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18 December 2012

NOISE ASSESSMENT
PROPOSED REZONING
GEORGE EVANS ROAD, MUNDAMIA

1.0 INTRODUCTION

Atkins Acoustics was commissioned by the *SET Consultants Pty Ltd* to prepare a noise assessment for a proposed subdivision at George Evans Road, Mundamia. The assessment was to consider potential noise impacts on the future residential subdivision from aircraft / defence operations, road traffic and the proposed Bamarang Power Station Stage 2 (MP08-0021).

The subdivision site is located to the east of George Evans Road and south of Jonsson Road and comprises Lot 1 DP 1021332 and Part Lot 458 DP 1063107, Mundamia. The subdivision is proposed to incorporate residential lots (single, dual occupancy and medium density), neighbourhood shops, community centre, childcare centre and public open *(Appendix 1)*.

The assessment considered the following documents and drawings:

- Sketch Plan Ref No. 102166 Plan No. 12/98 prepared by SET Consultants;
- *Australian Standard AS2021:2000 'Acoustics – Acoustics – Aircraft Noise Intrusion – Building Siting and Construction'*;
- *Office of Environment and Heritage, NSW Road Noise Policy*;
- *State Environmental Planning Policy (SEPP) (Infrastructure) 2007*;
- *Planning NSW 'Development near Rail Corridors and Busy Roads – Interim Guide'*;
- *Mundamia Traffic Impact Study* prepared by Bitzios Consulting dated 19 October 2012 (Project No. P1110 Version No. 001); and,
- *Bamarang. Proposed Gas Turbine Power Station. Noise Assessment of Air Cooling Option* prepared by Heggies Pty Ltd dated 27 March 2008 (Report No. 10-4004-R4 Revision 00)

This report has been prepared to assist with planning considerations and to present conceptual ameliorative measures that could be considered for residential building lots and dwellings exposed to the aircraft and road traffic noise.

Future development of the neighbourhood shops, community centre and child care centre should take into account any potential noise impacts and consider the procedures contained in the *Office of Environment and Heritage, Noise Guide for Local Government* and any relevant polices published by *Shoalhaven City Council*.

2.0 NOISE EXPOSURE

For the purpose of assessing noise exposure and determining the existing noise environment, ambient noise levels were measured and recorded from Thursday 8 November 2012 to Friday 16 November 2012.

Measurements were conducted at two (2) reference locations to represent the northern and southern portions of the rezoning area (*Appendix 1*). Location 1 (north) was approximately 20m from the centre of Jonsson Road and Location 2 (south) approximately 15m from George Evans Road.

Site observations, ambient measurement results and review of *Mundamia Traffic Impact Study* prepared by Bitzios Consulting dated 19 October 2012 (Project No. P1110 Version No. 001) confirm that Jonsson Road and George Evans Road carry very low volumes of traffic, with the ambient noise environment influenced by natural elements, birds, insects and distant road traffic noise from Yalwal Road

The instrumentation selected for the measurements consisted of two (2) RTA Technology Environmental Noise Loggers. The reference level of each instrument was checked prior to and after the measurements with a NATA calibrated Bruel & Kjaer Sound Level Calibrator Type 4230, Serial No. 623590, with no significant drift recorded. The meters were set to A-weighting, fast response and fifteen (15) minute sampling period.

The noise levels were measured and assessed as percentile A-weighted levels. The parameter regarded as being the most important amongst these is the "L_{Aeq}", which is the A-weighted energy equivalent continuous (constant) sound level. *Table 1* presents a summary of the measurement results with a graphical presentation presented in *Appendix 2*.

Table 1: Measured RBL and L_{Aeq} Noise Levels
dB(A) re: 20 × 10^{-6} Pa

Date	Assessment Background Level L_{A90}			Equivalent Continuous Level L_{Aeq}		
	Day	**Evening**	**Night**	**Day**	**Evening**	**Night**
Location 1: North						
Thu 8/11/12	-	32	32	-	39	37
Fri 9/11/12	34	33	32	46	43	39
Sat 10/11/12	35	33	34	46	41	40
Sun 11/11/12	34	33	33	43	41	46
Mon 12/11/12	32	32	32	43	40	43
Tue 13/11/12	35	32	33	44	42	43
Wed 14/11/12	34	33	33	44	45	41
Fri 15/11/12	31	32	32	44	39	41
RBL	**34**	**33**	**32**			
Ambient L_{Aeq}				**44**	**42**	**42**
Location 2: South						
Thu 8/11/12	-	28	26	-	34	36
Fri 9/11/12	33	26	26	51	38	35
Sat 10/11/12	29	28	28	42	34	37
Sun 11/11/12	29	27	27	44	32	39
Mon 12/11/12	29	27	26	45	36	43
Tue 13/11/12	30	27	26	43	39	45
Wed 14/11/12	31	29	29	42	33	39
Fri 15/11/12	29	28	26	42	39	44
RBL	**29**	**28**	**26**			
Ambient L_{Aeq}				**46**	**36**	**41**

Noise levels in *Italics* excluded
NOTE: *Daytime: (7.00am to 6.00pm Monday to Saturday, 8.00am to 6.00pm Sunday and Public Holidays)*
Evening: (6.00pm to 10.00pm)
Night: (10.00pm to 7.00am Monday to Saturday, 10.00pm to 8.00am Sunday and Public Holidays)

The measurements have confirmed an ambient noise environment typical of an isolated natural area with low background L_{A90} and ambient L_{Aeq} noise levels with limited human activity. Considering the low noise levels, design and development of the neighbourhood shops, community centre and child care centre will require consideration to ensure that residential properties are not adversely impacted.

A review of the L_{Amax} and L_{A1} noise levels has not identified any events that are typical of aircraft operations from HMAS Albatross. Identified peak events are likely to be as a result of occasional vehicle or motorbike pass by, or from birds or inspects in close proximity to measurement positions. Correspondence with Department of Defence has confirmed that no specific operations were conducted in the vicinity of the noise measurement locations during the monitoring period.

3.0 NOISE ASSESSMENT DESIGN OBJECTIVES

3.1 Aircraft Noise AS2021:2000

For the purpose assessing aircraft noise for the subdivision, the following indoor design goals (*Table 2*), as stipulated in *Table 3.3* of *AS2021:2000*, have been used to determine the aircraft noise reduction (ANR) for residential development assuming windows/doors in the closed position.

Table 2: Indoor Design Goal and Required Aircraft Noise Reduction
dB(A) re 20 × 10^{-6} Pa

Use of Area	Indoor Design Goal
Houses, home units, flats, caravan parks	
Sleeping areas, dedicated lounges	50
Other habitable spaces	55
Bathrooms, toilets, laundries	60

3.2 Road Traffic Noise

3.2.1 OEH, NSW Road Noise Policy (RNP)

The *RNP* provides noise assessment criteria for particular types of projects, road categories and land use and aims to identify the strategies to address road traffic noise from:

- Existing roads;
- New road projects;
- Road redevelopment projects; and
- New traffic generating developments.

The proposed rezoning at Mundamia provides a situation of new roads and new residences, accordingly there is no specific category or assessment criteria under the *RNP* [Table 3] that would apply. For example existing residences affected by noise from a new freeway / arterial / or sub arterial (new 'Spine Road') should achieve $L_{Aeq(15hour)}$ 55dB(A) and $L_{Aeq(9hour)}$ 50dB(A). Notes to *RNP* [Table 3] confirm that land use developers must meet internal noise goals in accordance with the Infrastructure SEPP (Department of Planning NSW 2007).

