43 dBA** during the day, **43 dBA** during the evening, and **37 dBA** during the night.

Compliance with these design goals will maintain the amenity of the residential component of the development. The **total** noise emissions from "continuous" sources, such as mechanical plant, associated with the retail/commercial component should be designed to comply with these criteria at the residences. In accordance with the INP if the source is tonal, impulsive or intermittent then consideration of criteria modifying adjustments will be required during the retail/commercial design stage.

4 ROAD TRAFFIC NOISE ACOUSTICAL MODELLING

4.1 General

To assess the potential impact of traffic noise on the proposed development computer modelling of the site and surrounding areas has been conducted using the "SoundPLAN" software. In assessing road traffic noise, the "Calculation of Road Traffic Noise" (CORTN) procedure algorithms were adopted for the analysis. This procedure is recommended by the Roads and Traffic Authority of NSW. The calculated noise levels are determined by taking into account:

- overall traffic volumes;
- vehicle speed;
- percentage of heavy vehicles;
- distance between roadway and the receiver;
- nature of the intervening ground ; and
- intervening features such as proposed commercial buildings and topography which can provide acoustical shielding.

Two scenarios have been modelled:

- $L_{Aeq(1hour)}$ daytime noise levels; and
- $L_{Aeq(1hour)}$ night-time noise levels

For each of the above two scenarios, noise contours have been generated at heights of 1.5 m above a nominal ground floor level. Single point calculations were also carried out at the expected location of the closest residential facades, nominally set back 6 metres from Village West boundaries and 10 metres from Village Central boundaries. The two scenarios have been developed based on the expected future traffic flow predictions as provided in the Transport Reports of June 2004 and November 2005 and expected increases in night-time traffic, provided by Masson Wilson Twiney.

The results of the modelling are presented graphically in **Appendix A** to **Appendix B** respectively. These graphs present noise levels for the future full development (ultimate development).

The output of the SoundPLAN model was verified and calibrated against the long term noise monitoring conducted at two different locations at the site, as detailed in **Section 2.**

4.2 Existing Receivers

In addition to potential receivers on the development site, noise levels were calculated at residences located on the south-eastern side of Naval College Road, and at the High School south east of The Wool Road. The results are shown in **Table 6**. Note the ECRTN requires that "traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dBA". The development increase was calculated based on the difference between future traffic flows without the development and with the full development.

Table 6 Traffic Noise Levels at Existing Receivers

Receiver	Daytime $L_{Aeq(1hr)}$ Noise Levels		Night-time $L_{Aeq(1hr)}$ Noise Levels	
	Existing	**Development Increase**	**Existing**	**Development Increase**
Receiver 1 15 m south west of Naval College Road	64 dBA	2 dB	63 dBA	2 dB
Receiver 2 30 m south west of Naval College Road	61 dBA	2 dB	60 dBA	2 dB
High School 85 m south east of The Wool Road	52 dBA	1 dB	n/a	n/a

Notes 1. The average maximum hourly value over the time period is shown.

2. Calculations at these receivers has been "facade corrected" in accordance with EPA/RTA procedures. The free field noise level has been adjusted upwards to include a 2.5 dBA facade reflection.

3. Based on the noise survey results $L_{Aeq(15hour)}$ daytime and $L_{Aeq(9hour)}$ night-time levels are 2 dBA and 5 dBA respectively below the average maximum daytime and night-time hourly values shown.

The results show the increase in noise level at residential receivers is not more than 2 dB for both the daytime and night-time average maximum hourly period, and also not "acute"[1]. Compliance with the ECRTN objective is achieved. For Schools, ECRTN also recommends that any increase should not be more than 2 dB, and compliance is therefore also achieved here.

[1] Noise levels as defined by the RTA are "Acute" when the $L_{Aeq(15hour)}$ daytime levels are 65 dBA and $L_{Aeq(9hour)}$ night-time levels are 60 dBA.

5 DISCUSSION AND CONTROL MEASURES

5.1 Traffic Noise Modelling Results

There are two main residential 'groups' facing Naval College Road (referred to as Village Central and Village West), and a third, smaller residential group (referred to as Village East) facing The Wool Road.

Appendix A : presents the daytime traffic noise contours at a height of 1.5 m above the nominal ground floor level. At Village West the graphs show the noise levels range from 59 dBA to 60 dBA at the closest residential facades to Naval College Road. At Village Central noise levels range from 59 dBA to 62 dBA. For the closest residence west of The Wool Road, the level is predicted to be 60 dBA. These noise levels comply with the ECRTN target of 60 dB $L_{Aeq(1hour)}$, except at Village Central, where there is a 2 dBA exceedance. The RTA's Environmental Noise Management Manual (ENMM) provides the RTA's policy in relation to the noise mitigation and the reasonability of it and may be used to provide guidance here. The ENMM indicates that it is considered unreasonable to implement special measures for noise mitigation where the road traffic noise levels do not exceed the ECRTN target noise levels by up to 2 dBA. This is on the basis of the insignificance of the exceedance.

On the basis of the above, no further noise controls are deemed to be required here.

Appendix B : presents the night-time traffic noise contours at a height of 1.5 m above the nominal ground floor level. At Village West, the graphs show that noise levels range from 56 dBA to 57 dBA at the closest residential facades to Naval College Road. At Village Central, noise levels range from 56 dBA to 59 dBA. At the closest residence west of The Wool Road the level is predicted to be 55 dBA. The Wool Road receiver complies with the 55 dBA target noise level, Village West receivers are up to 2 dBA above the target and Village Central receivers up to 4 dBA above the target. In accordance with the guiding principles of the RTA's ENMM, there should be further consideration of noise mitigation for the Village Central receivers.

5.2 Complying Barrier – Road Traffic Noise

A noise wall was modelled at the property boundary (located approximately 15 m north of Naval College Road) between access road B and access road C (south of Village Central lots 154 to 163 and 725 to 733). The noise wall was also extended to the north for 30 metres at the western end of Village Central (west of lot 154 along the access road B boundary). The barrier height was increased to determine requirements for compliance with the ECRTN criteria for new residential development. To comply, for single storey residential receivers, the required noise wall height is in the order of 2.5 m. For double-storey residential receivers, the required wall height is in the order of 4 m.

Additionally an alternative noise wall was modelled at the lot boundary of the Village Central residential lots facing Naval Collage Road (located approximately 35 m north of Naval College Road). The wall was located along lot 154 to 163, and 725 to 733, and also on the eastern boundary of lot 733, and for two thirds of the length of the western boundary of lot 154. The barrier height was increased to determine requirements for compliance with the ECRTN criteria for new residential development. To comply, for single storey residential receivers, the required noise wall height is in the order of 2.5 m. For double-storey residential receivers, the required wall height is in the order of 5 m, except for lot 733 where the height is required to be the order of 5.5 m. Walls of the order of 5 m to 5.5 m in height are not considered aesthetically viable.

The noise wall can be constructed from a combination of earth mound and solid wall to achieve the height required. For example a 2.5 m high wall can be achieved using a 0.7 m high earth mound and 1.8 m high solid fence.

5.3 Architectural Treatments

Whilst the preferred form of mitigation is noise walls for single storey dwellings, as this maintains the amenity of outdoor areas and does not constrain architectural design, an alternative to noise walls is architectural treatments at the dwellings.

These aim to ensure that satisfactory internal noise levels are achieved, as a minimum. As design goal exceedances are 10 dBA or lower, the provision of mechanical ventilation (complying with Building Code of Australia requirements) to allow windows to be kept shut to minimise noise intrusion should be adequate. This is because external noise levels are reduced in the order of 10 dBA through a window opened sufficiently to allow for ventilation.

Although ECRTN does not explicitly provide specific internal noise criteria for dwellings, it does suggest that night-time noise levels between 35 dBA and 40 dBA within sleeping spaces and noise levels 10 dBA lower than the external daytime criteria (ie 50 dBA in this case) within other habitable spaces may be taken as satisfactory internal noise levels.

With windows closed and assuming a conservative noise reduction of 20 dBA for light-weight building structures (such as timber or weatherboard), internal noise levels not exceeding 40 dBA are expected to be achieved in bedrooms fronting Naval College Road during the night-time period, and 50 dBA (10 dBA lower than the external criteria) and lower within other living areas during the daytime period.

Another form of mitigation to be considered is planning the layout of the site and location of habitable rooms within the dwellings to minimize noise traffic noise impact. For example designing habitable rooms to not face the roadway directly and/or the provision of external solid boundary fences or walls to provide individual shielding. These techniques can be applied, however their use is limited when applied to two storey (or higher) residences.

Regardless of the techniques employed, attenuation of external noise is required and recommended during the detailed design of the dwellings on site. Noise mitigation measures should include:

- Consideration of the use of mechanical ventilation to enable windows to be kept shut.

or

- Dwelling layout and/or the use of solid boundary fences to shield bedroom and sensitive living areas from traffic noise sources.

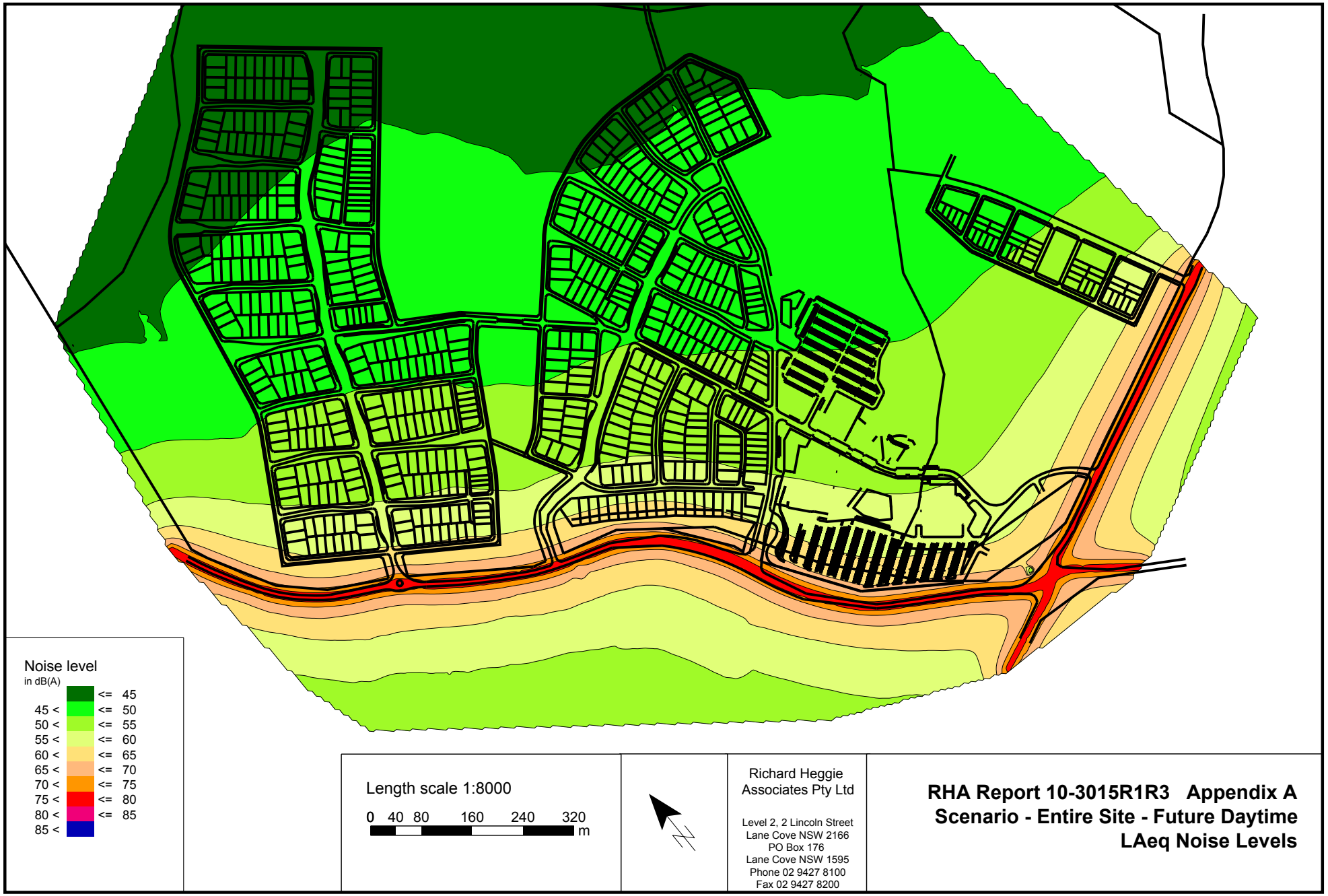
5.4 Industrial Noise

Noise from industrial sources was not assessed, as the nature of the commercial facilities is not known at the concept approval stage. Compliance with the design criteria developed in **Section 3.2** would occur during the detailed design phase of the project.

6 CONCLUSION

It is proposed to undertake an urban development north of The Wool Road and north-east of Naval College Road in Vincentia. The proposed development includes residential, retail and commercial elements. The acoustic assessment of the development contained within this report can be summarised in the following points:

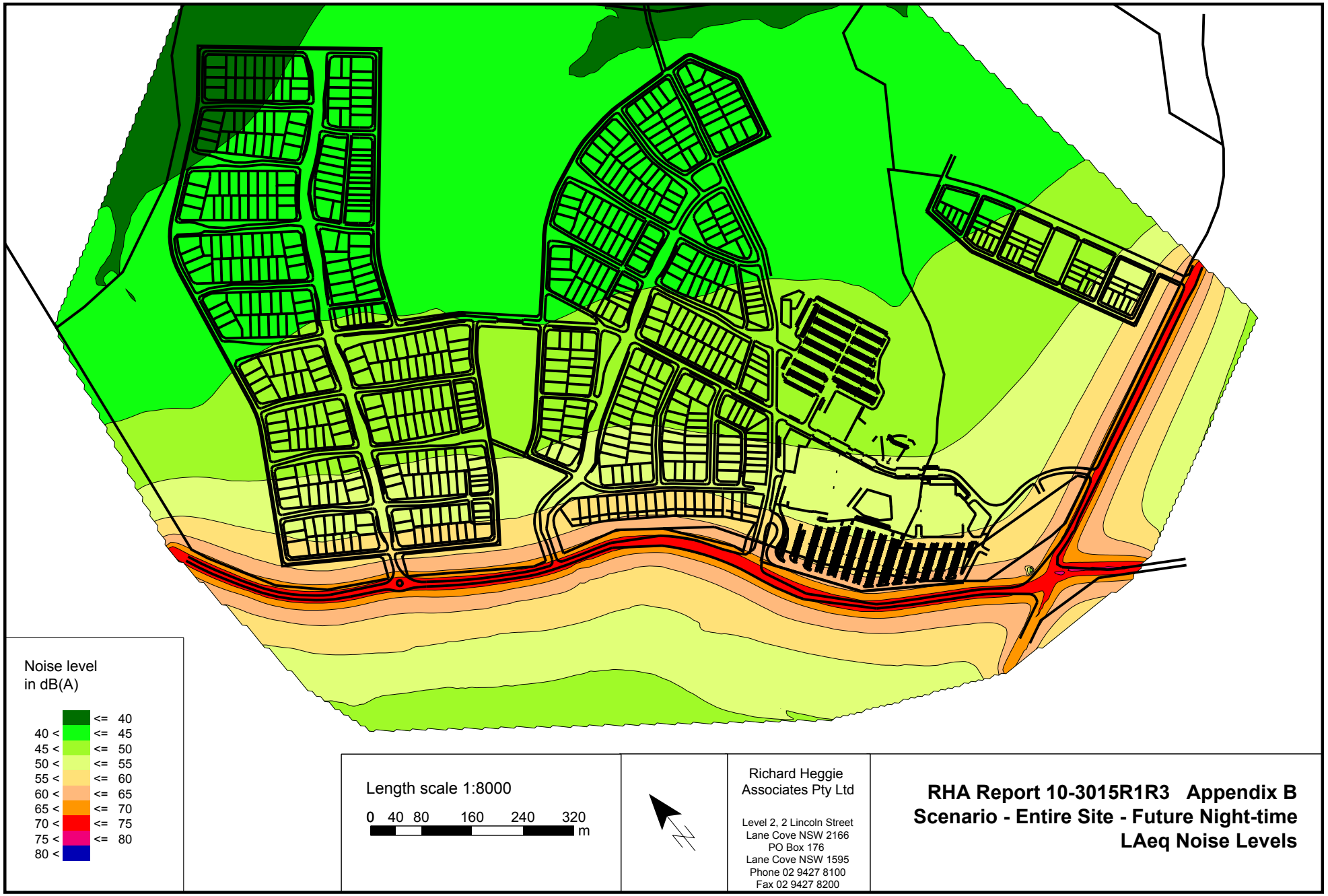
- An ambient noise survey was conducted over one week at four locations, two chosen to determine typical on site noise levels, and two chosen to measure traffic noise from The Wool Road and Naval College Road. The survey established baseline noise levels for the setting of design criteria for on site generated noise. The 'typical' minimum background or Rated Background Levels (RBL) are 38 dBA to 46 dBA during the day and 32 dBA to 41 dBA during the night. The traffic noise measurements were used to calibrate the computer modelling
- Design criteria have been developed to address on site operational noise, in accordance with the NSW Department of Environment and Conservation's (DEC) "*Industrial Noise Policy*" (INP).
- Traffic noise associated with the facility has been assessed against the DEC's *"Environmental Criteria for Road Traffic Noise"* (ECRTN)
- Acoustic computer modelling was carried out to assess the impact of traffic noise from both The Wool Road and Naval College Road. In accordance with guidance provided within the RTA's Environmental Noise Management Manual (ENMM) it is considered unreasonable to provide special mitigation measures where noise levels are not more than 2 dBA above the ECRTN target. The modelling shows that the DEC ECRTN daytime criterion of $L_{Aeq(1hour)}$ 60 dBA is not exceeded by more than 2 dBA. During night-time, DEC ECRTN criterion of $L_{Aeq(1hour)}$ 55 dBA will be complied with at Wool Road residences, however exceedances of up to 2 dBA are expected at Village West and of up to 4 dBA at Village Central. In these areas where exceedances are more than 2 dBA noise mitigation is recommended.
- The impact of increases in traffic noise resulting from the development has been assessed at existing residences on Naval College Road, and at the High School on The Wool Road. Compliance with the ECRTN guidelines is expected at the existing residences, and at the High School



Richard Heggie
Associates Pty Ltd

Level 2, 2 Lincoln Street
Lane Cove NSW 2166
PO Box 176
Lane Cove NSW 1595
Phone 02 9427 8100
Fax 02 9427 8200

RHA Report 10-3015R1R3 Appendix A
Scenario - Entire Site - Future Daytime
LAeq Noise Levels