Where feasible and reasonable, it is recommended that through road design, lot size and building setbacks, façade noise levels for development fronting the proposed 'Spine Road' achieve a baseline goal of $L_{Aeq(15hour)}$ 55dB(A) and $L_{Aeq(9hour)}$ 50dB(A).

3.2.2 SEPP (Infrastructure) 2007 – Clause 102

State Environmental Planning Policy (Infrastructure) 2007 - Clause 102 applies to development in the vicinity of a freeway, tollway, transit way or any other road within an annual average daily traffic volume of more than 40,000 vehicles.

Notwithstanding that roads within the proposed development will not generate volumes of that order, the procedures and goals outlined in the *NSW Department of Planning 'Development near Rail Corridors and Busy Roads – Interim Guideline'* should be considered. The *Guideline* states that if the development is for the purposes of a building for residential use, the consent authority must be satisfied that appropriate design measures will be taken to ensure that the following L_{Aeq} levels are not exceeded:

(a) in any bedroom in the building: 35dB(A) at any time between 10:00pm and 7:00am;
(b) anywhere else in the building (other than a garage, kitchen, bathroom or hallway): 40dB(A) at any time.

For assessment purposes, the $L_{Aeq,15hr}$ (living) and $L_{Aeq,9hr}$ (sleeping) acoustic descriptors were adopted in accordance with *'Development near Rail Corridors and Busy Roads – Interim Guideline' Section 3.4* and *Section 3.6.1 (Table 3.1)*.

4.0 NOISE PREDICTION AND ASSESSMENT

4.1 Aircraft Noise

The subject site is located more than five (5) kilometres to the northern extent of Runway 03C/21C at HMAS Albatross. A review of the 2014 ANEF for HMAS Albatross confirms the rezoning site is located outside of the 20 ANEF, accordingly there are no specific planning restrictions applicable under *Table 2.1* of *AS2021:2000*. Notwithstanding the acceptability of the site, *Note 1* to *Table 2.1* of *AS2021:2000* recommends that due to the difficulty in accurately defining the 20 ANEF contour, maximum aircraft noise levels and aircraft noise reduction requirements should be determined to ensure that developments are designed and constructed to achieve the relevant internal design noise levels.

The calculation of maximum aircraft noise levels in accordance with *AS2021:2000* requires the distance co-ordinates for the building site relative to the aerodrome runways to be established, which includes:

- the perpendicular distance from the proposed development to the extended runway centre-line (DS);
- the distance from the closer end of the relevant runway to the intersection of the extended runway centre-line and the perpendicular line passing through the proposed development (DL); and
- the distance from the further end of the relevant runway to the intersection of the runway centre-line and the perpendicular line passing through the proposed development (DT).

For the subject site the closest distance co-ordinates have been considered, *Table 1* presents a summary of the predicted maximum noise levels from take-off and landing operations for different aircraft types. Additional information has been provided by Department of Defence (Brenin Presswell) in order to specifically address fixed wing aircraft and helicopters that utilise HMAS Albatross and including typically training routes. DoD confirmed that Lockheed C-130H Hercules utilise the facility along with SeaHawk and Squirrel helicopters.

A review of operational procedures for HMAS Albatross (Nowra Airport YSNW) published by Air Services Australia dated 23 August 2012 confirm normal procedures would not result in direct flyovers, however the assessment has considered a reduced sideline distance of 1,000 metres to account for the an altered flight path. In addition consideration of Circuit Training Operations utilised a centreline distance (DT) of 1000m and a sideline distance (DS) of 0m (*Tables 12, 42 & 53 Report No. DOD01-001, dated December 2001 prepared by Air Services Australia*).

Table 1 Predicted Maximum Aircraft Noise Level
dB(A) re 20 × 10^{-6} Pa

Aircraft Type	Predicted Maximum Aircraft Noise Level	
	Take-off	Landing
British Aerospace Bae146	49-64	51-56
SAAB 340, Boeing Dash 8, Fokker F50	47-58	50-55
Corporate Jet	52-66	47-52
Light General Aviation Aircraft	49-61	49-54
Lockheed C-130H Hercules	60-70	49-61
SeaHawk	45-57	47-58
Squirrel	???	40-54

Based on *AS2021:2000* assessment procedures, maximum aircraft noise levels of up to 70dB(A) are predicted for a take-off using a reduced 1000m sideline distance (DS) of a Lockheed C-130H Hercules aircraft operating on Runway 03/21. For circuit operations there is potential for isolated events with L_{Amax} noise levels of 95dB(A) for Hercules C130H, 90-93dB(A) for Sikorsky S-70A Seahawk and 90-91dB(A) for Eurocopter AS350 Squirrel. These scenarios are atypical of normal noise environment for the development and are considered unnecessarily onerous for the development to be designed to address these isolated events.

Accordingly excluding the atypical circuit training operational noise levels, and adopting the L_{Amax} noise level of 70dB(A), noise reductions in the order of 20dB (Rw26) for dedicated lounges and sleeping areas is required. Other areas habitable and service areas for residential dwellings do not have any specific acoustic performance requirements.

It should be noted that the maximum aircraft noise level for the site calculated in accordance with the standard, is based on average maximum levels. Accordingly, aircraft noise events may exceed the predicted maximum noise level.

Acoustic performances of Rw22-28 are normally achieved with single glazed 6mm glass installed in acoustic rated frames with acoustic seals. Individual window / door manufacturers should be consulted for a specific design solution to satisfy recommended R_W rating.

4.2 Road Traffic Noise

A review of *Mundamia Traffic Impact Study* prepared by Bitzios Consulting dated 19 October 2012 (Project No. P1110 Version No. 001) confirmed up to 550 vehicle trips during peak periods. It is noted that the traffic study addresses traffic volumes for the total Mundamia release area, whilst the study area considered in this assessment is approximately 25% of the total release area.

George Evans Road will bound the western side of the study area, whilst a new 'Spine Road' will form the eastern boundary of the study area. The new 'Spine Road' will effectively link the Mundamia Development with the southern portion of George Evans Road and the junction at Yalwal Road, accordingly it will function as a Minor Collect Road. Information from Bitzios Consulting and additional details from SET Consultants confirm the following estimated daily traffic volumes:

Spine Road (south of town centre)	3000-4000vpd
Spine Road (north of town centre)	1000-2000vpd

For assessment purposes it has been assumed that 80% of vehicle trips would be during daytime hours (7.00am to 10.00pm). Accordingly in order to assess potential noise impacts on residences fronting the 'Spine Road' the following traffic volumes were considered:

	Day	Night
Spine Road (south of town centre)	3200 trips	800 trips
Spine Road (north of town centre)	1600 trips	400 trips

Calculations have considered a vehicle speed of up to 50km/h, a minimum façade setback from centre line of road of fifteen (15) metres, single event level (Lw 90dB(A)) and the following formulas:

$$L_{Aeq(15hr)} = \mathbf{SEL + 10log(N) -10log(54000)-10log(r)-8+2.5}$$

where: **SEL** = single event sound power level (car)
N = number of vehicles in fifteen (15) hours
54000 = number of seconds in fifteen (15) hours
r = distance from source (metres)
2.5 = facade reflection

$$L_{Aeq(9hr)} = \mathbf{SEL + 10log(N) -10log(32400)-10log(r)-8+2.5}$$

where: **SEL** = single event sound power level (car)
N = number of cars in nine (9) hours
32400 = number of seconds in nine (9) hours
r = distance from source (metres)
2.5 = facade reflection

The calculations confirmed the following predicted road traffic noise levels:

	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$
Spine Road (south of town centre)	60.5dB(A)	56.7dB(A)
Spine Road (north of town centre)	57.5dB(A)	53.7dB(A)

The calculations show that in the absence of shielding from boundary fences, the predicted façade road traffic noise levels for the future 'Spine Road' could exceed the baseline *RNP* criteria of $L_{Aeq(15hour)}$ 55dB(A) and $L_{Aeq(9hour)}$ 50dB(A).

Furthermore taking account of windows open for ventilation purposes (10-15% of floor area) and a nominal noise reduction across an open façade of 10-12dB, the calculations demonstrate that the internal design noise levels of *NSW Department of Planning 'Development near Rail Corridors and Busy Roads – Interim Guideline'* may be exceeded.

To achieve the external *RNP* noise criteria at residences fronting the future spine road would require consideration of increased building setbacks (in order of 45-50m) or provision of acoustic barrier of a height in the order of two to two point two (2.0-2.2) metres. Considering the proposed subdivision layout, reduction on yield and access requirements for residential properties of the 'Spine Road', the provision of increased setbacks or acoustic barriers is not considered feasible.

Accordingly the provision of secondary building noise controls has been considered. In order to achieve the internal design noise levels of 40dB(A) for living areas (all hours) and 35dB(A) for sleeping areas (night hours) façade noise reductions of up to 21dB (Rw27) living areas and 22dB (Rw28) sleeping areas are required for exposed building facades.

Acoustic performances of Rw22-28 are normally achieved with single glazed 6mm glass installed in acoustic rated frames with acoustic seals. Individual window / door manufacturers should be consulted for a specific design solution to satisfy recommended R_W rating.

4.3 Bamarang Power Station

Atkins Acoustics reviewed *Bamarang. Proposed Gas Turbine Power Station. Noise Assessment of Air Cooling Option* prepared by Heggies Pty Ltd (*Heggie*) dated 27 March 2008 (Report No. 10-4004-R4 Revision 00). The *Heggie* assessment (*Section 2*) confirmed the adoption of a L_{Aeq} 35dB(A) noise criterion for all receivers.

Reference to the operational noise modelling including adverse weather scenario noise contours contained in Appendices B1, B2 and B3 of the *Heggie* Report confirms that the subject site is greater than 1,500m beyond the predicted 35dB(A) noise contour of Stage 2 of Bamarang Power Station under all scenarios modelled.

Accordingly based on the *Heggie* modelling, noise contributions from the operation of Stage 2 of Bamarang Power Station at the subject site at Mundamia is estimated to be less than 32dB(A) and satisfy the 35dB(A) noise criterion recommended by *Heggies*.

Accordingly, no additional control measures are required to be incorporated in the Mundamia residential development in order to address noise from the proposed Bamarang Power Station.

5.0 SUMMARY of RECOMMENDATIONS

5.1 Aircraft Noise

Utilising the information contained in *Australian Standard AS2021:2000 'Acoustics – Acoustics – Aircraft Noise Intrusion – Building Siting and Construction'* and additional details provided from *Department of Defence (DoD)*, the assessment has established that L_{Amax} noise levels up to 70dB(A) could be experienced at Mundamia. Occasional isolated events associated with HMAS Albatross circuit training operations may exceed this level as discussed in *Section 4.1*.

Accordingly noise reductions of 20dB (Rw26) for dedicated lounges and sleeping areas are required. Rw26 would typically be achieved with single glazed 6mm glass installed in acoustic rated frames with acoustic seals. Other areas habitable and service areas for residential dwellings do not have any specific acoustic performance requirements.

5.2 Road Traffic Noise

The assessment has identified that in the absence of any additional shielding or increased building setbacks, façade noise levels for dwellings on the proposed 'Spine Road' may exceed the baseline *RNP* criteria of $L_{Aeq(15hour)}$ 55dB(A) and $L_{Aeq(9hour)}$ 50dB(A). As a result internal noise levels for exposed dwellings may also exceed the internal design noise levels adopted by *State Environmental Planning Policy (Infrastructure) 2007* and recommended in *NSW Department of Planning 'Development near Rail Corridors and Busy Roads – Interim Guideline'*.

The assessment has discussed that increased building setbacks or acoustic barriers are not feasible, therefore building noise controls have been considered. In order to

achieve the recommended internal design noise levels the assessment has identified that exposed windows and door of dwellings on the 'Spine Road' would be specified with acoustic performances of not less than Rw28 which is typically achieved with single glazed 6mm glass installed in acoustic rated frames with acoustic seals.

5.3 Bamarang Power Station

The assessment has established that the proposed Bamarang Power Station satisfies the L_{Aeq} 35dB(A) noise criterion adopted by *Heggies* at the Mundamia residential area and no additional amelioration measures have been recommended.

6.0 CONCLUSION

The assessment has shown that with the incorporation of the building treatments (acoustic rated windows / doors) and installation detailing, the proposed residential subdivision at Mundamia can be designed to satisfy the requirements for aircraft noise (*AS2021:2000*) and road traffic noise levels (*NSW Road Noise Policy* and *NSW Department of Planning 'Development near Rail Corridors and Busy Roads – Interim Guideline')*.

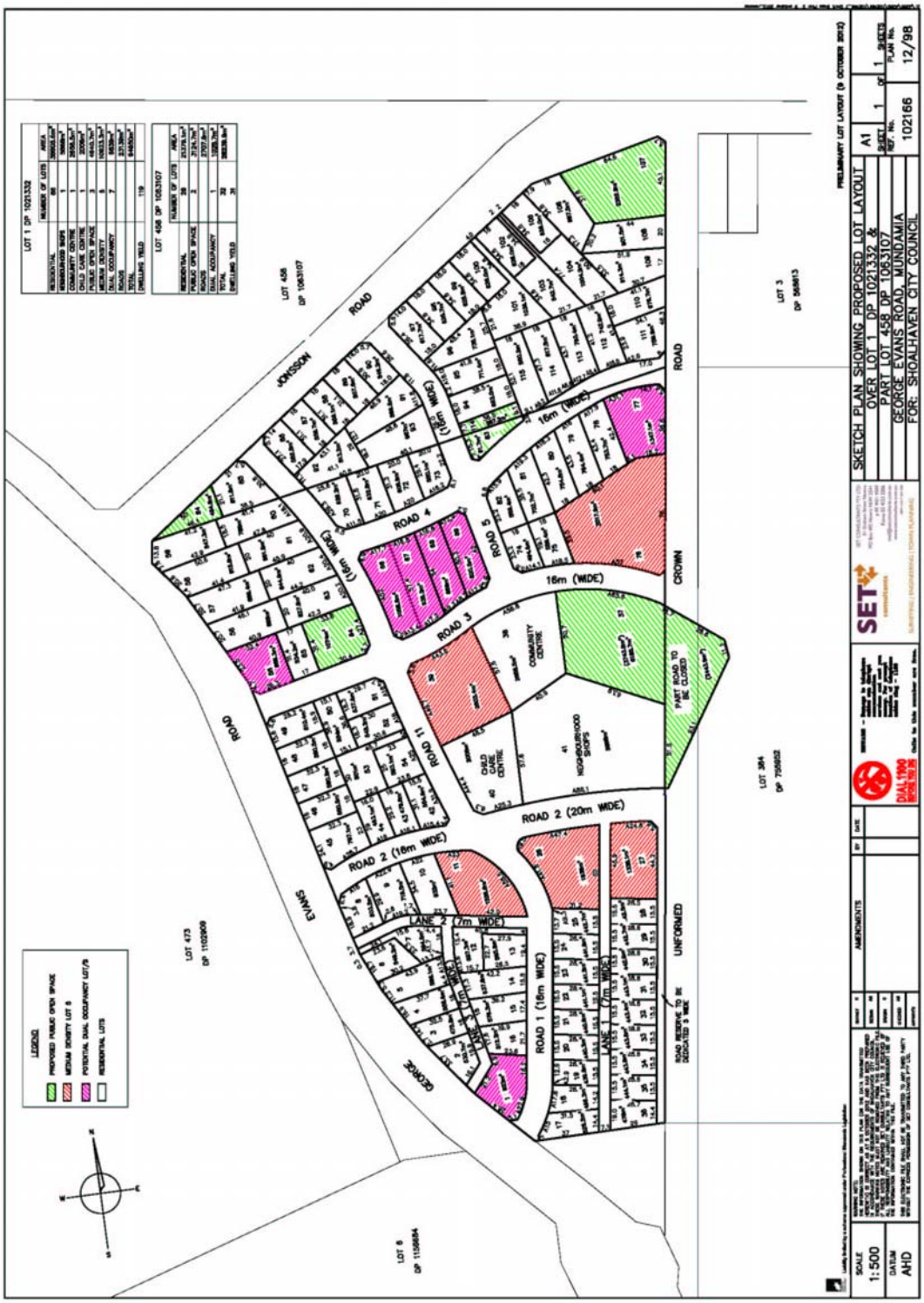
A review of the Bamarang Power Station Noise Assessment has demonstrated that the recommended noise criterion is satisfied for the Mundamia residential area.