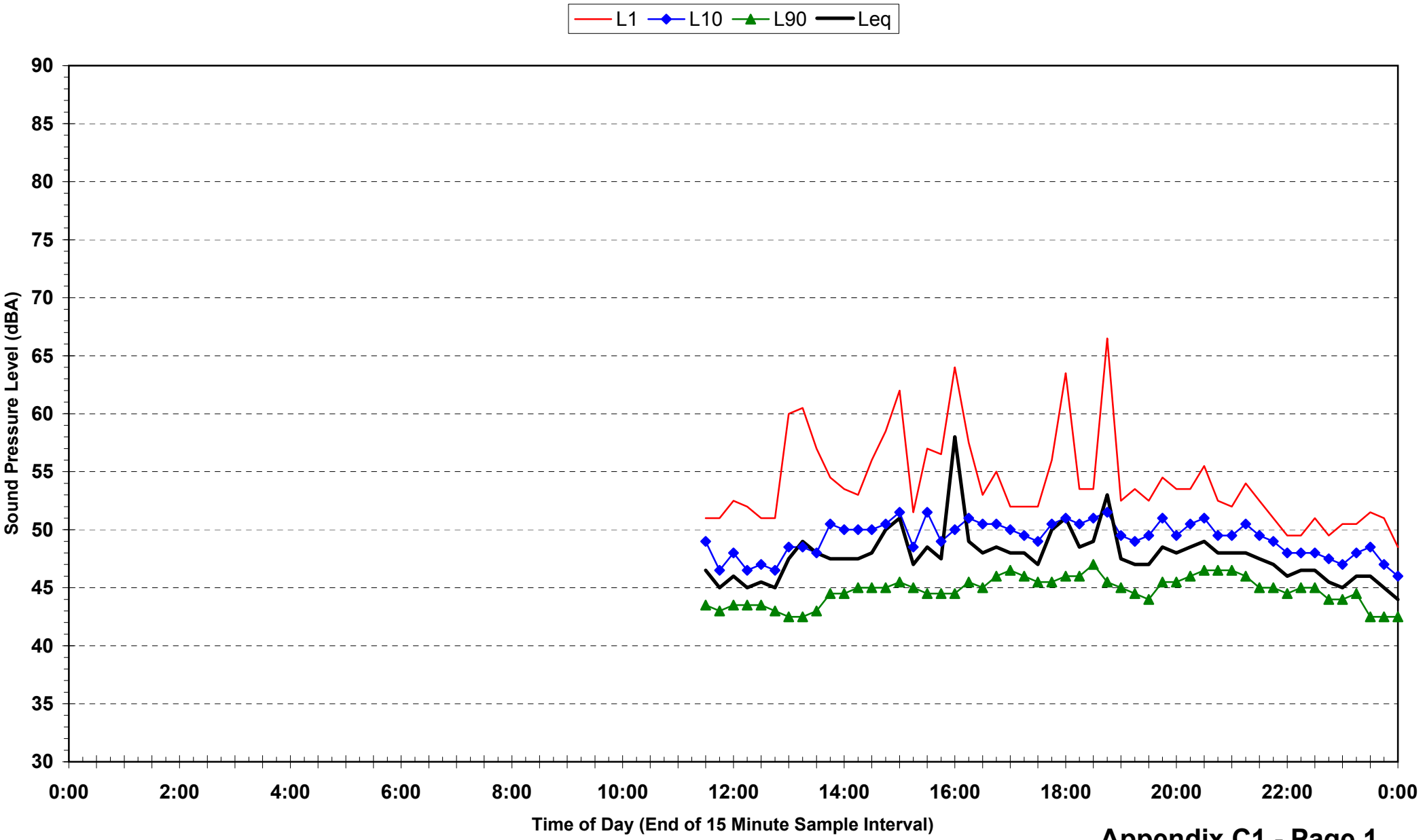


Richard Heggie
Associates Pty Ltd

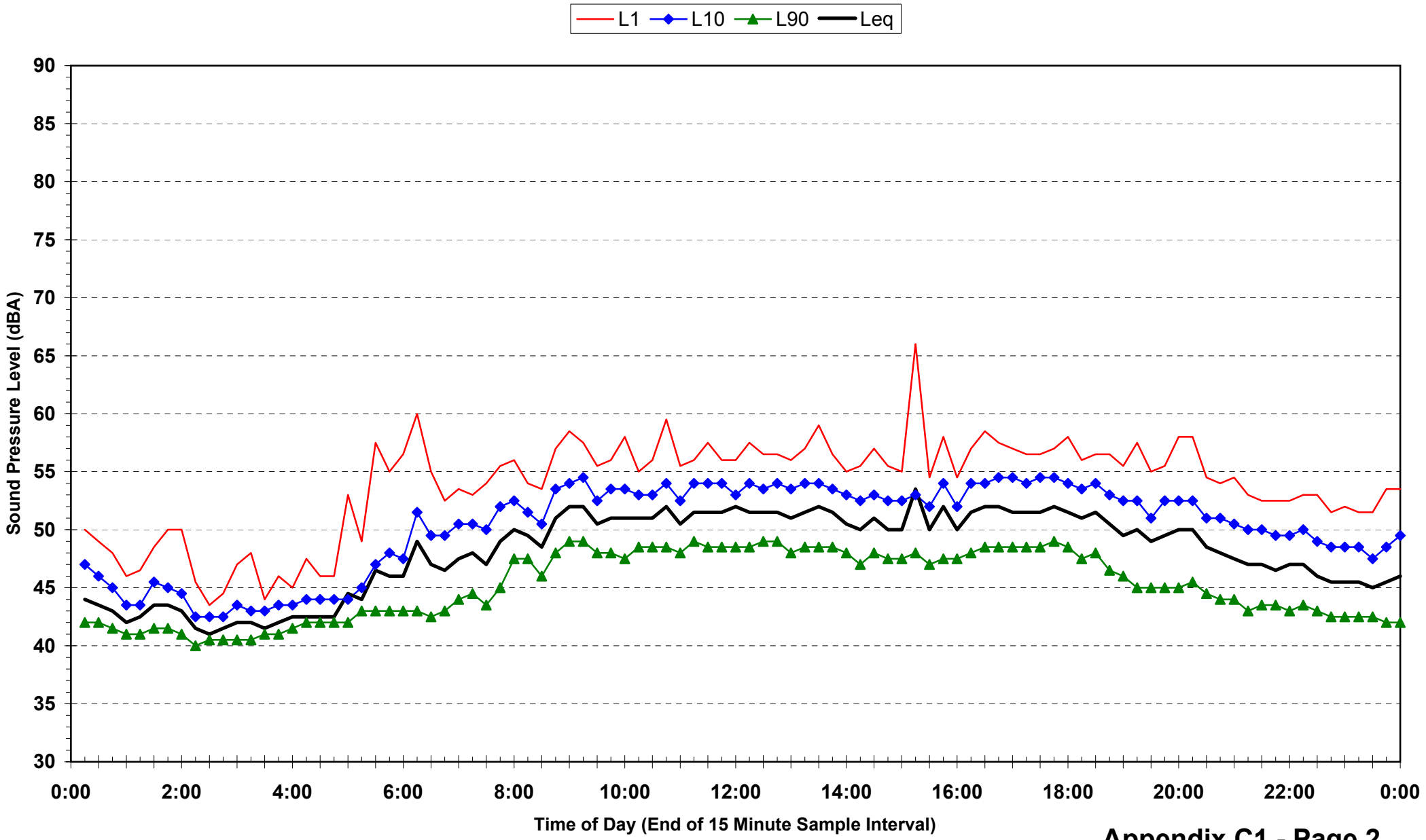
Level 2, 2 Lincoln Street
Lane Cove NSW 2166
PO Box 176
Lane Cove NSW 1595
Phone 02 9427 8100
Fax 02 9427 8200

RHA Report 10-3015R1R3 Appendix B
Scenario - Entire Site - Future Night-time
LAeq Noise Levels

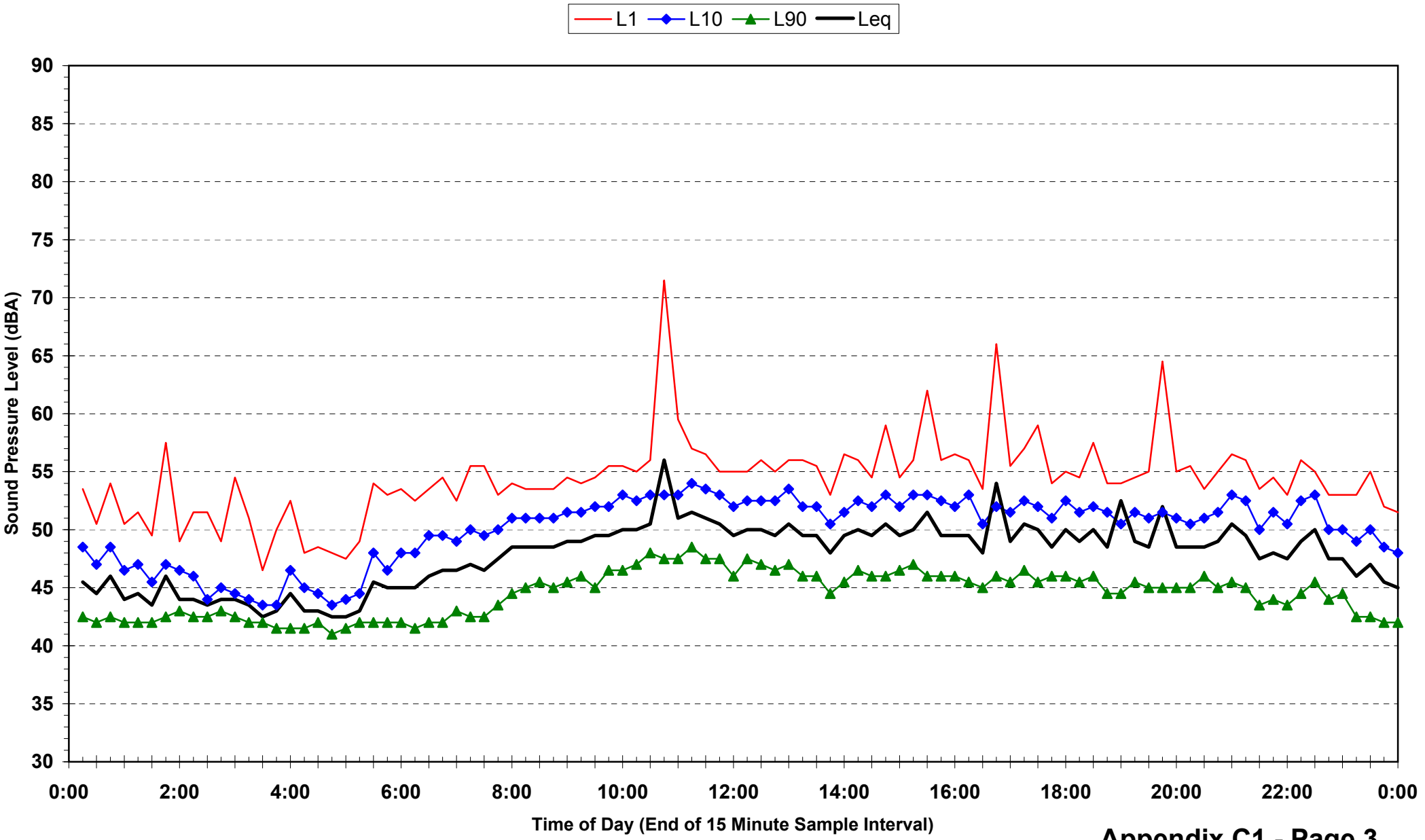
Statistical Ambient Noise Levels
Location 1 - North East Site Boundary - Thursday 4 December 2003



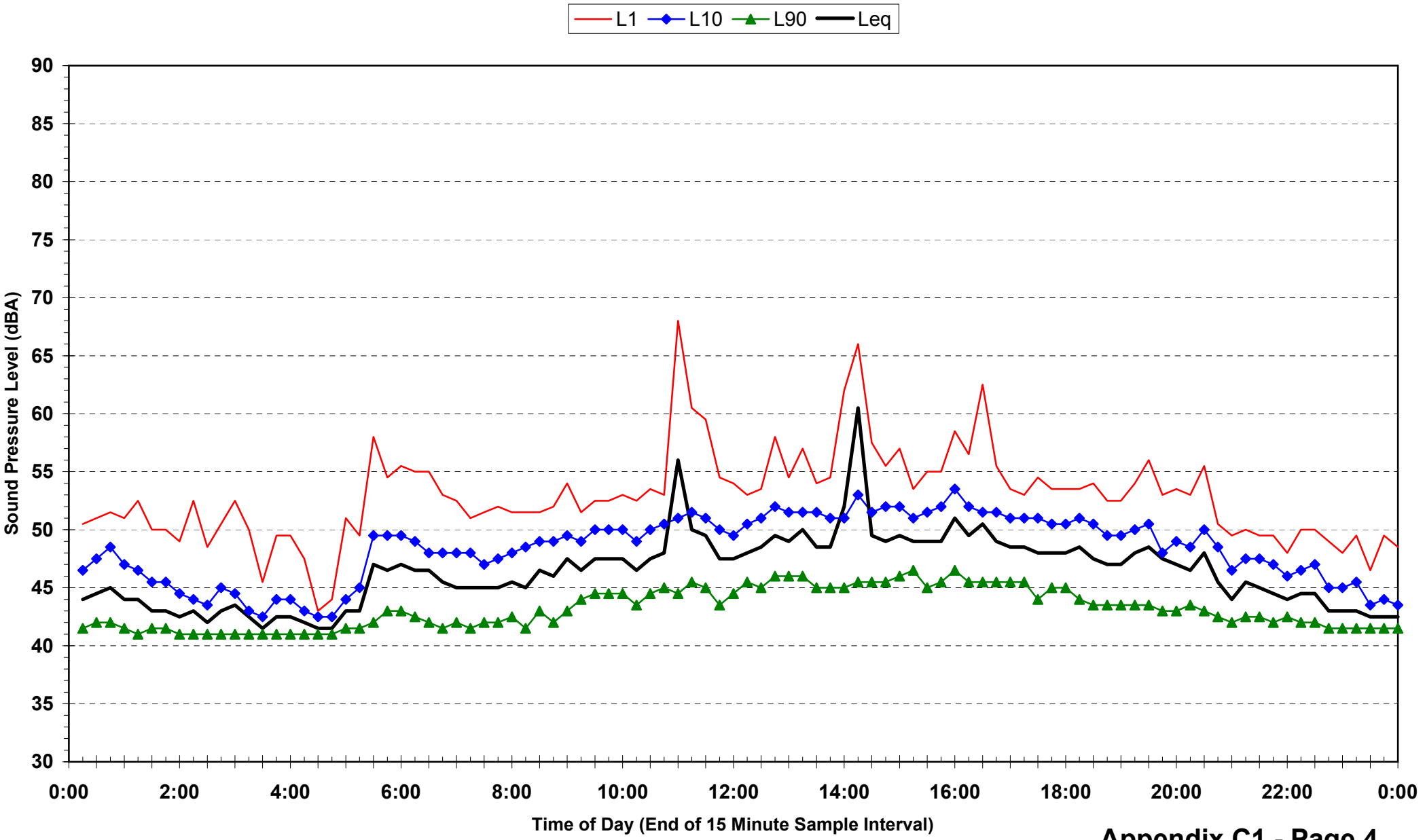
Statistical Ambient Noise Levels
Location 1 - North East Site Boundary - Friday 5 December 2003



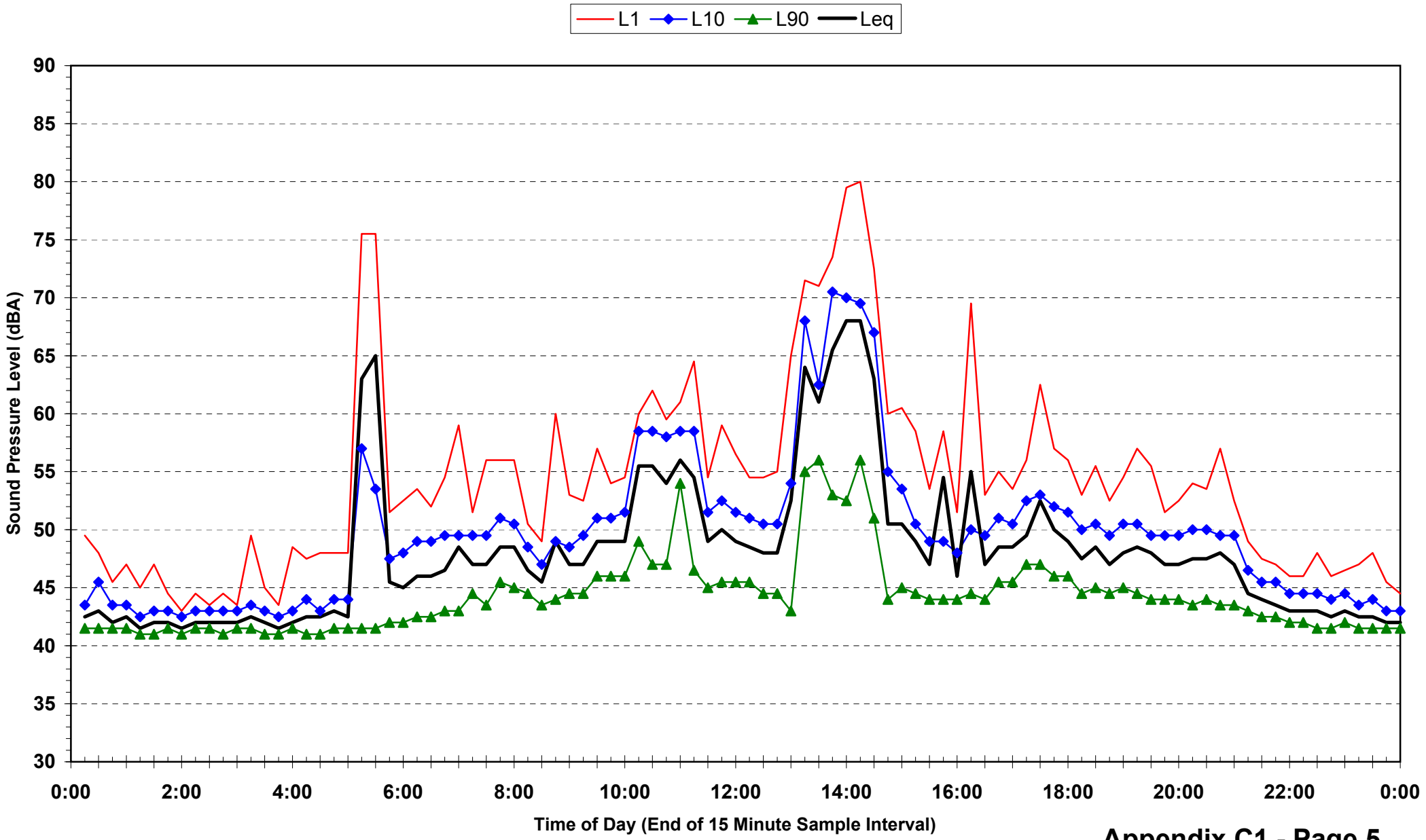
Statistical Ambient Noise Levels
Location 1 - North East Site Boundary - Saturday 6 December 2003



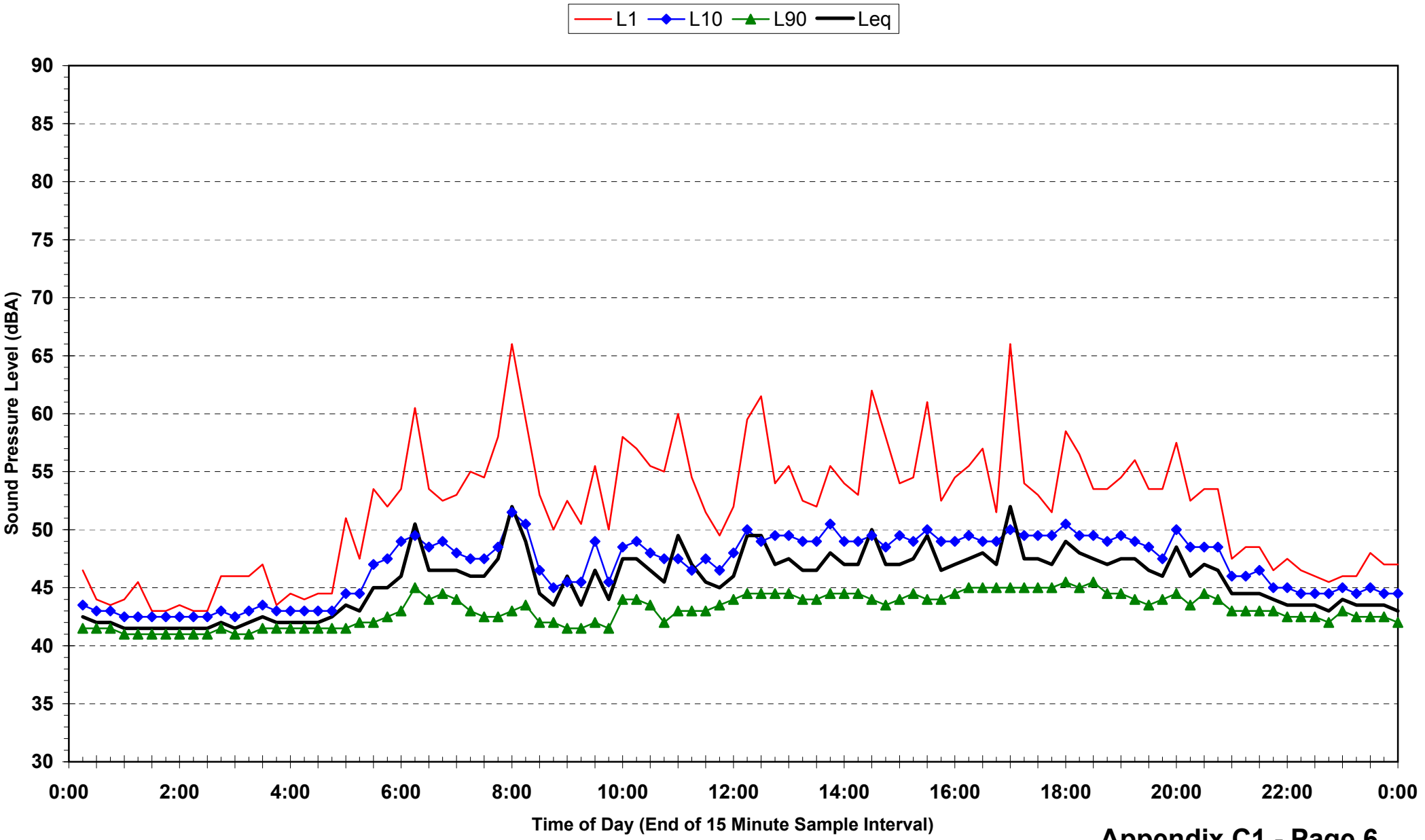
Statistical Ambient Noise Levels
Location 1 - North East Site Boundary - Sunday 7 December 2003