Please do not hesitate to contact our office should further information or clarification be required.

Yours sincerely,
ATKINS ACOUSTICS & ASSOCIATES PTY LTD.

Carl Fokkema

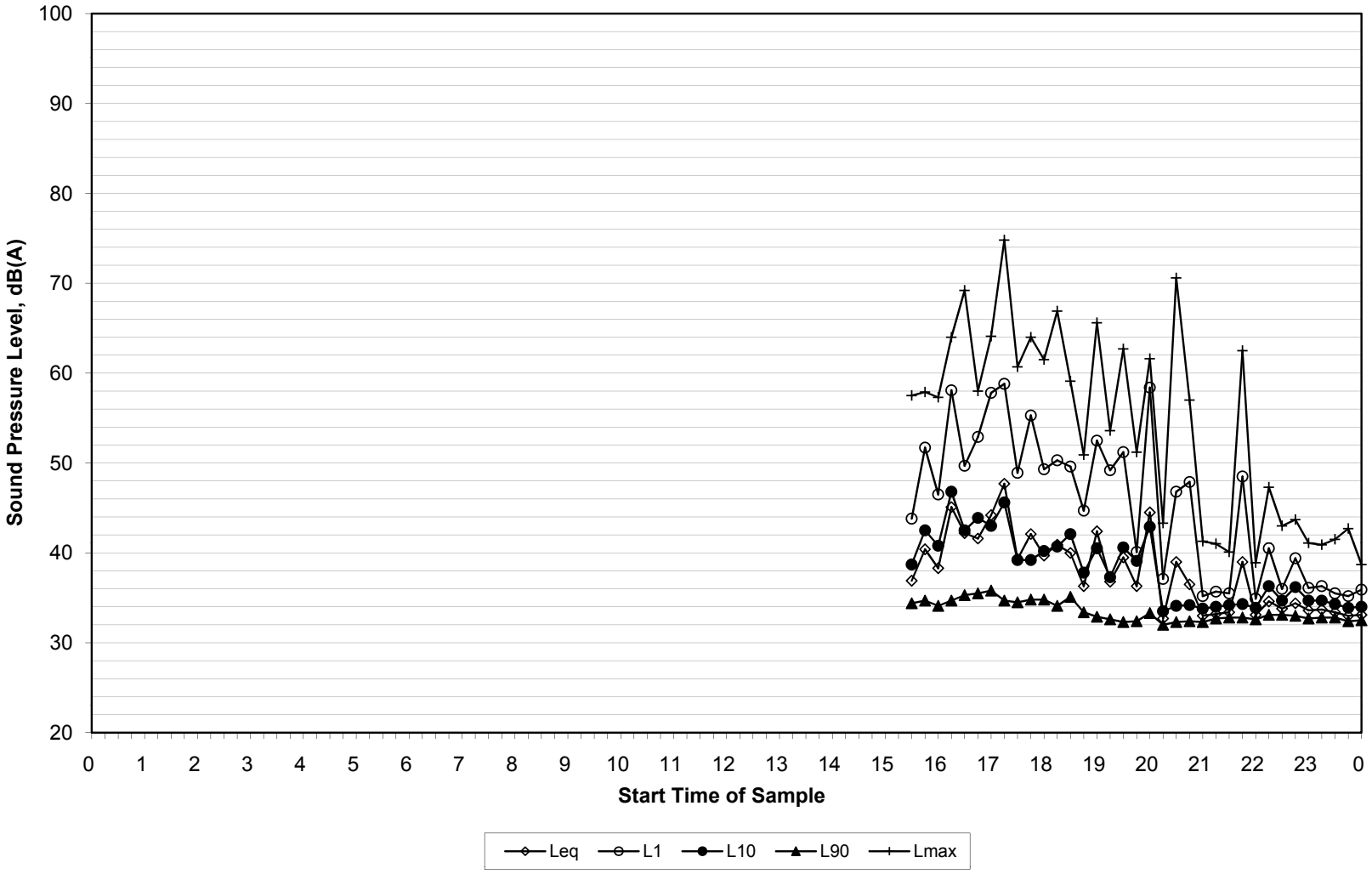
APPENDIX 1: CONCEPTUAL LOT LAYOUT



APPENDIX 2: AMBIENT NOISE MEASUREMENT RESULTS

Ambient Sound Pressure Levels

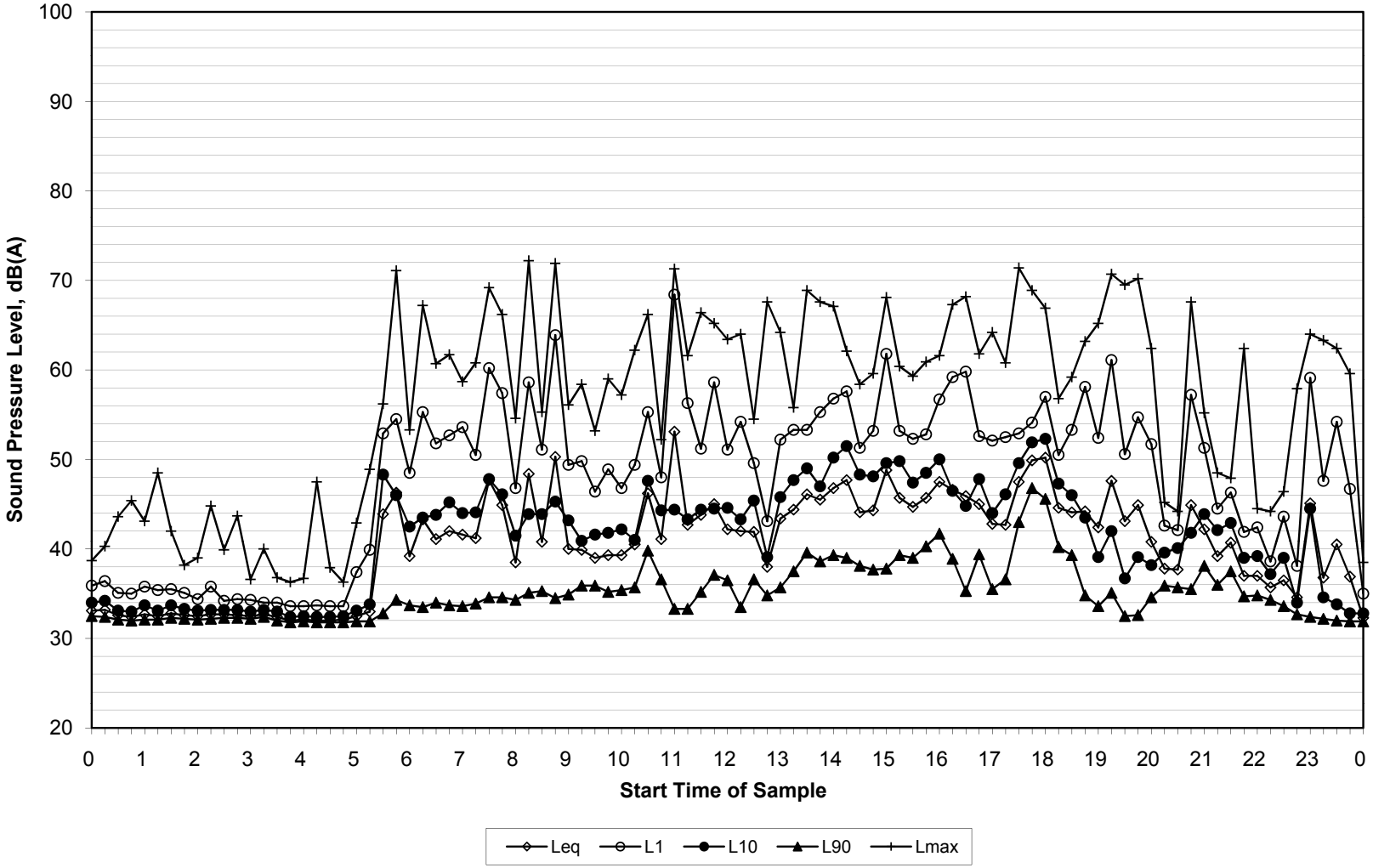
Thursday, 8 November 2012



Location 1
Mundamia Rezoning - North

Ambient Sound Pressure Levels

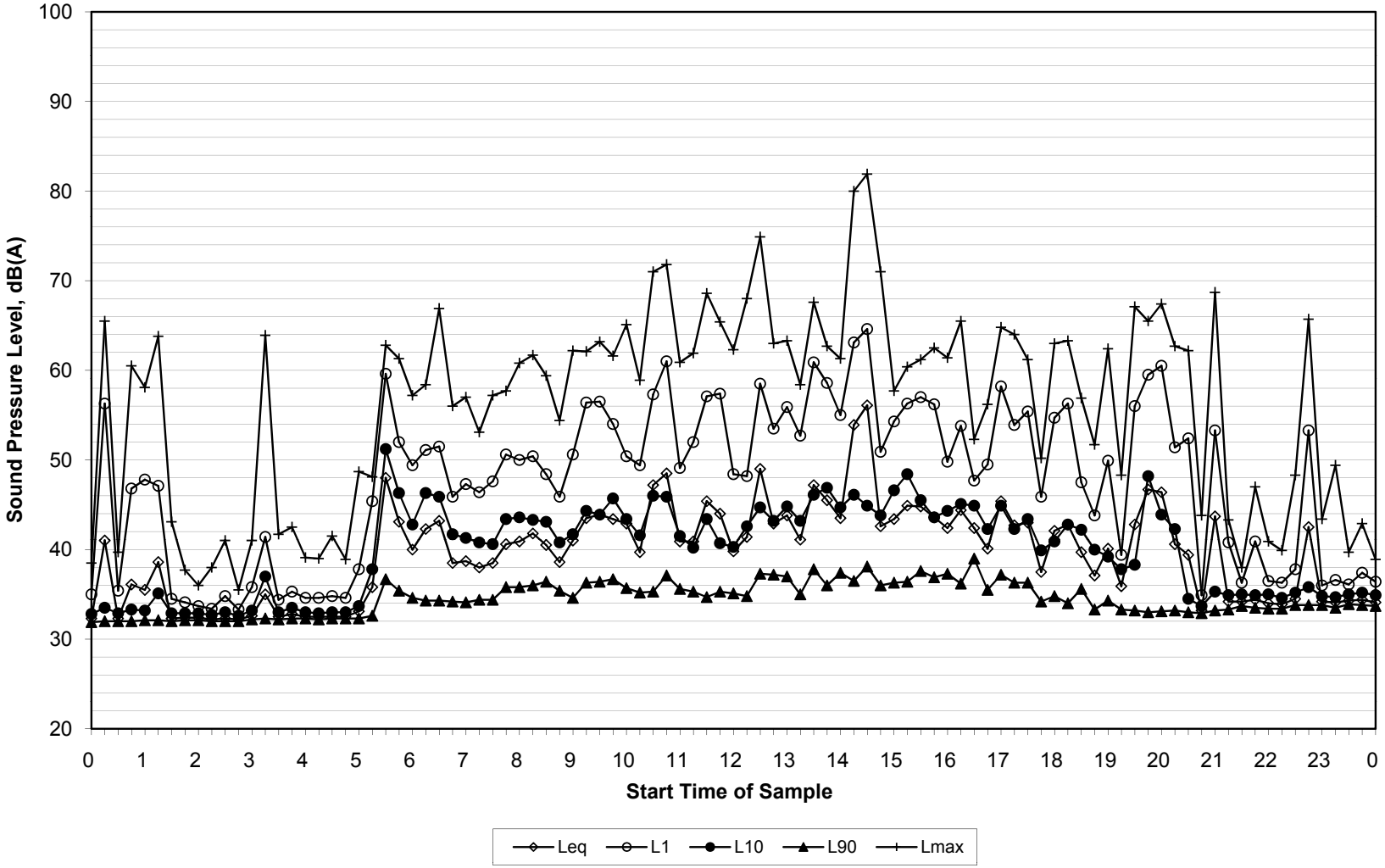
Friday, 9 November 2012



Location 1
Mundamia Rezoning - North