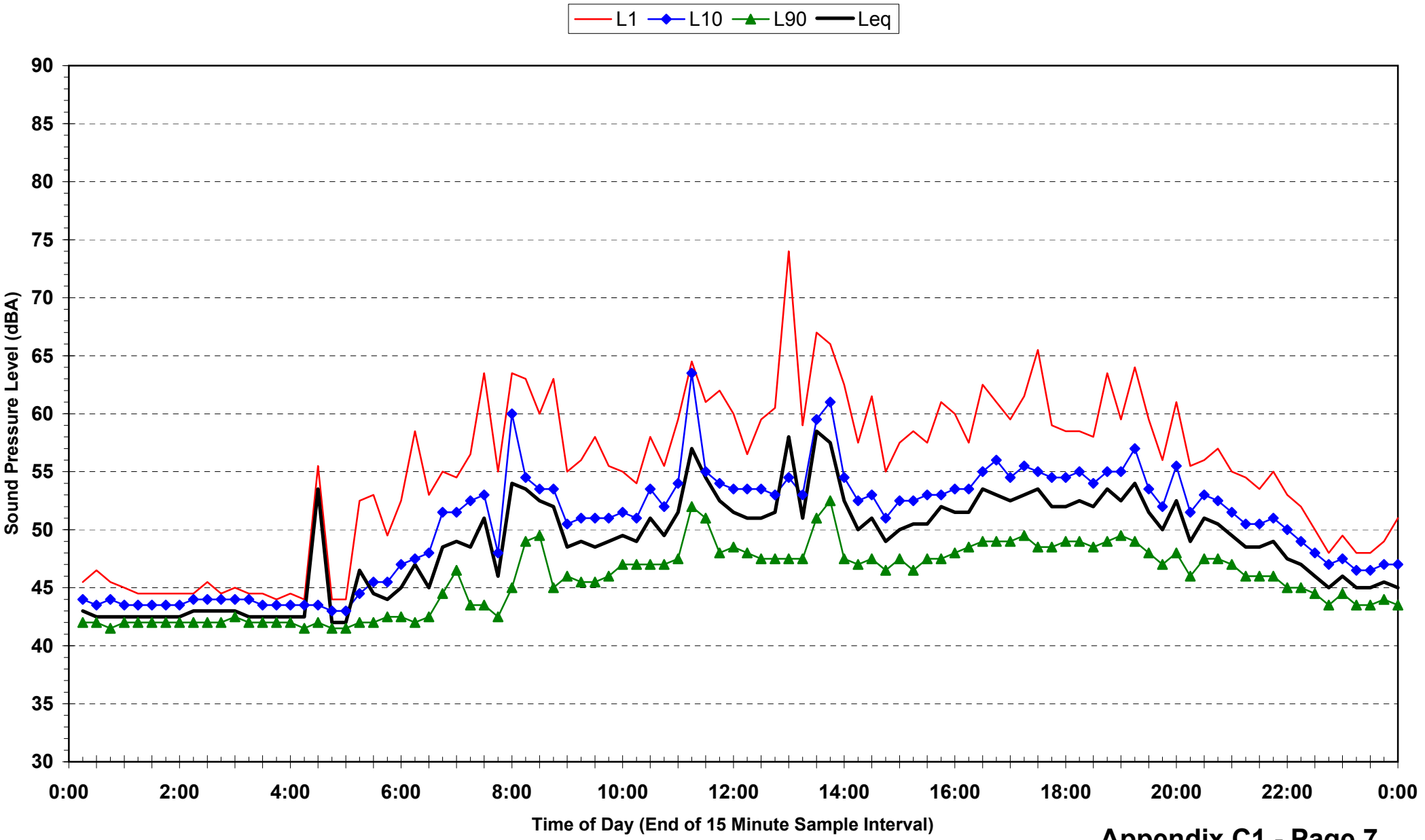
Statistical Ambient Noise Levels
Location 1 - North East Site Boundary - Monday 8 December 2003



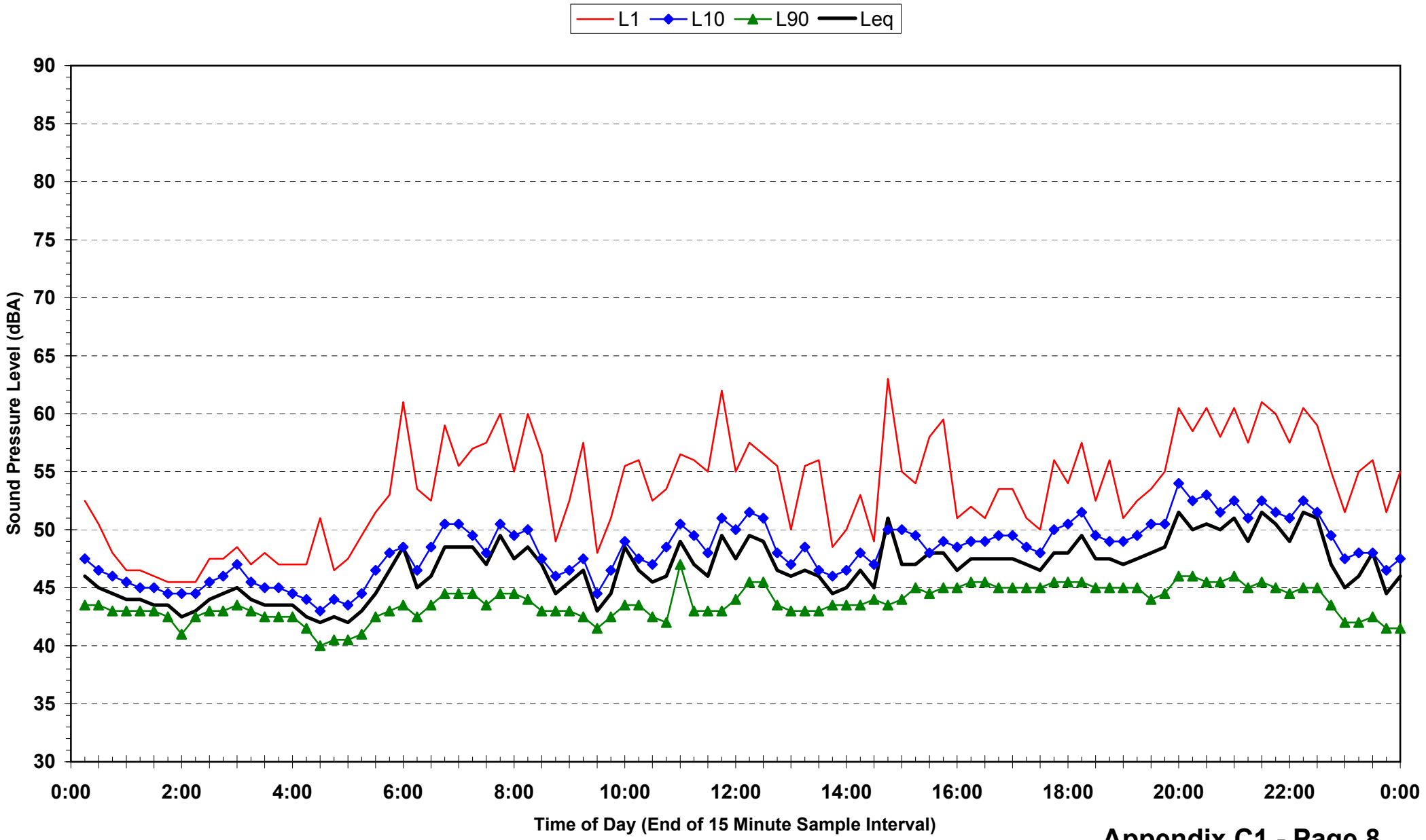
Statistical Ambient Noise Levels
Location 1 - North East Site Boundary - Tuesday 9 December 2003



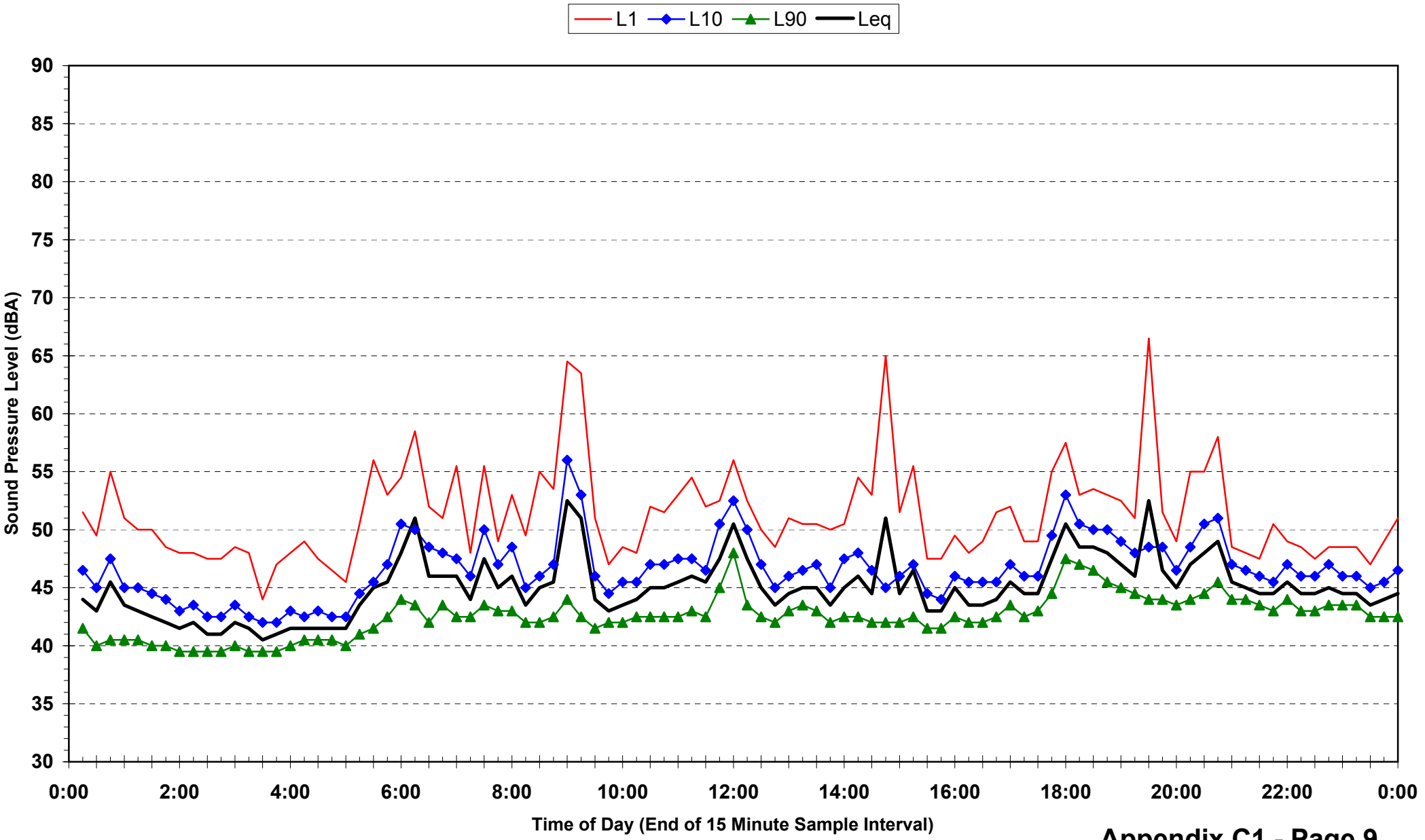
Statistical Ambient Noise Levels
Location 1 - North East Site Boundary - Wednesday 10 December 2003



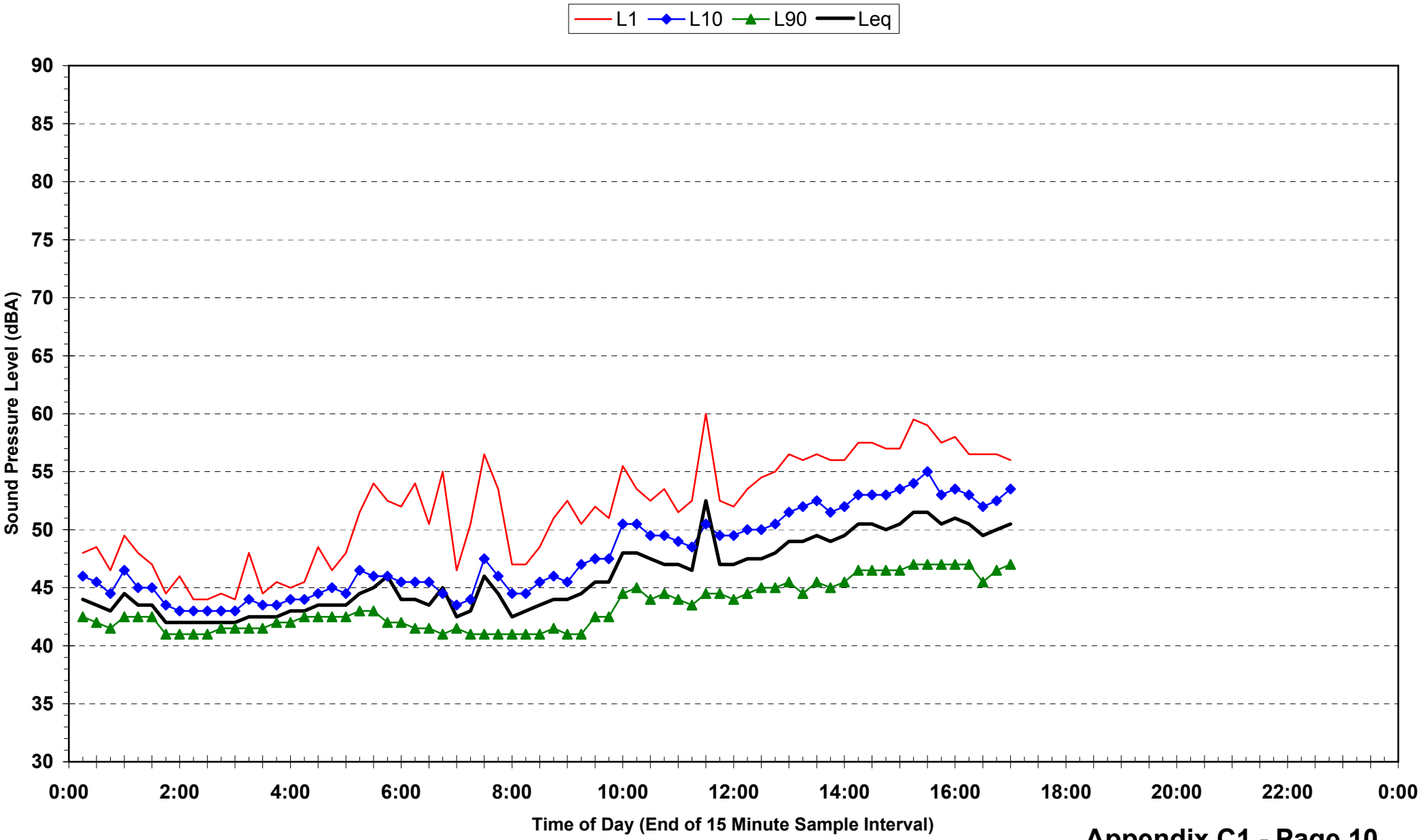
Statistical Ambient Noise Levels
Location 1 - North East Site Boundary - Thursday 11 December 2003



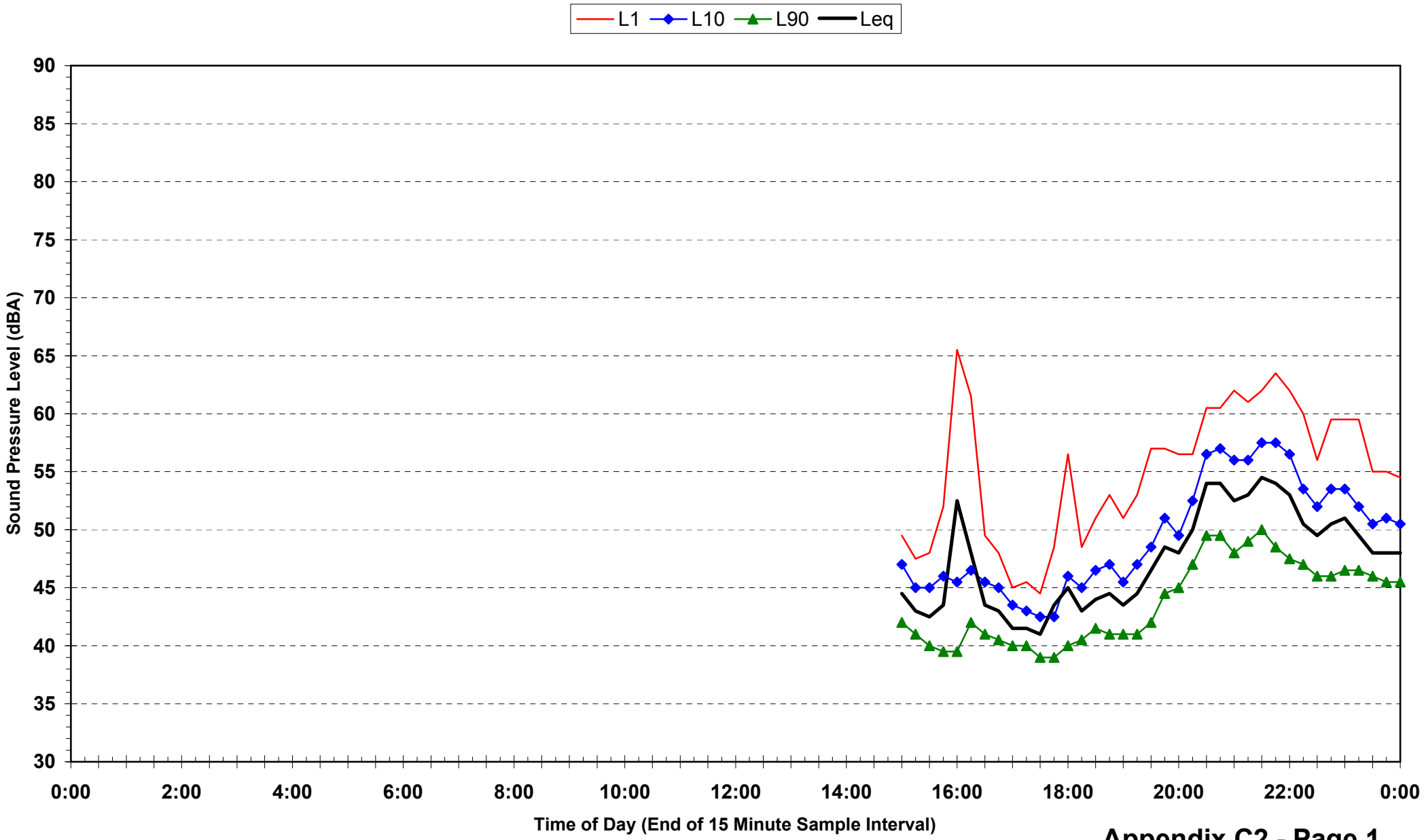
Statistical Ambient Noise Levels
Location 1 - North East Site Boundary - Friday 12 December 2003



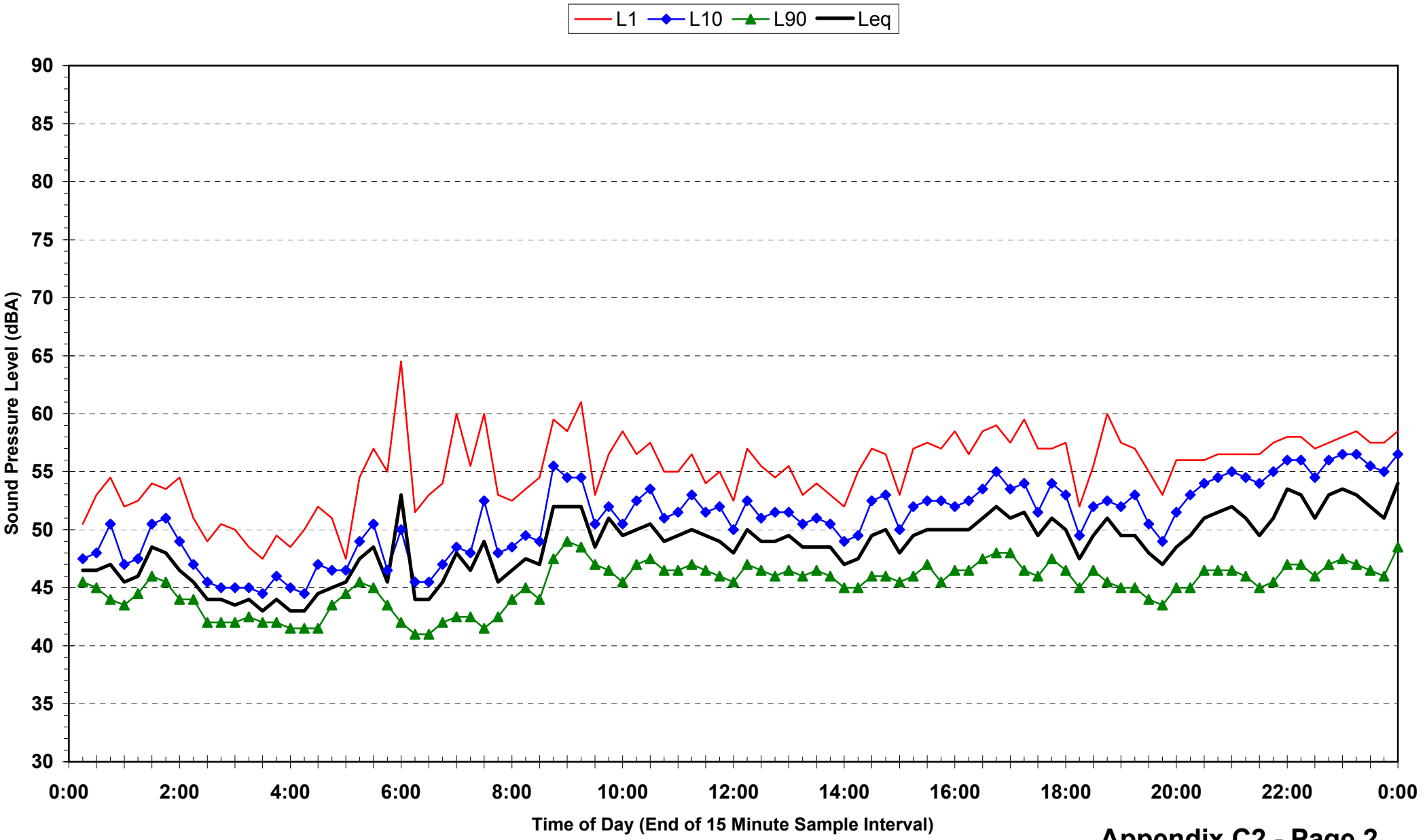
Statistical Ambient Noise Levels
Location 1 - North East Site Boundary - Saturday 13 December 2003



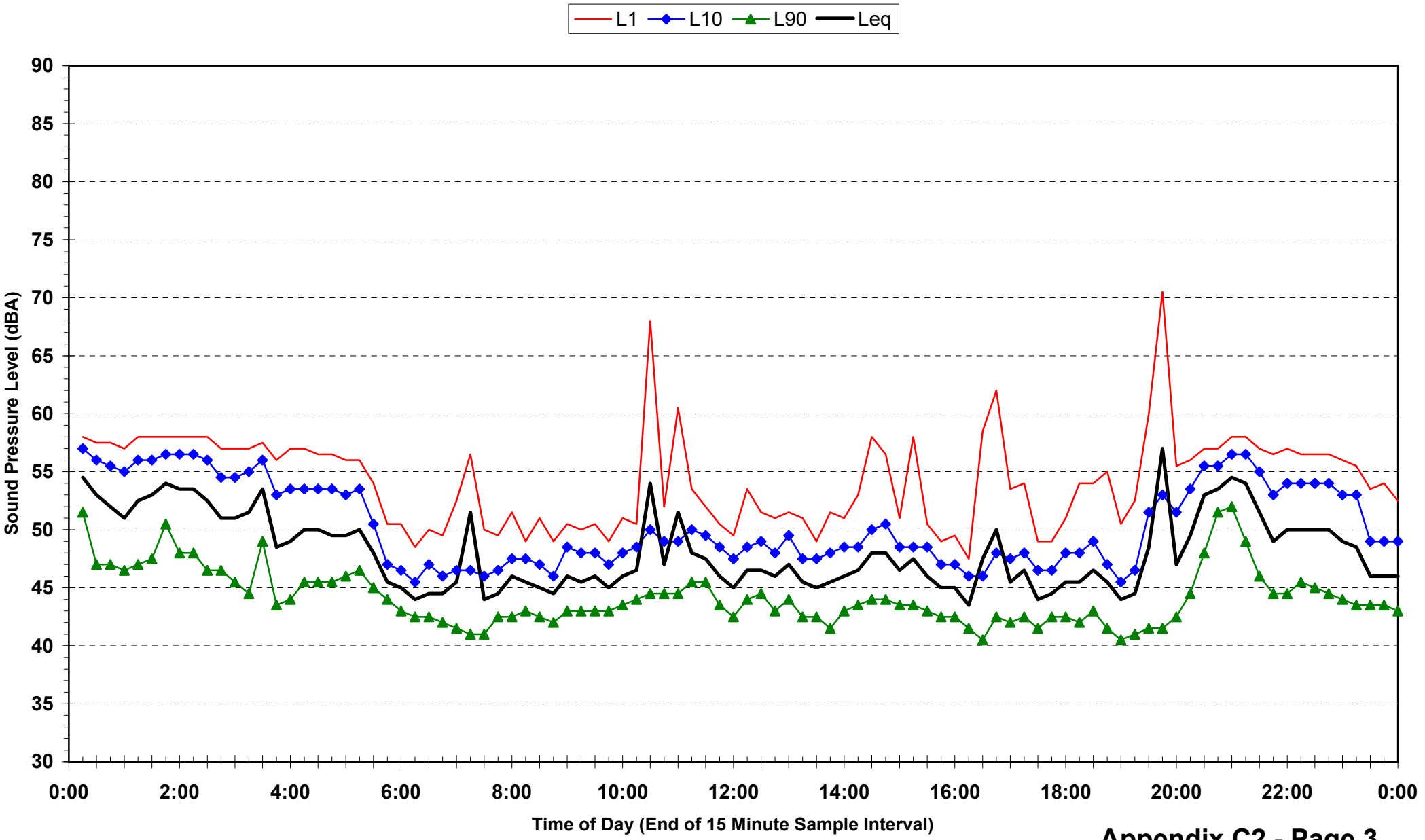
Statistical Ambient Noise Levels
Location 2 - Site Internal - Thursday 4 December 2003



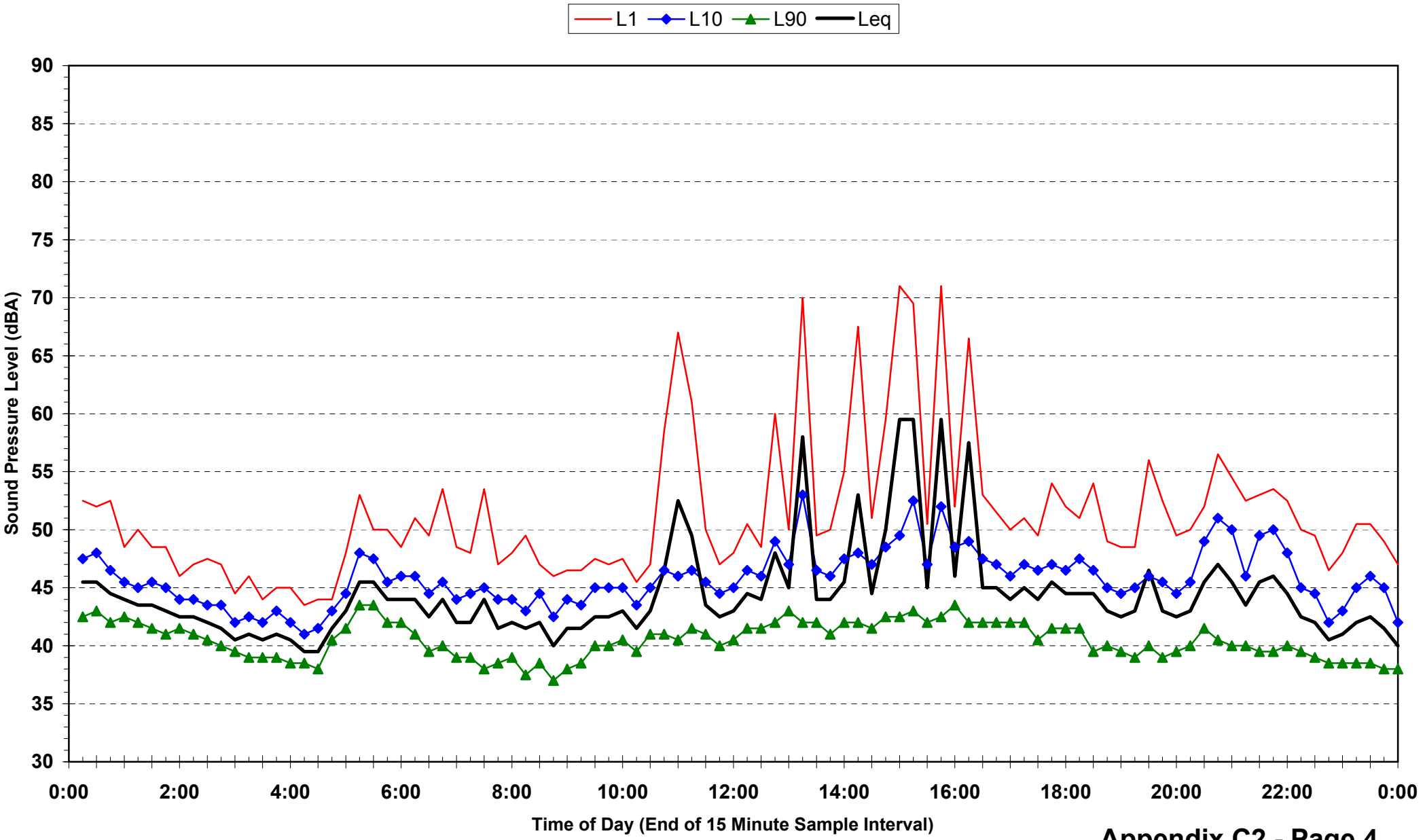
Statistical Ambient Noise Levels
Location 2 - Site Internal - Friday 5 December 2003



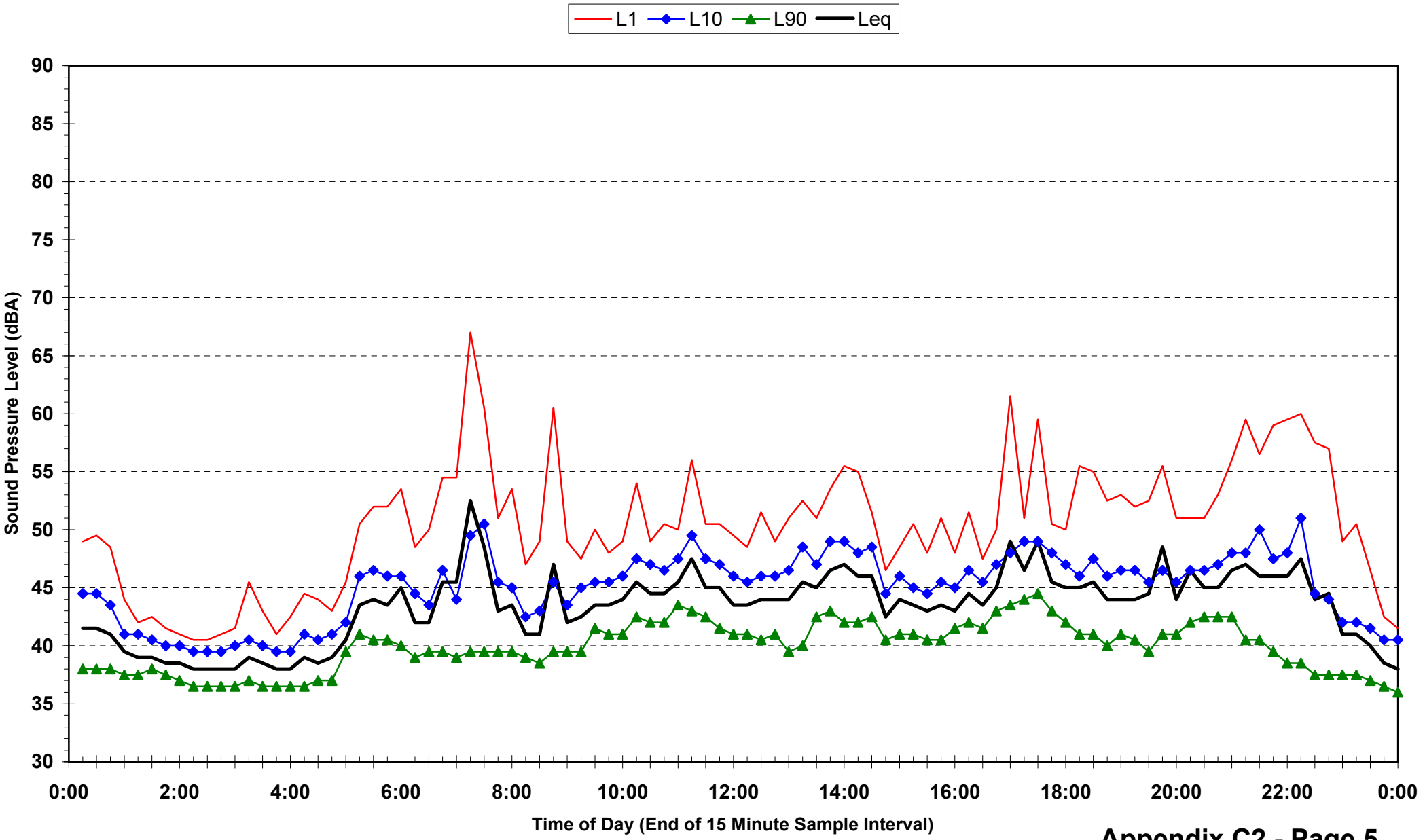
Statistical Ambient Noise Levels
Location 2 - Site Internal - Saturday 6 December 2003



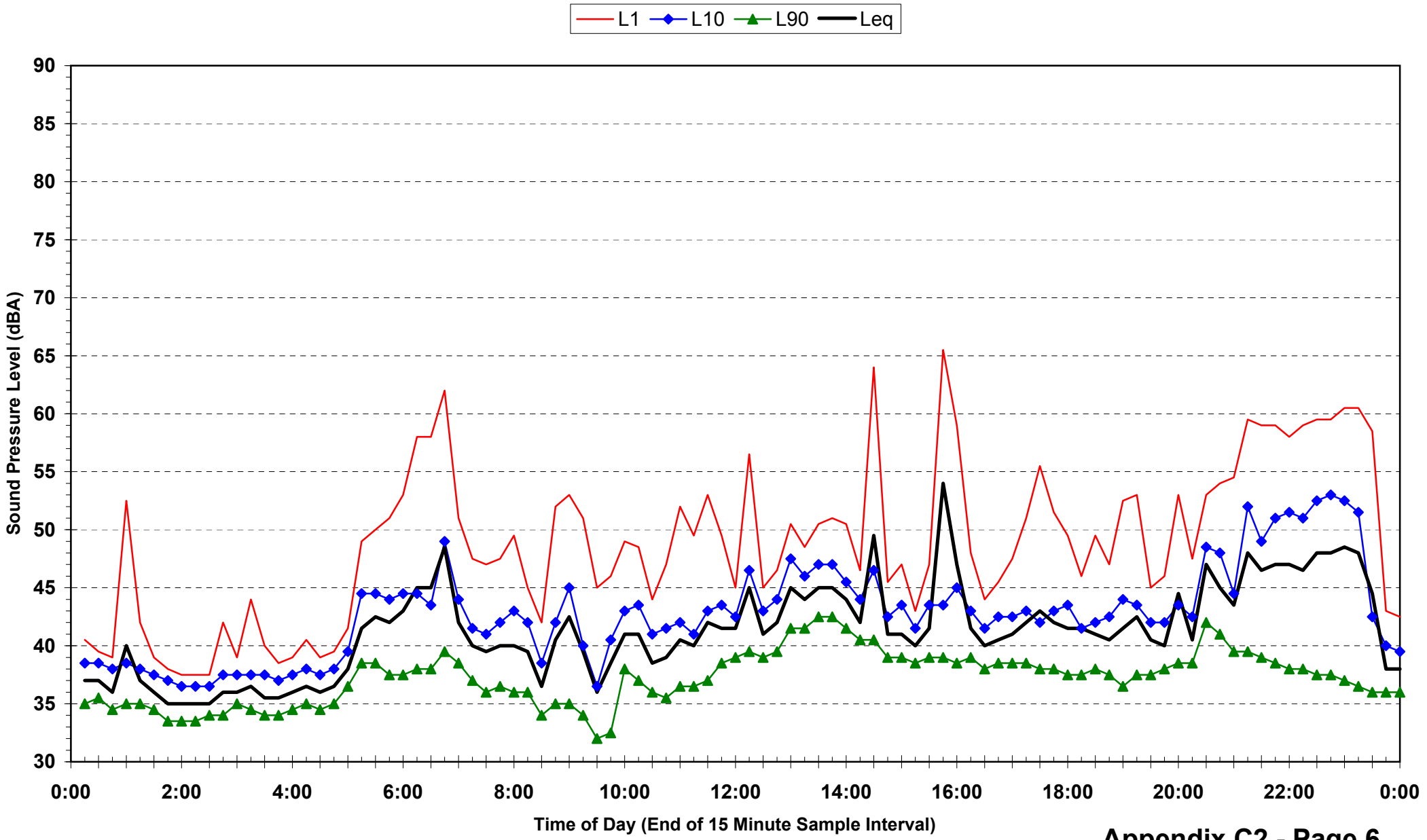
Statistical Ambient Noise Levels
Location 2 - Site Internal - Sunday 7 December 2003



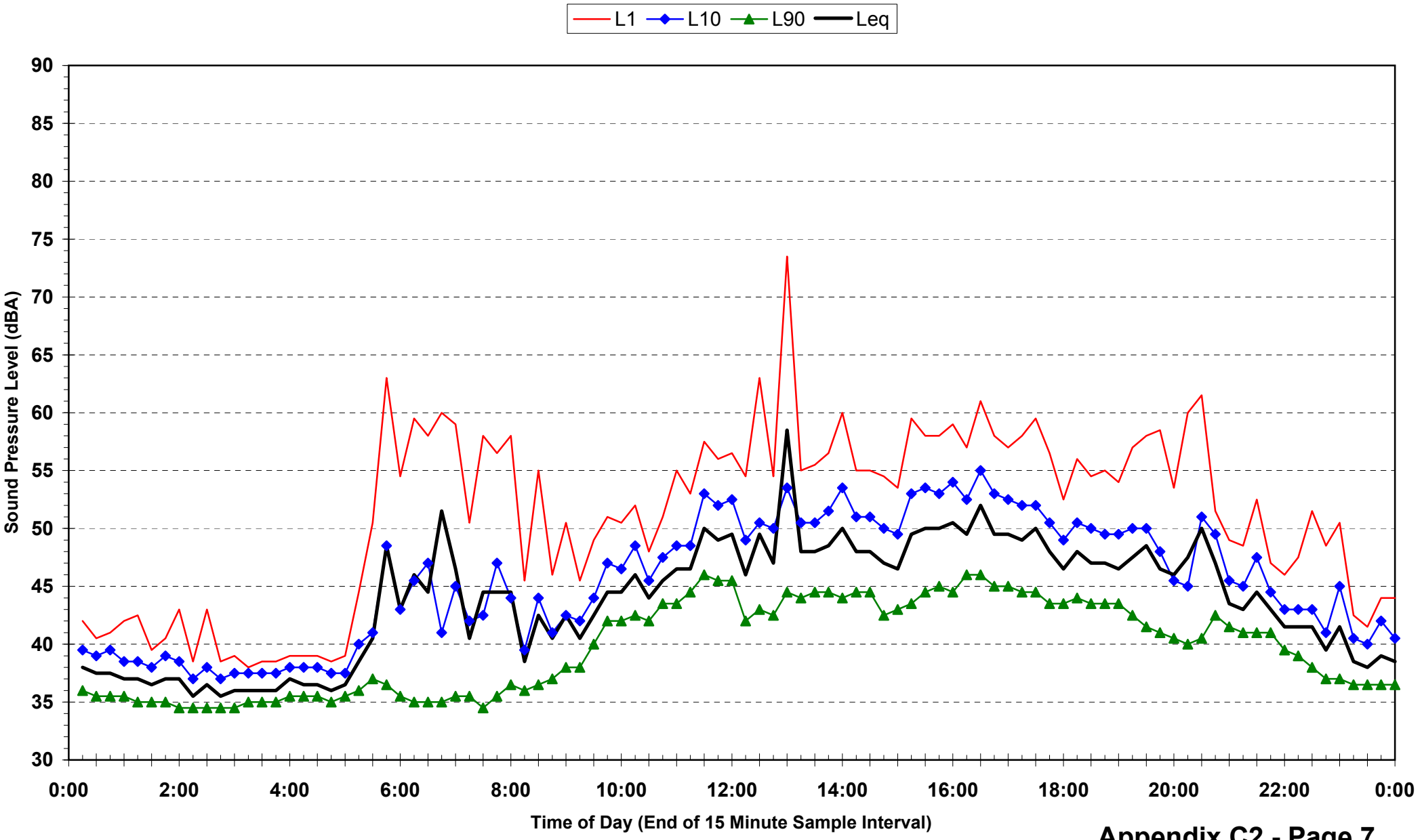
Statistical Ambient Noise Levels
Location 2 - Site Internal - Monday 8 December 2003