Ambient Sound Pressure Levels

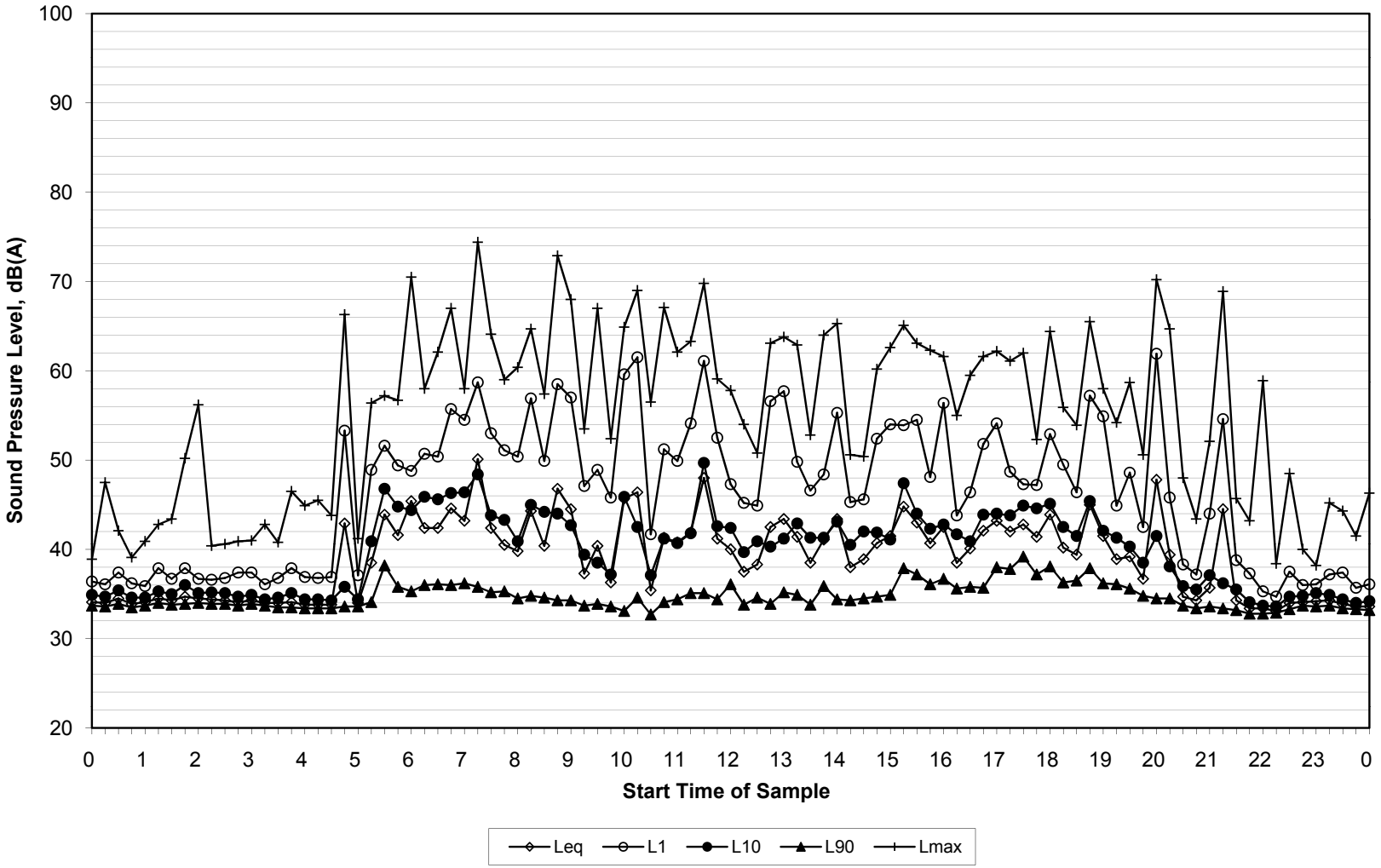
Saturday, 10 November 2012



Location 1
Mundamia Rezoning - North

Ambient Sound Pressure Levels

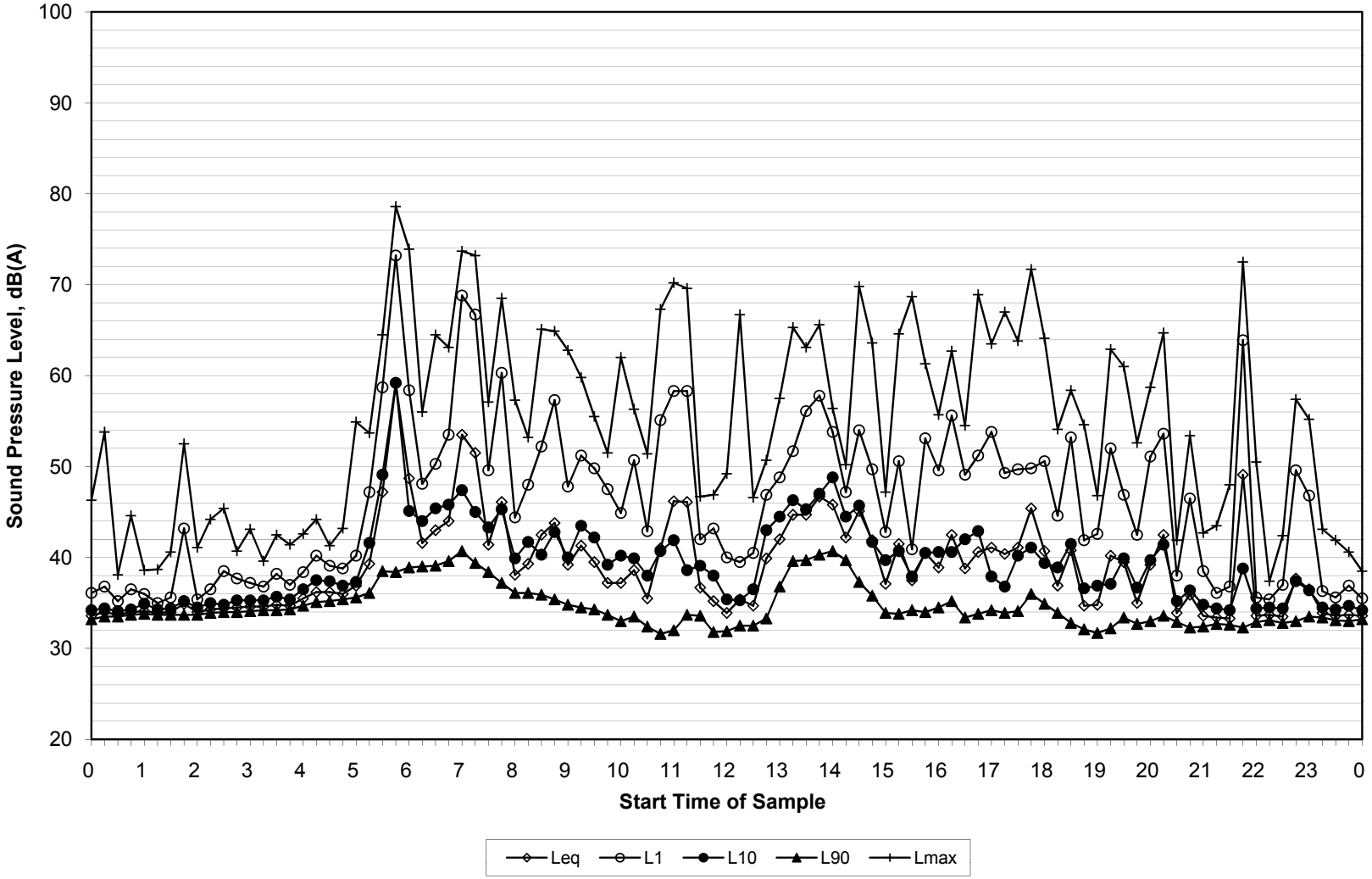
Sunday, 11 November 2012



Location 1
Mundamia Rezoning - North

Ambient Sound Pressure Levels

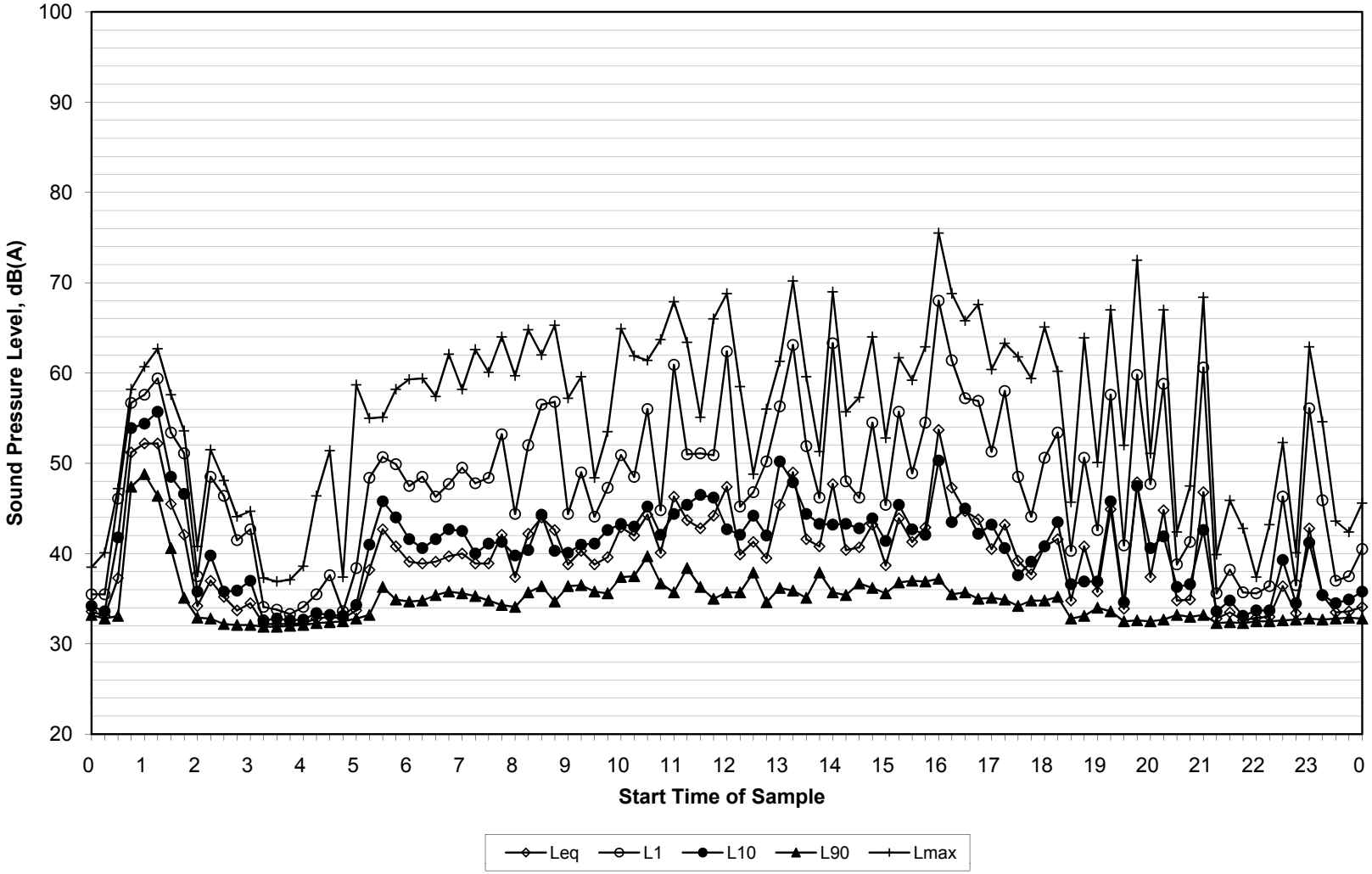
Monday, 12 November 2012



Location 1
Mundamia Rezoning - North

Ambient Sound Pressure Levels

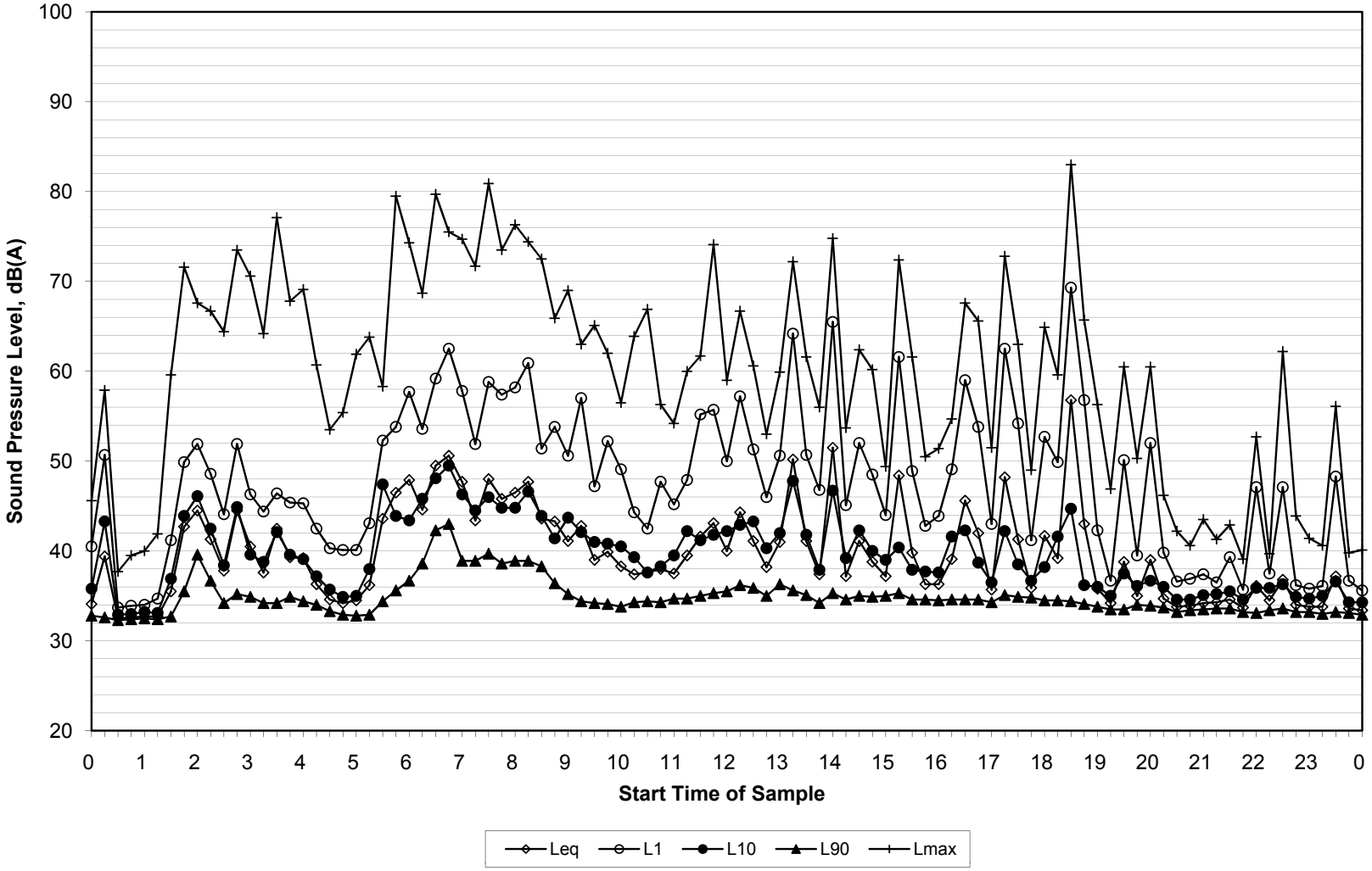
Tuesday, 13 November 2012



Location 1
Mundamia Rezoning - North

Ambient Sound Pressure Levels