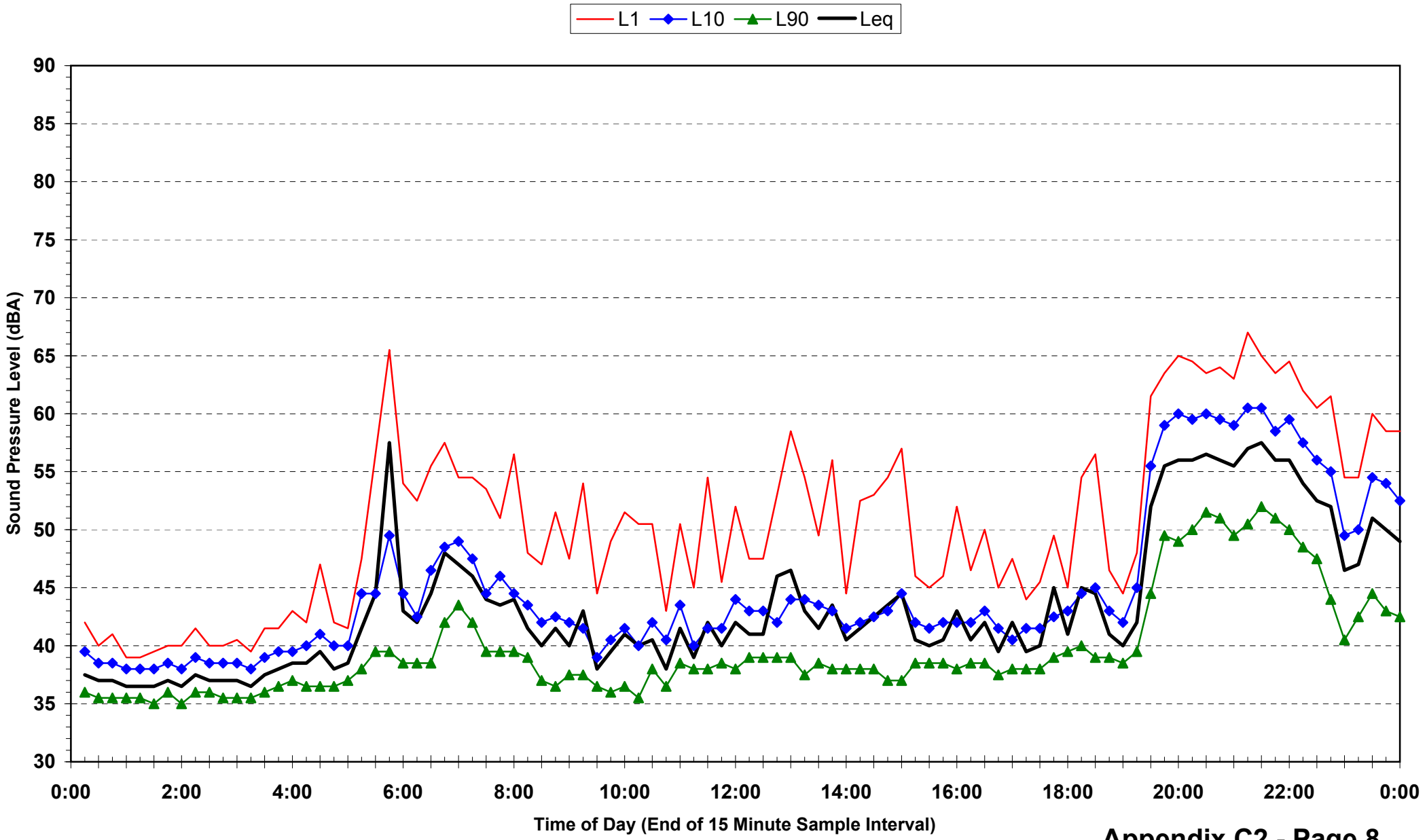
Statistical Ambient Noise Levels
Location 2 - Site Internal - Tuesday 9 December 2003



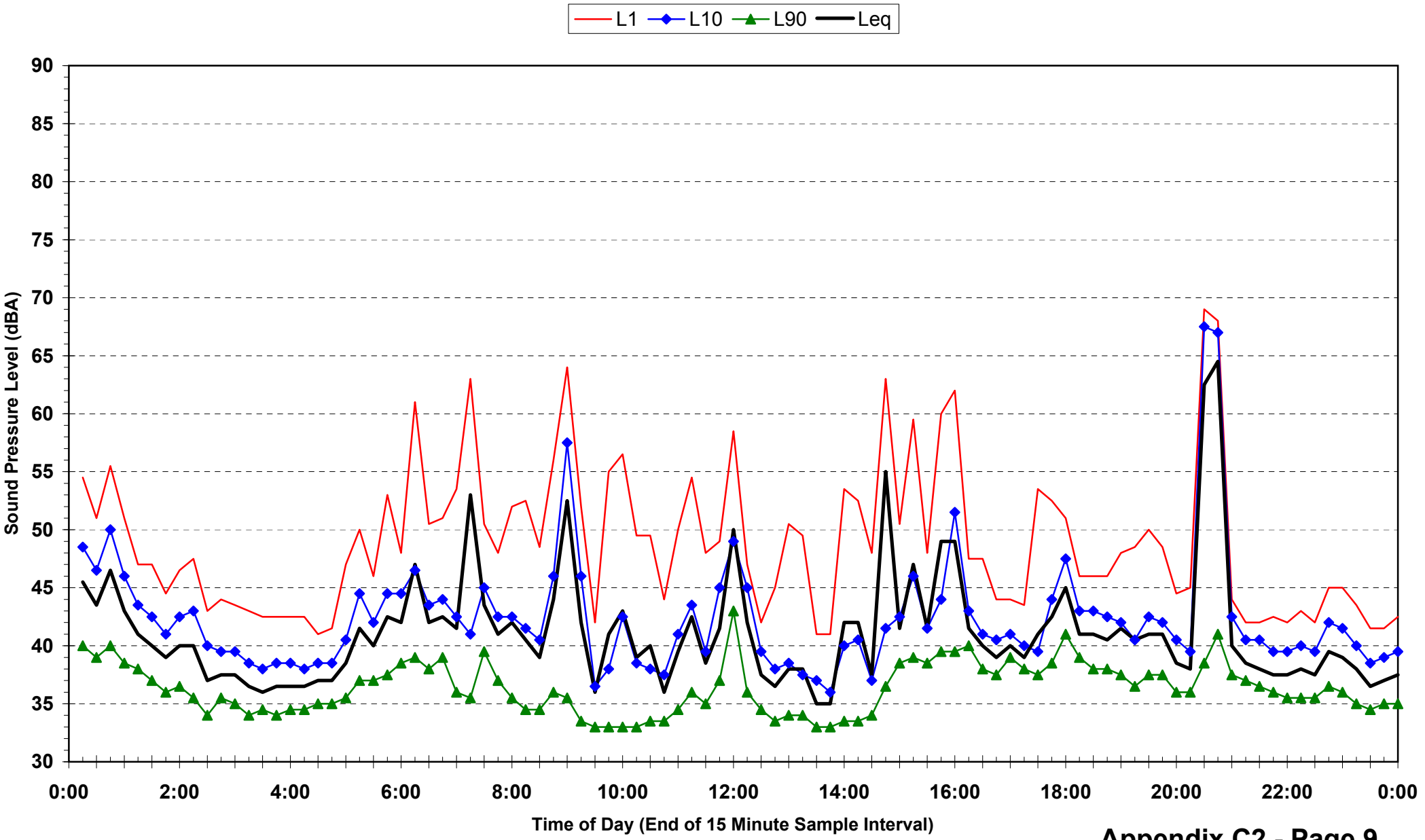
Statistical Ambient Noise Levels
Location 2 - Site Internal - Wednesday 10 December 2003



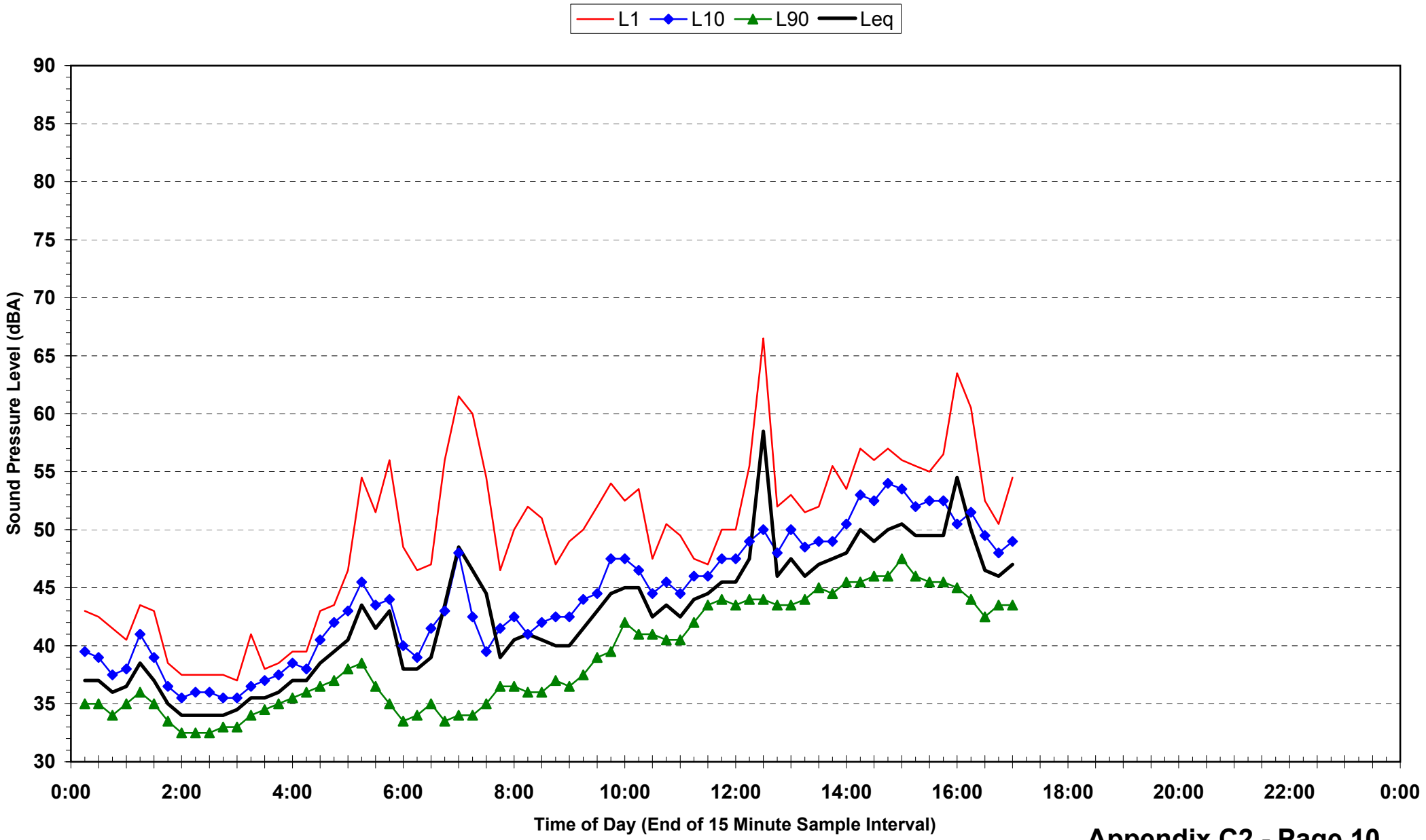
Statistical Ambient Noise Levels
Location 2 - Site Internal - Thursday 11 December 2003



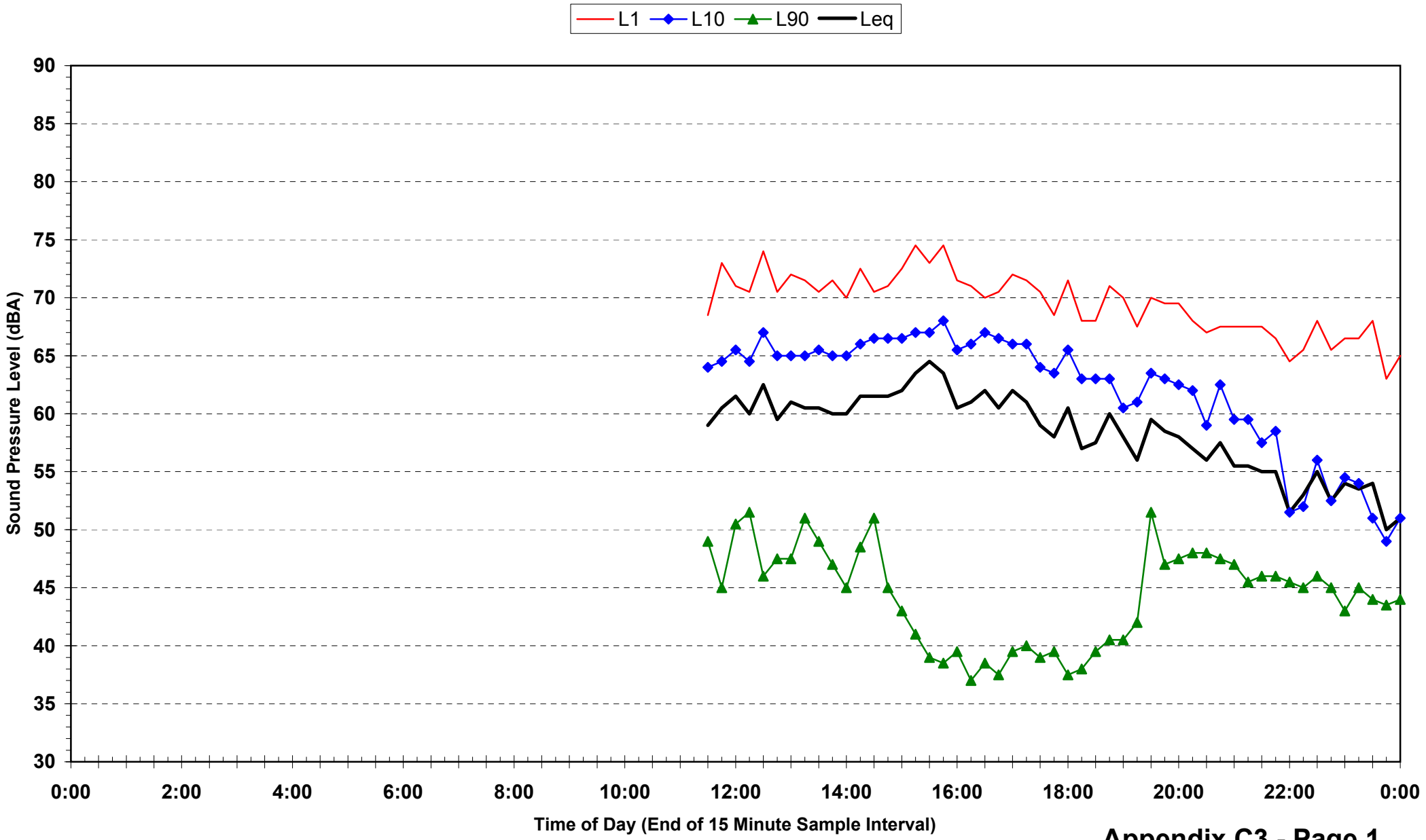
Statistical Ambient Noise Levels
Location 2 - Site Internal - Friday 12 December 2003



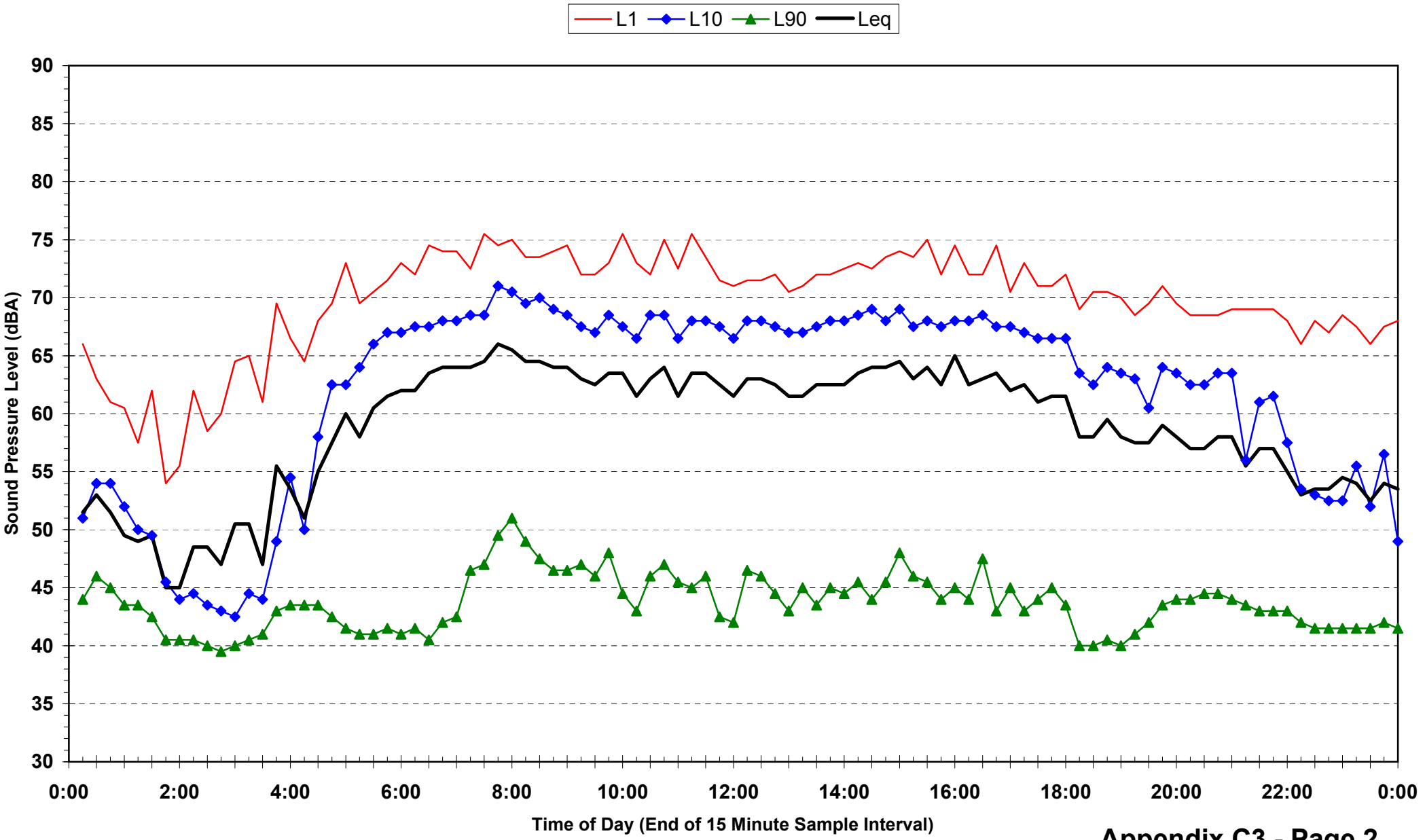
Statistical Ambient Noise Levels
Location 2 - Site Internal - Saturday 13 December 2003



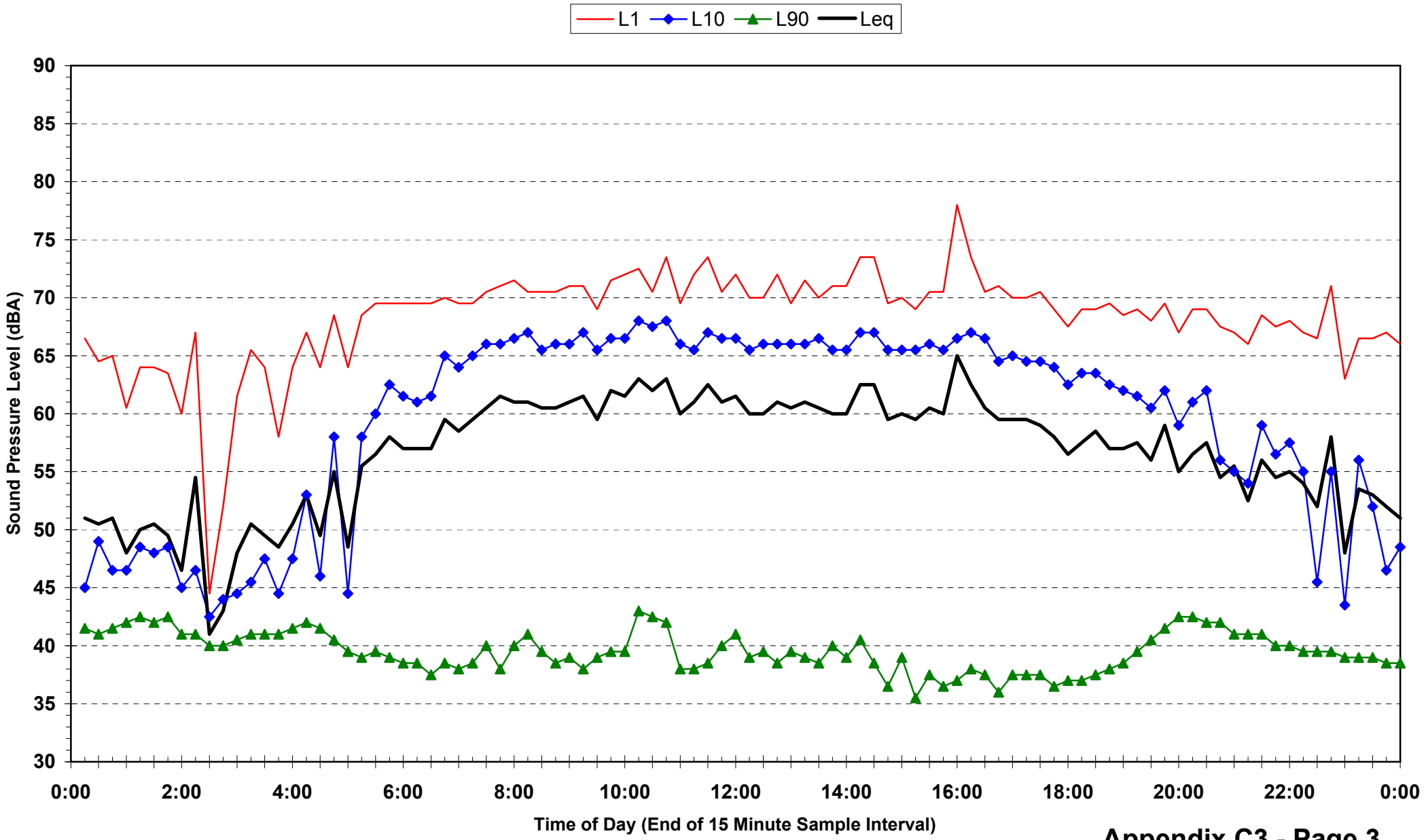
Statistical Ambient Noise Levels
Location 3 - Naval College Road - Thursday 4 December 2003



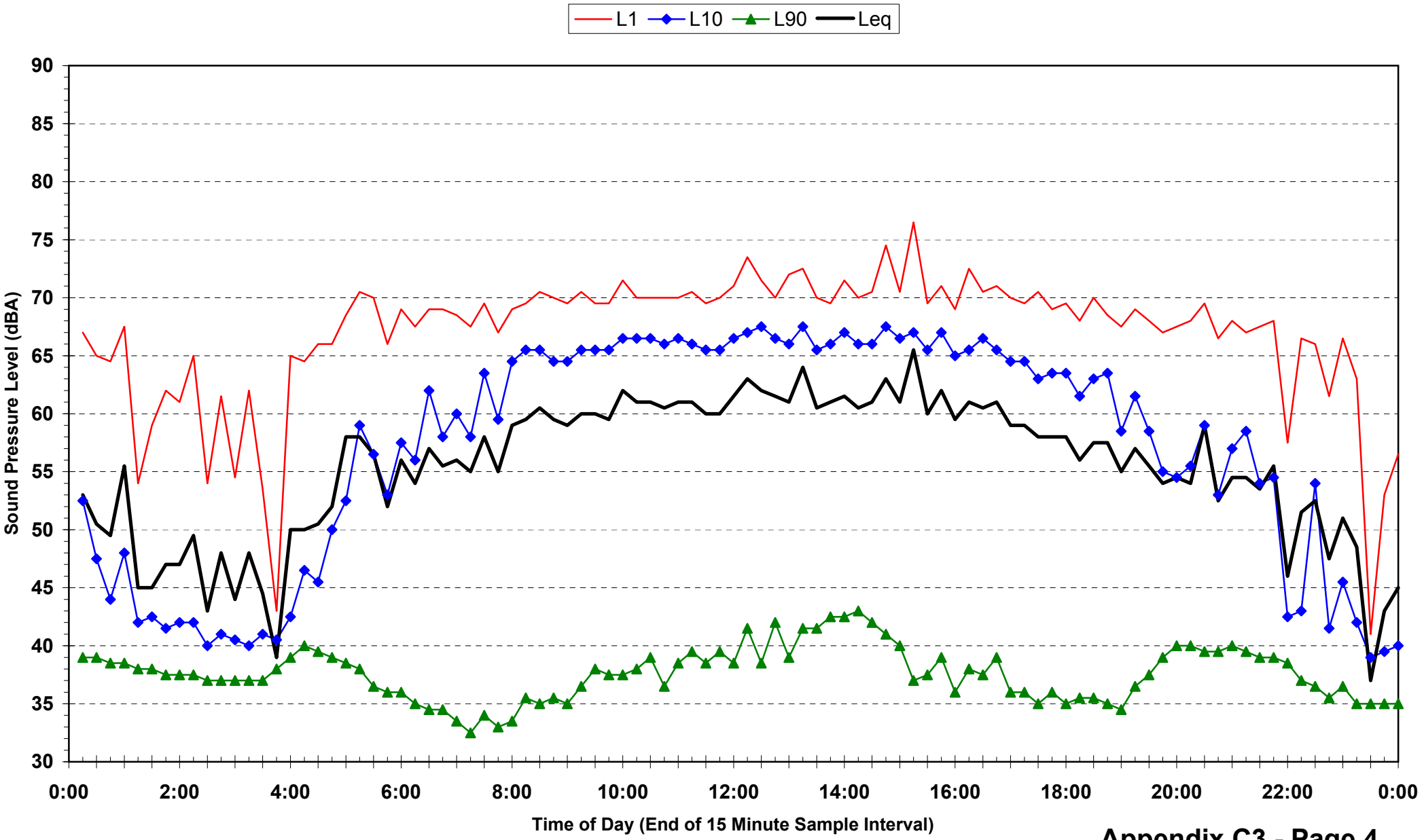
Statistical Ambient Noise Levels
Location 3 - Naval College Road - Friday 5 December 2003



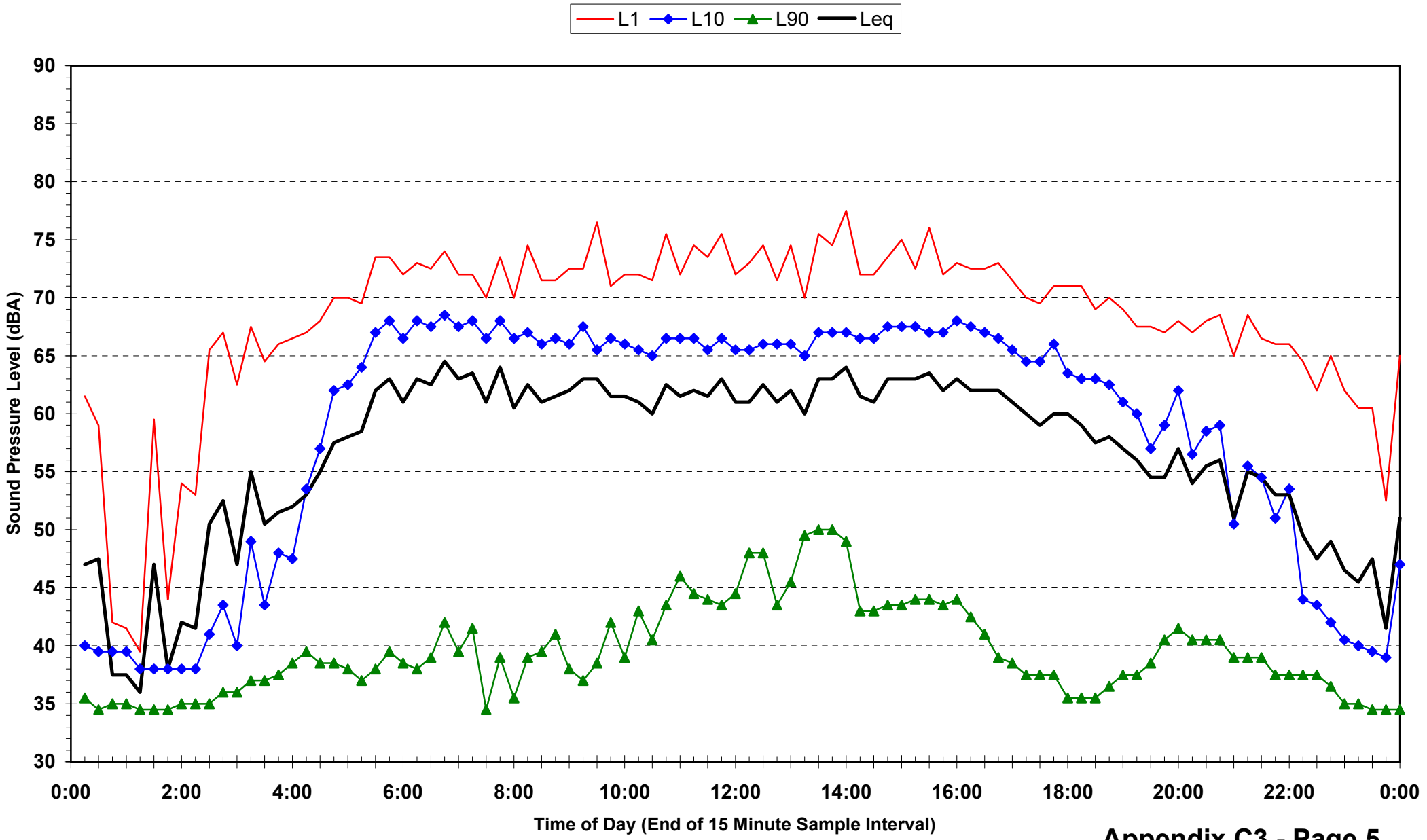
Statistical Ambient Noise Levels
Location 3 - Naval College Road - Saturday 6 December 2003



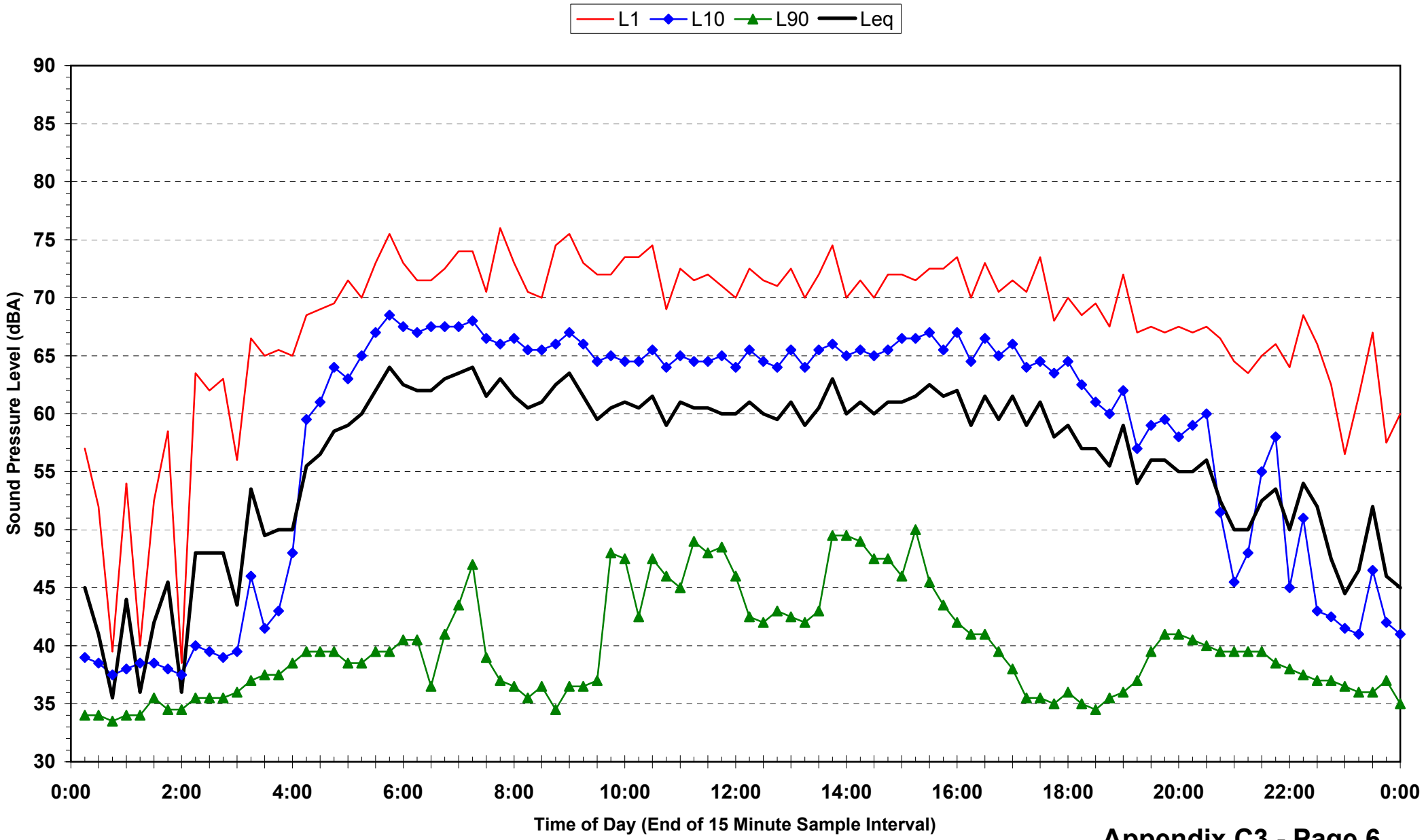
Statistical Ambient Noise Levels
Location 3 - Naval College Road - Sunday 7 December 2003



Statistical Ambient Noise Levels
Location 3 - Naval College Road - Monday 8 December 2003



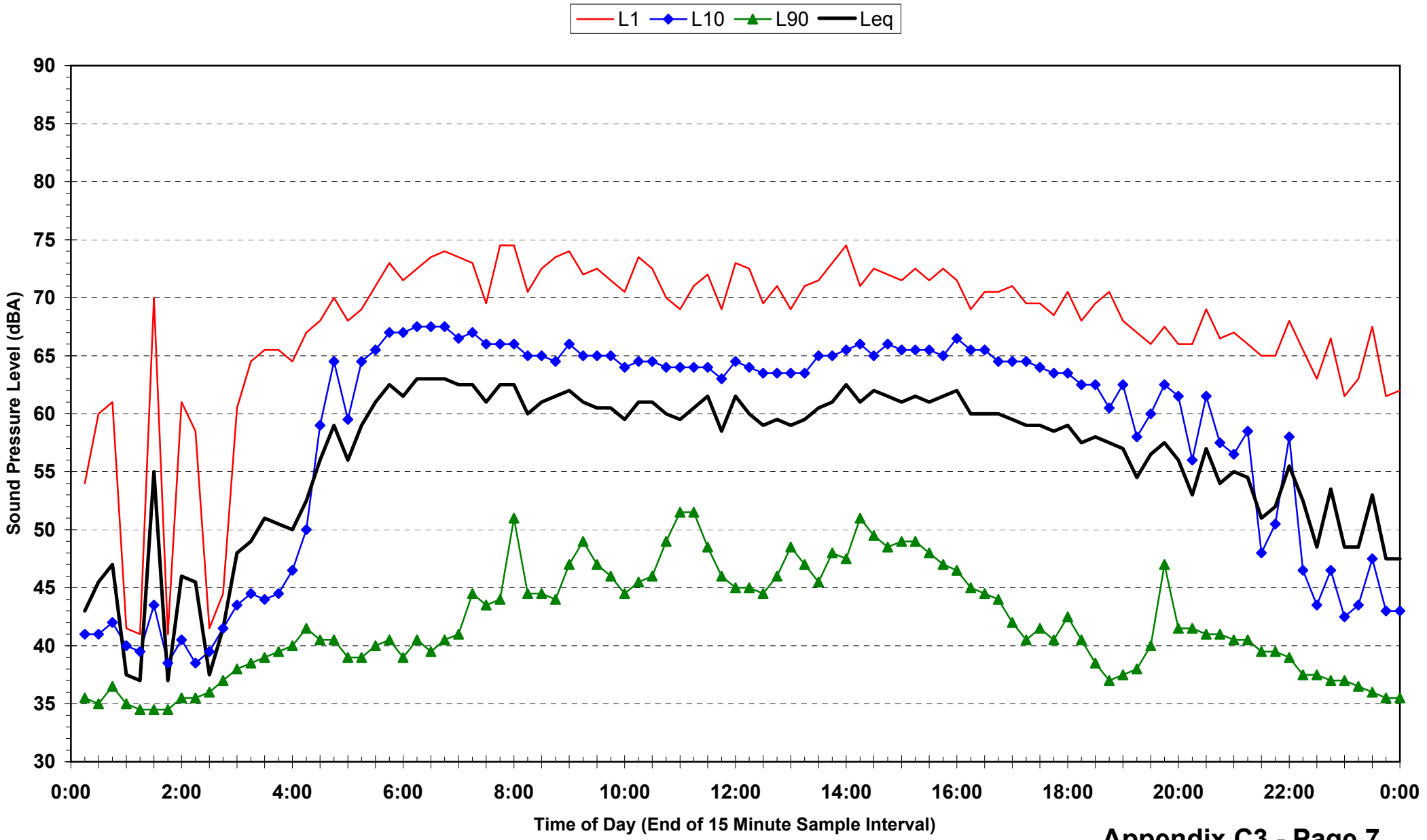
Statistical Ambient Noise Levels
Location 3 - Naval College Road - Tuesday 9 December 2003



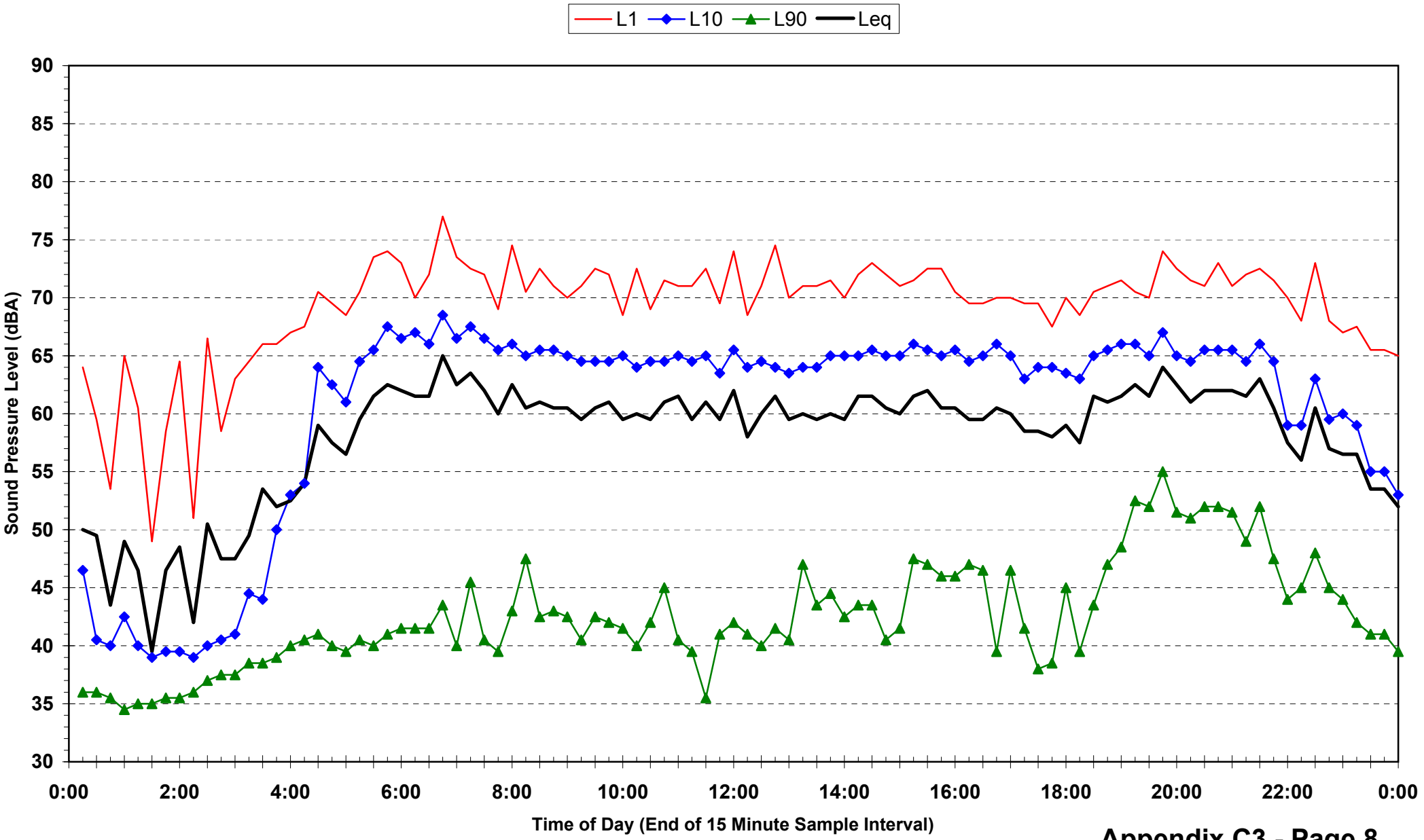
Appendix C3 - Page 6
Statistical Noise Levels
RHA Report 10-3015

\\JOHN-SLEEMAN\H:\Projects\10-SrvSYD\10-Sydney\10-3015 Vincentia Master Plan - Acoustical Study\Eng\VINCENT6.xls
Tue 09-Dec-03 Printed 6/09/2004 4:41 PM

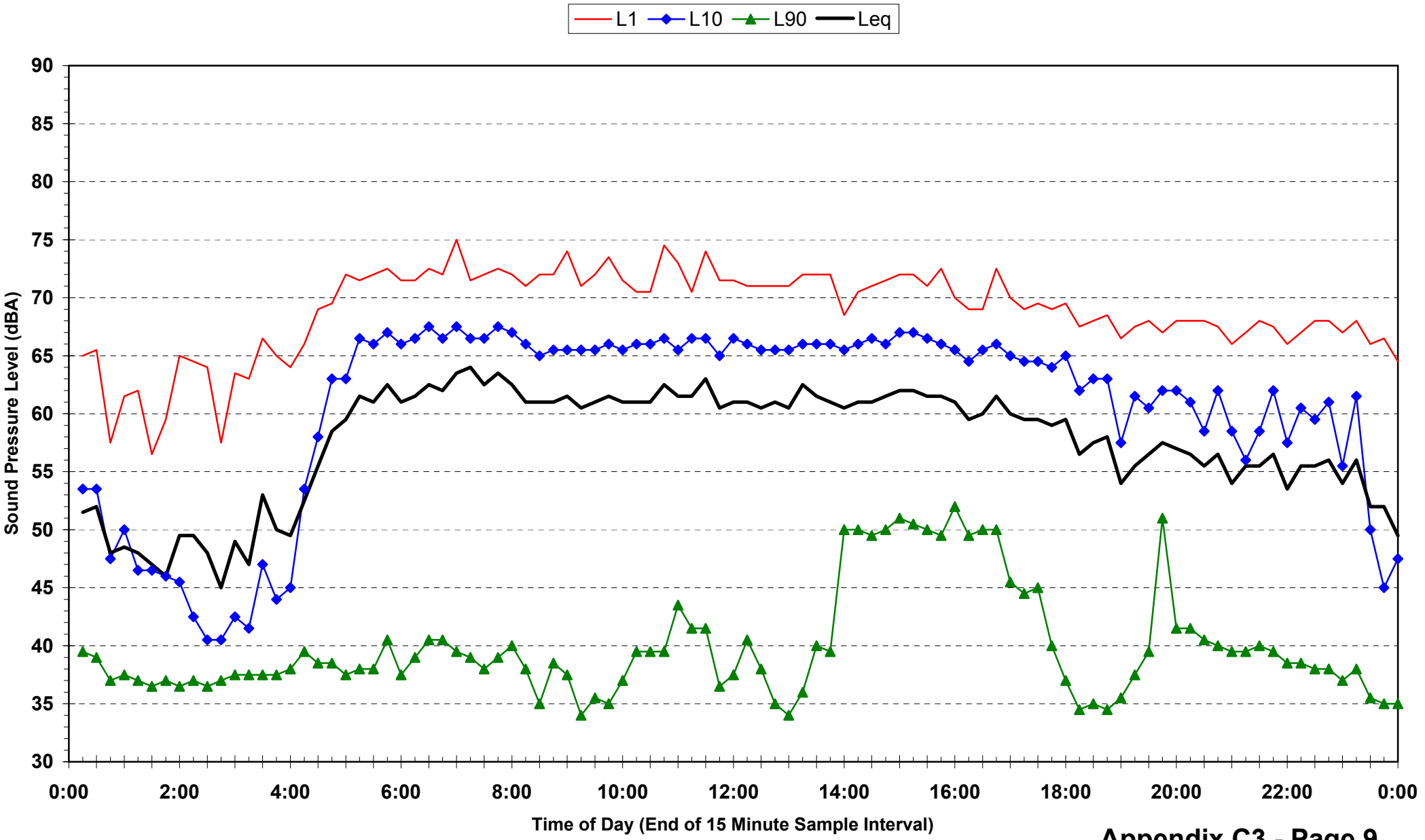
Statistical Ambient Noise Levels
Location 3 - Naval College Road - Wednesday 10 December 2003



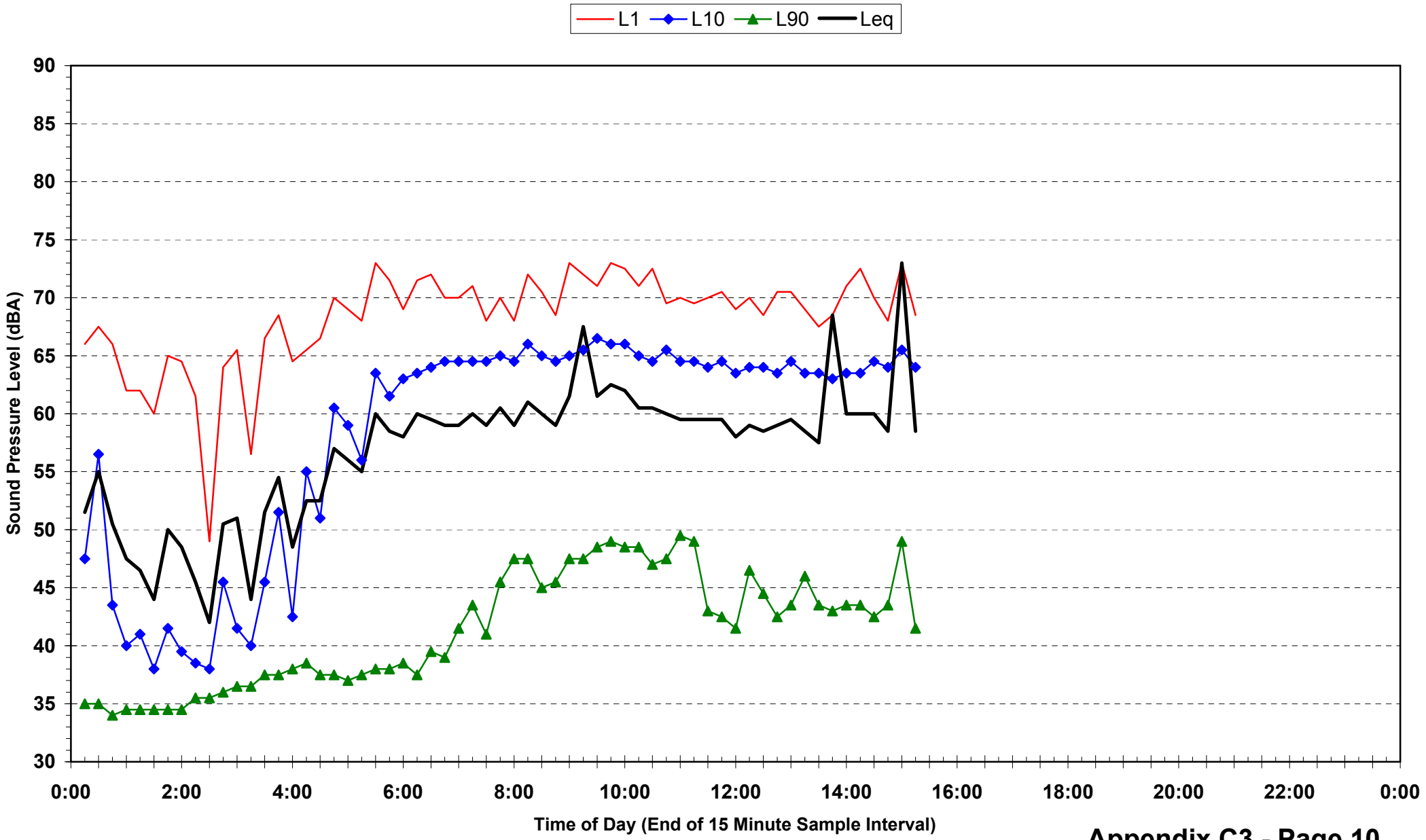
Statistical Ambient Noise Levels
Location 3 - Naval College Road - Thursday 11 December 2003



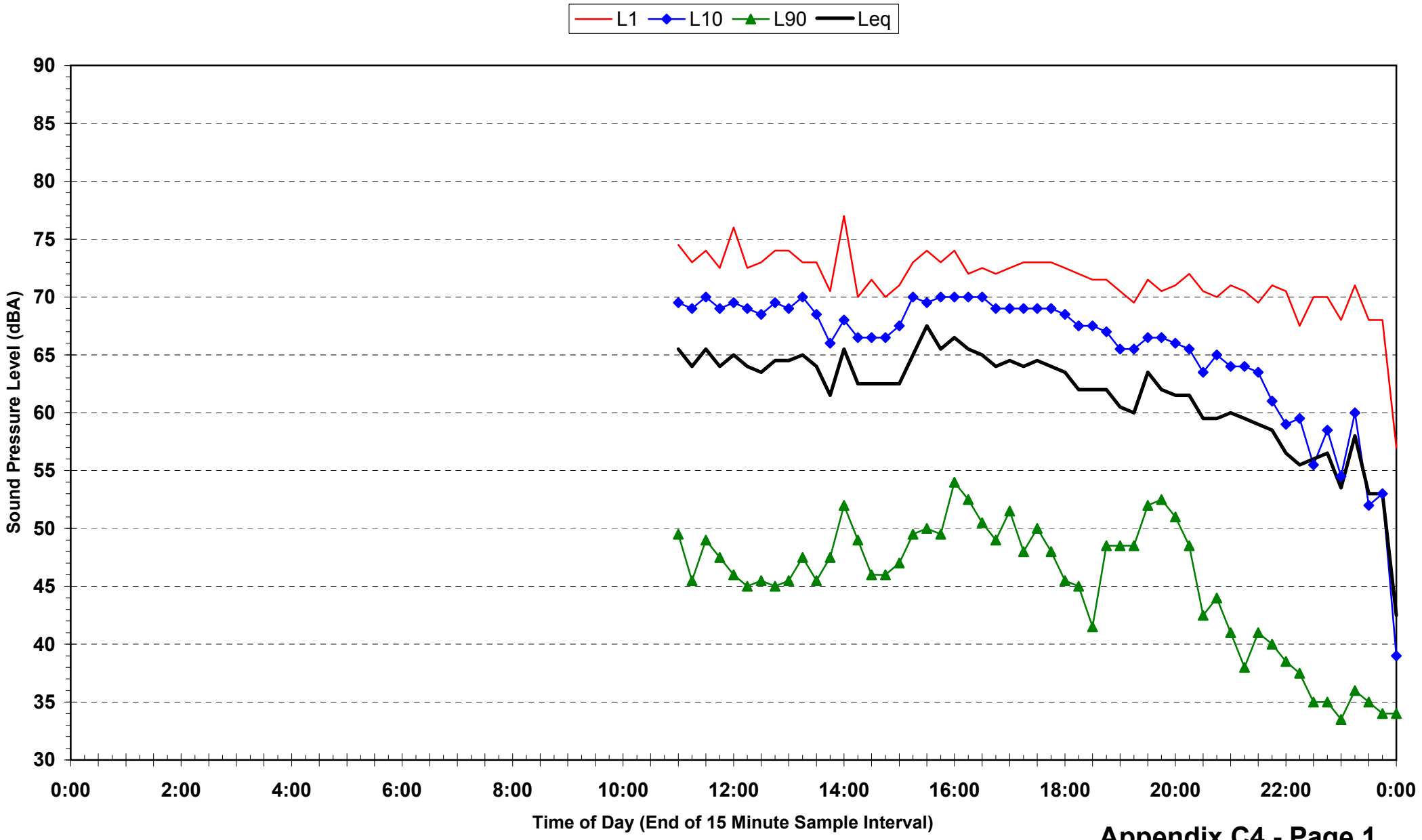
Statistical Ambient Noise Levels
Location 3 - Naval College Road - Friday 12 December 2003



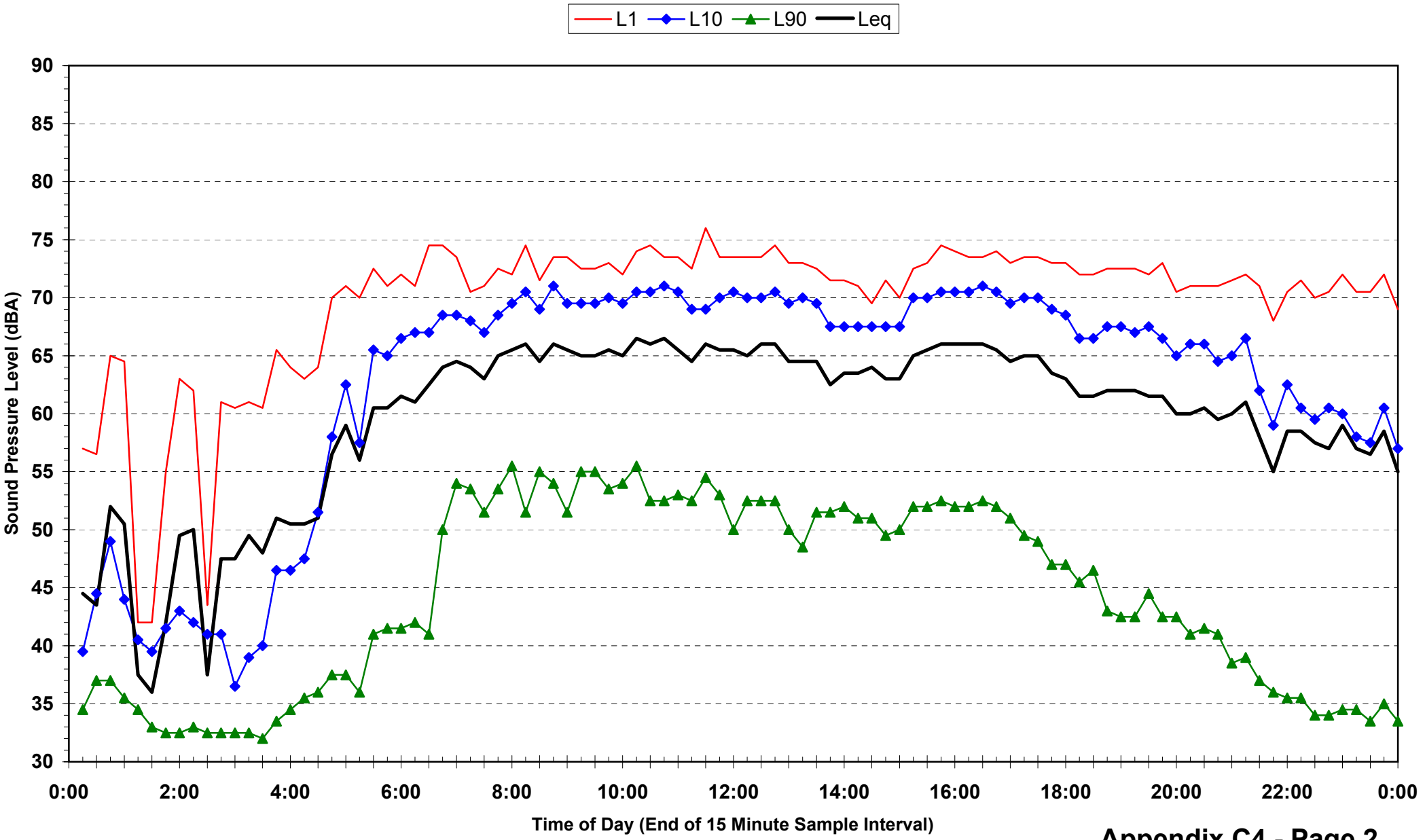
Statistical Ambient Noise Levels
Location 3 - Naval College Road - Saturday 13 December 2003



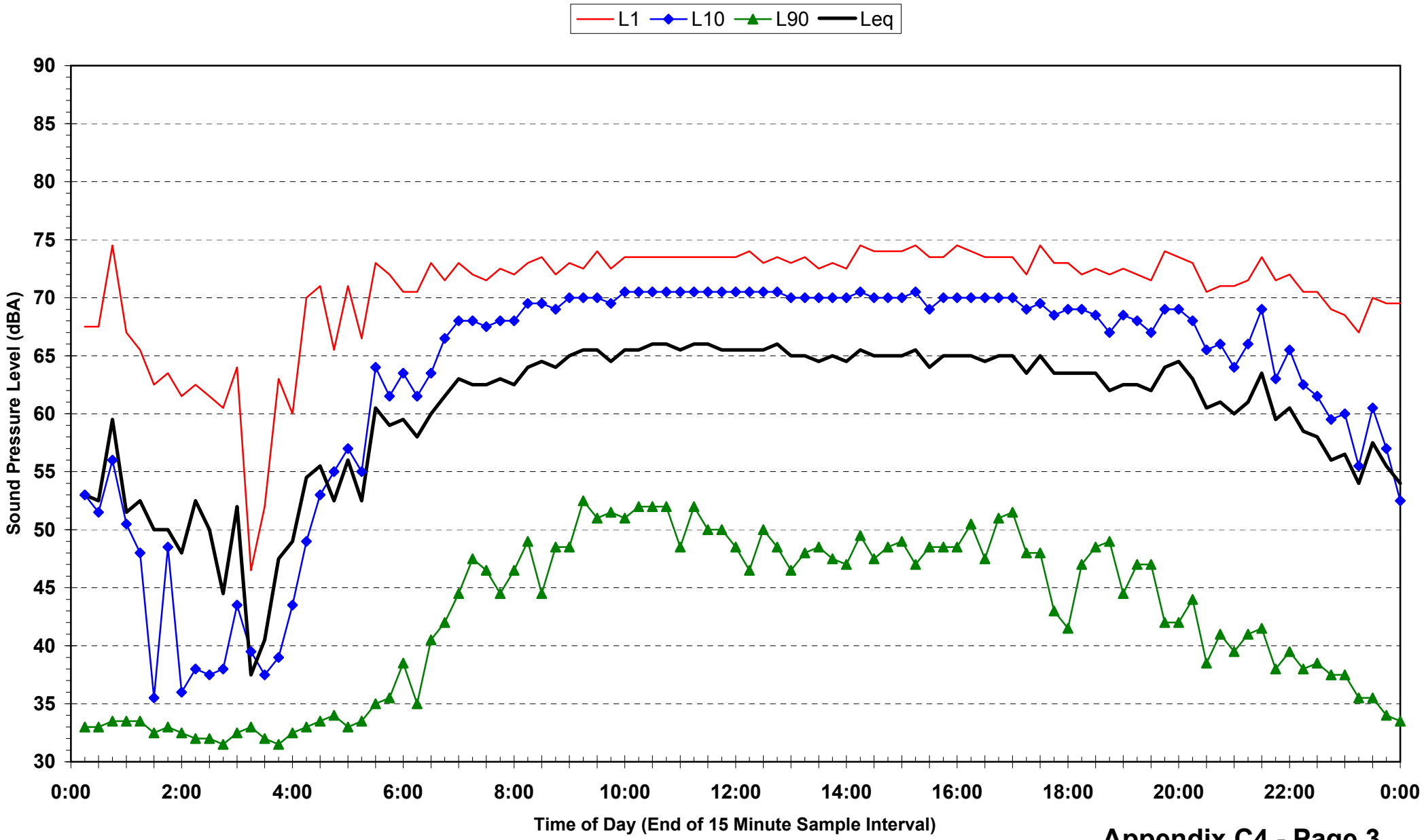
Statistical Ambient Noise Levels
Location 4 - Wool Road - Thursday 4 December 2003



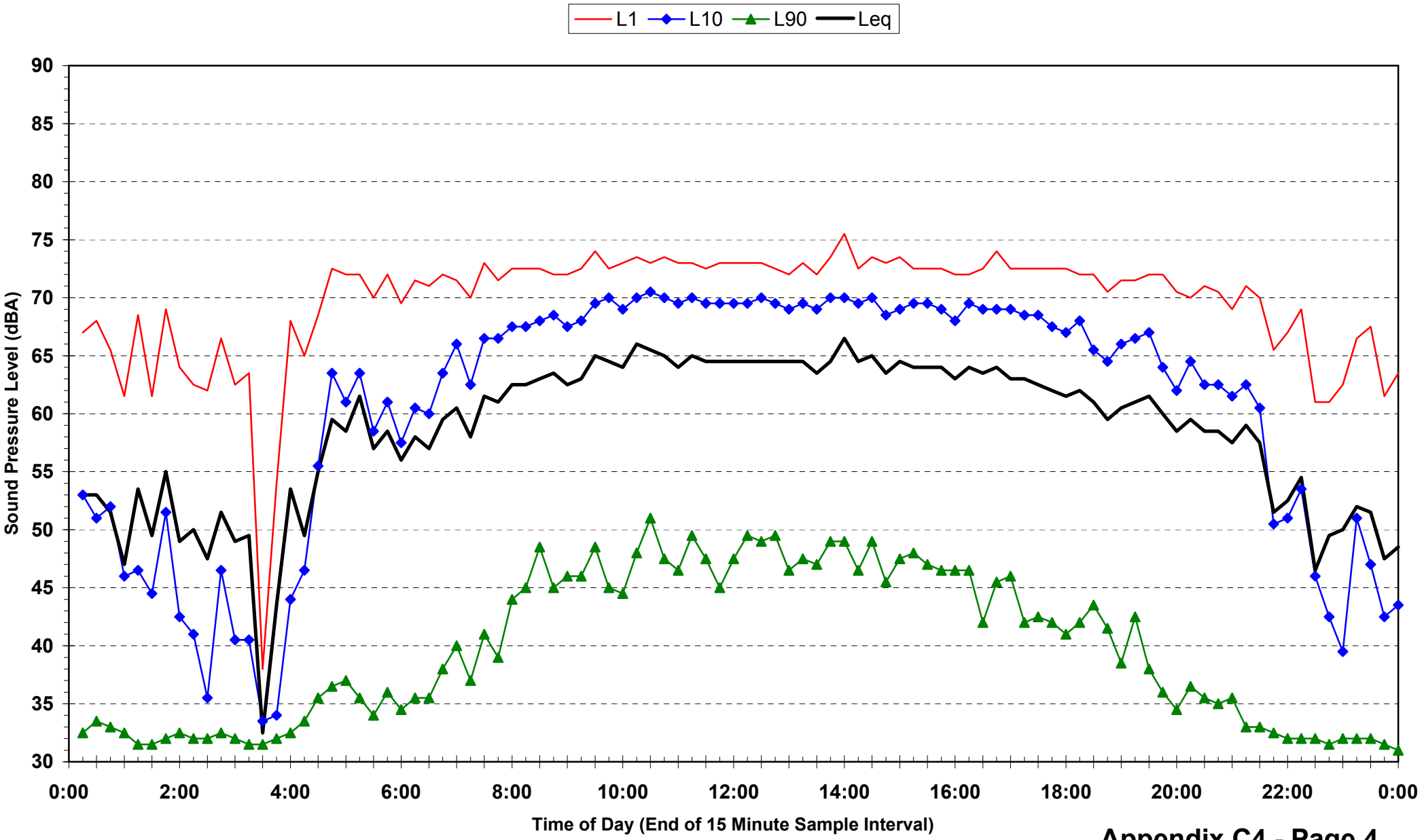
Statistical Ambient Noise Levels
Location 4 - Wool Road - Friday 5 December 2003



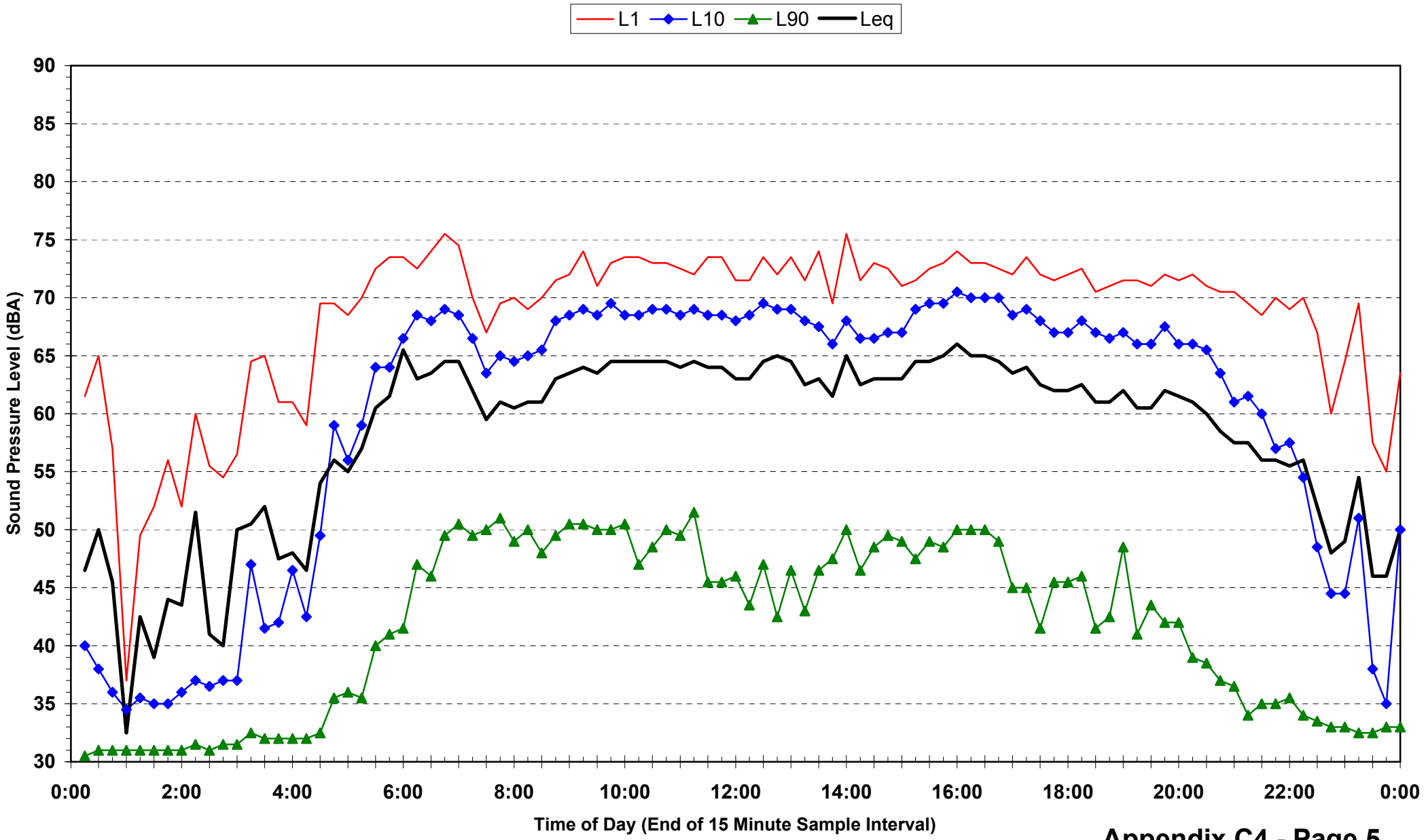
Statistical Ambient Noise Levels
Location 4 - Wool Road - Saturday 6 December 2003



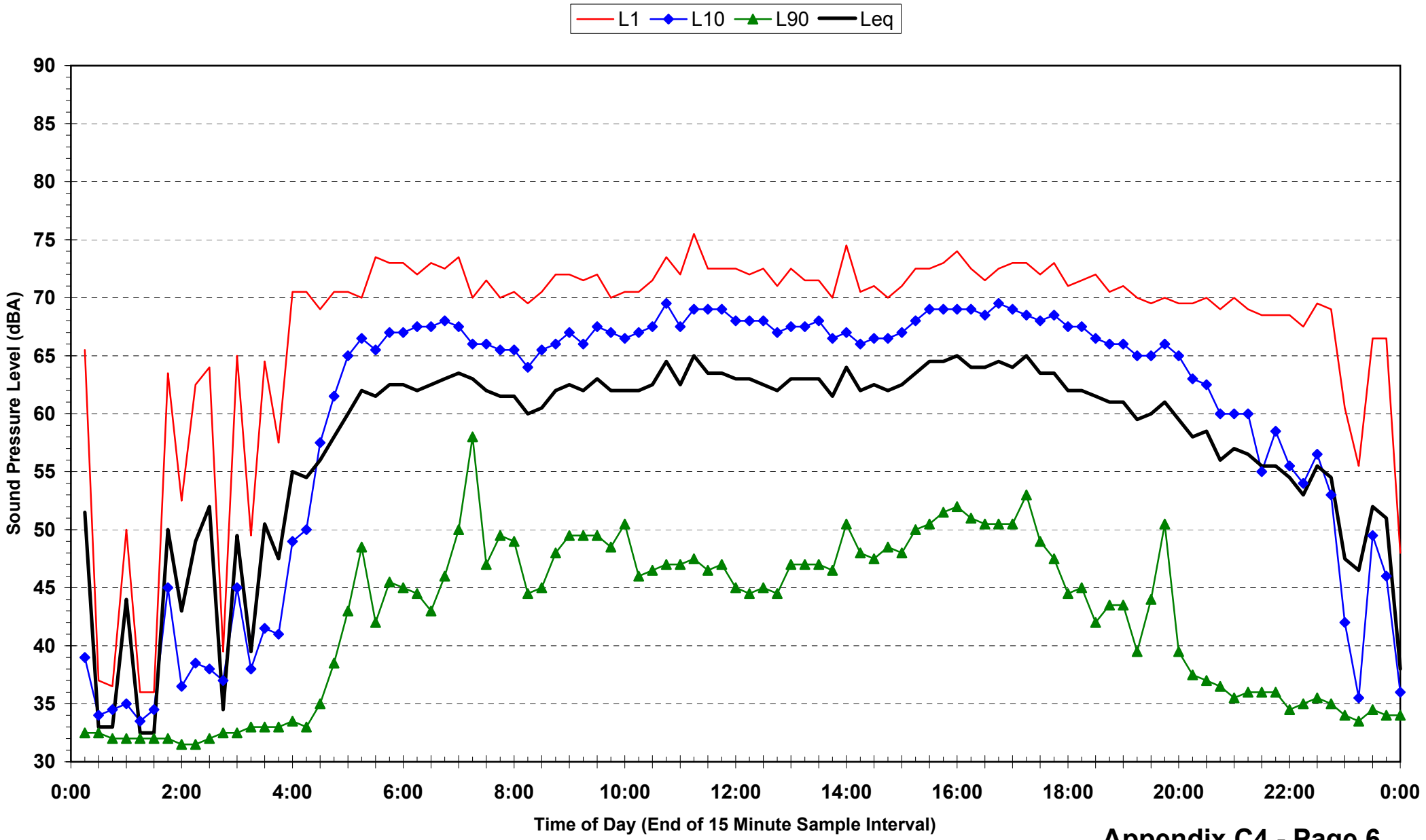
Statistical Ambient Noise Levels
Location 4 - Wool Road - Sunday 7 December 2003



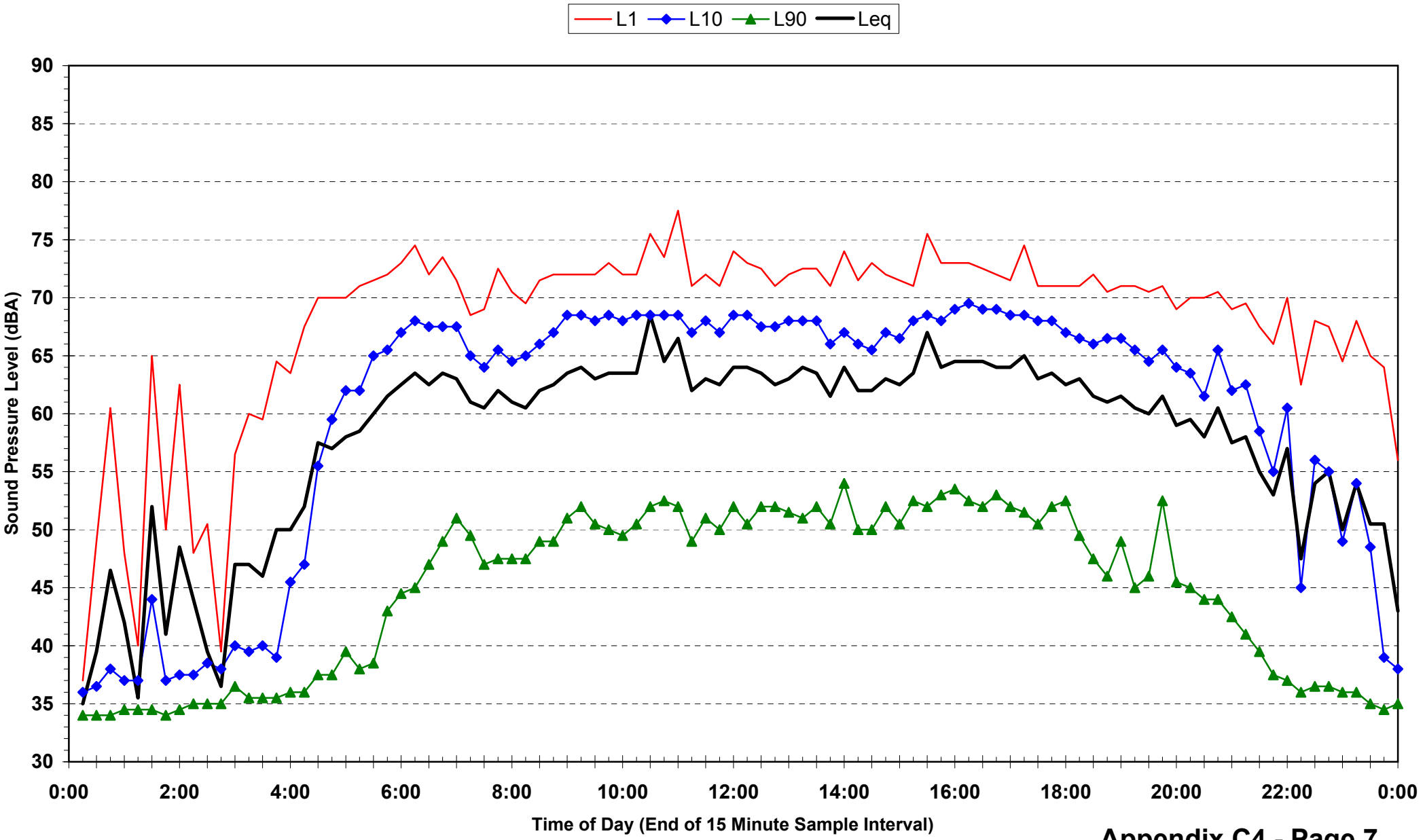
Statistical Ambient Noise Levels
Location 4 - Wool Road - Monday 8 December 2003



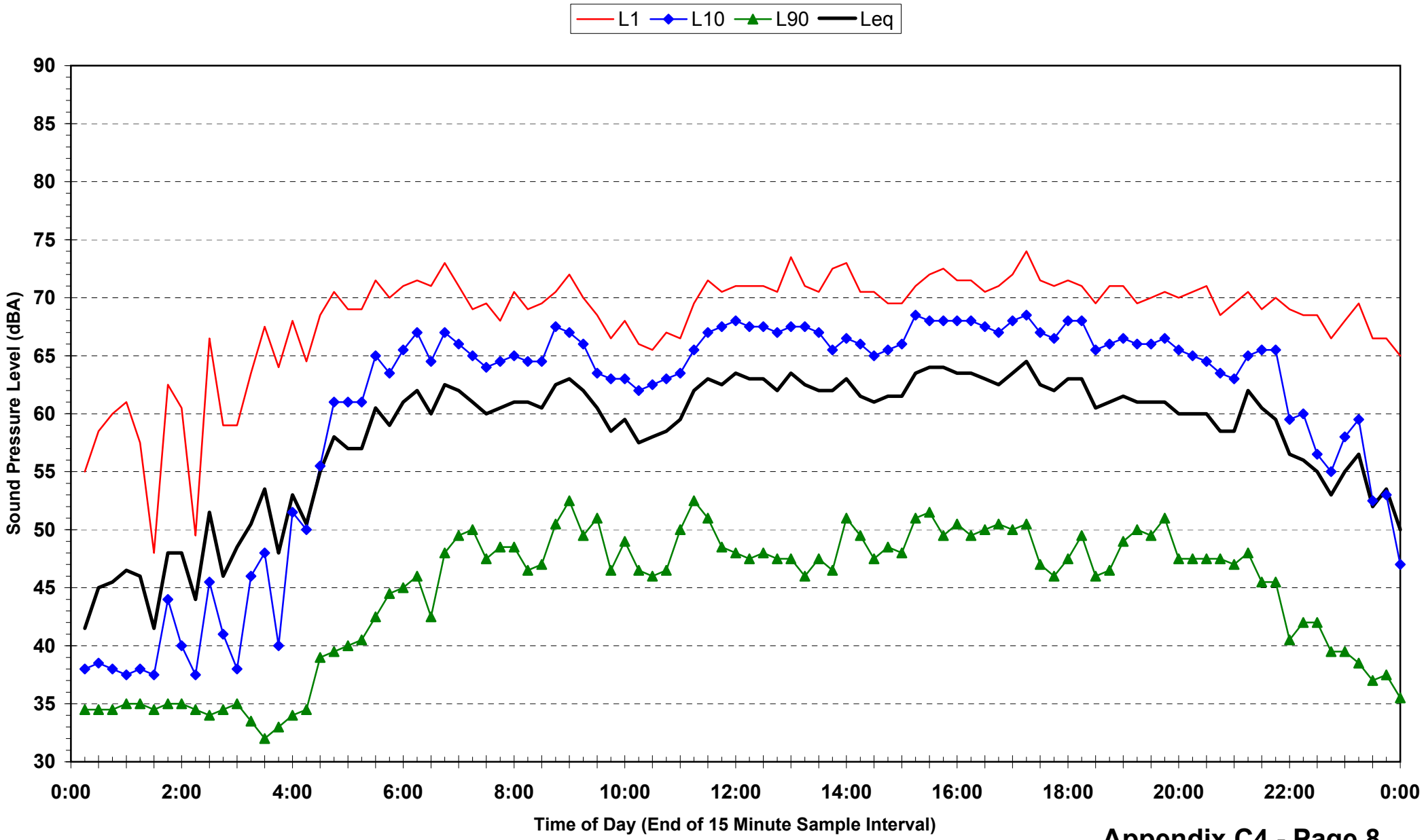
Statistical Ambient Noise Levels
Location 4 - Wool Road - Tuesday 9 December 2003



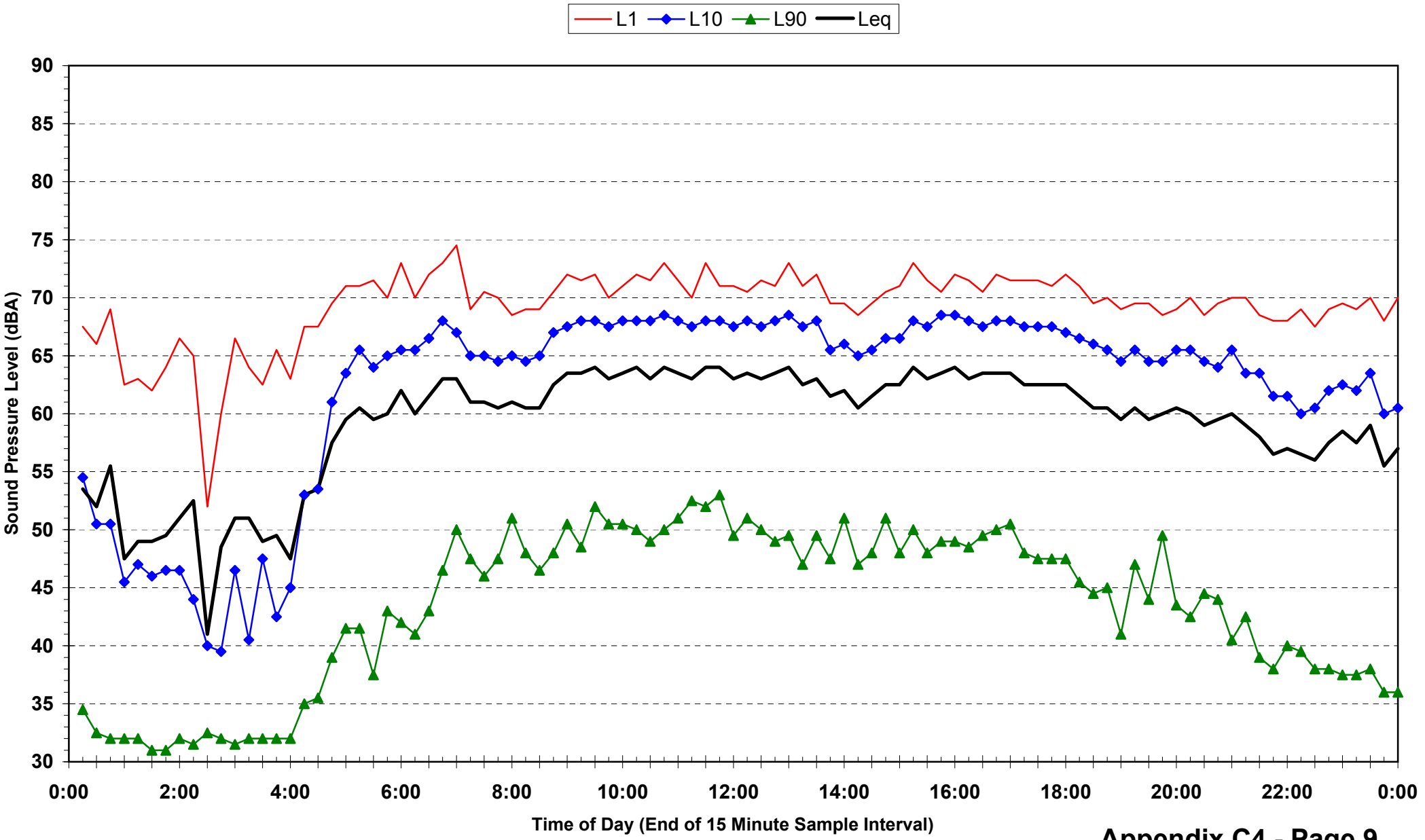
Statistical Ambient Noise Levels
Location 4 - Wool Road - Wednesday 10 December 2003



Statistical Ambient Noise Levels
Location 4 - Wool Road - Thursday 11 December 2003



Statistical Ambient Noise Levels
Location 4 - Wool Road - Friday 12 December 2003



Statistical Ambient Noise Levels
Location 4 - Wool Road - Saturday 13 December 2003