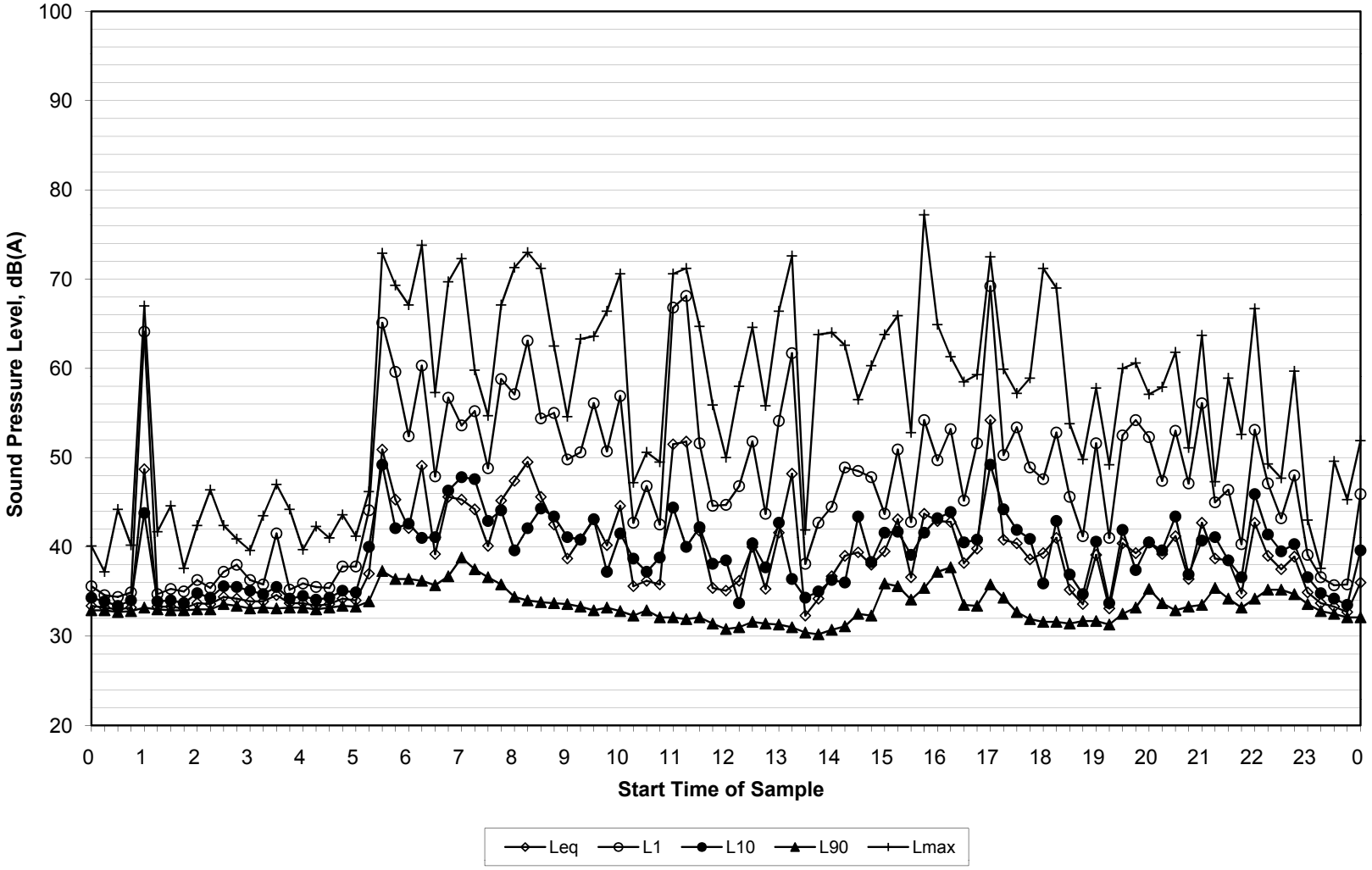
Wednesday, 14 November 2012



Location 1
Mundamia Rezoning - North

Ambient Sound Pressure Levels

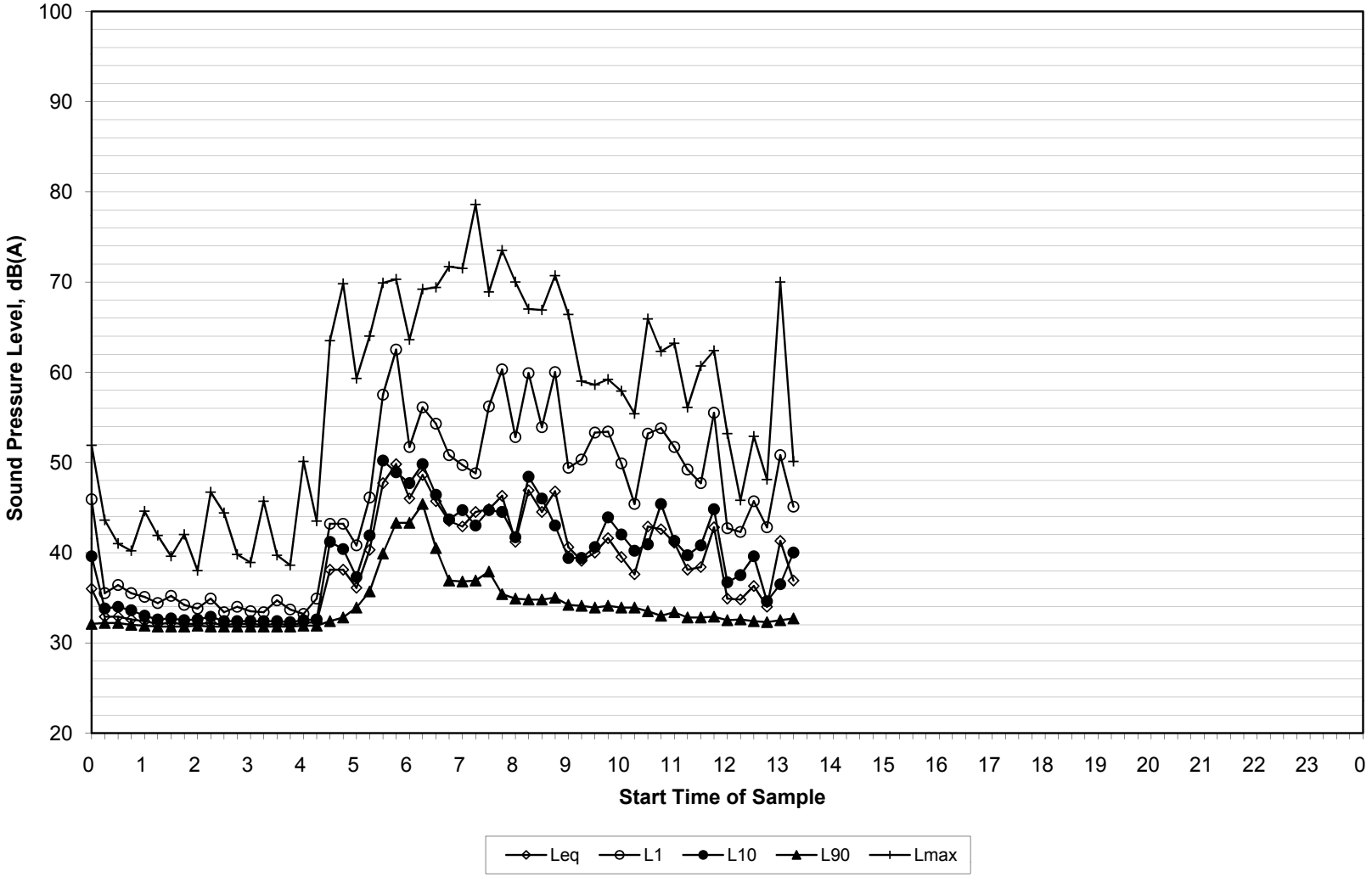
Thursday, 15 November 2012



Location 1
Mundamia Rezoning - North

Ambient Sound Pressure Levels

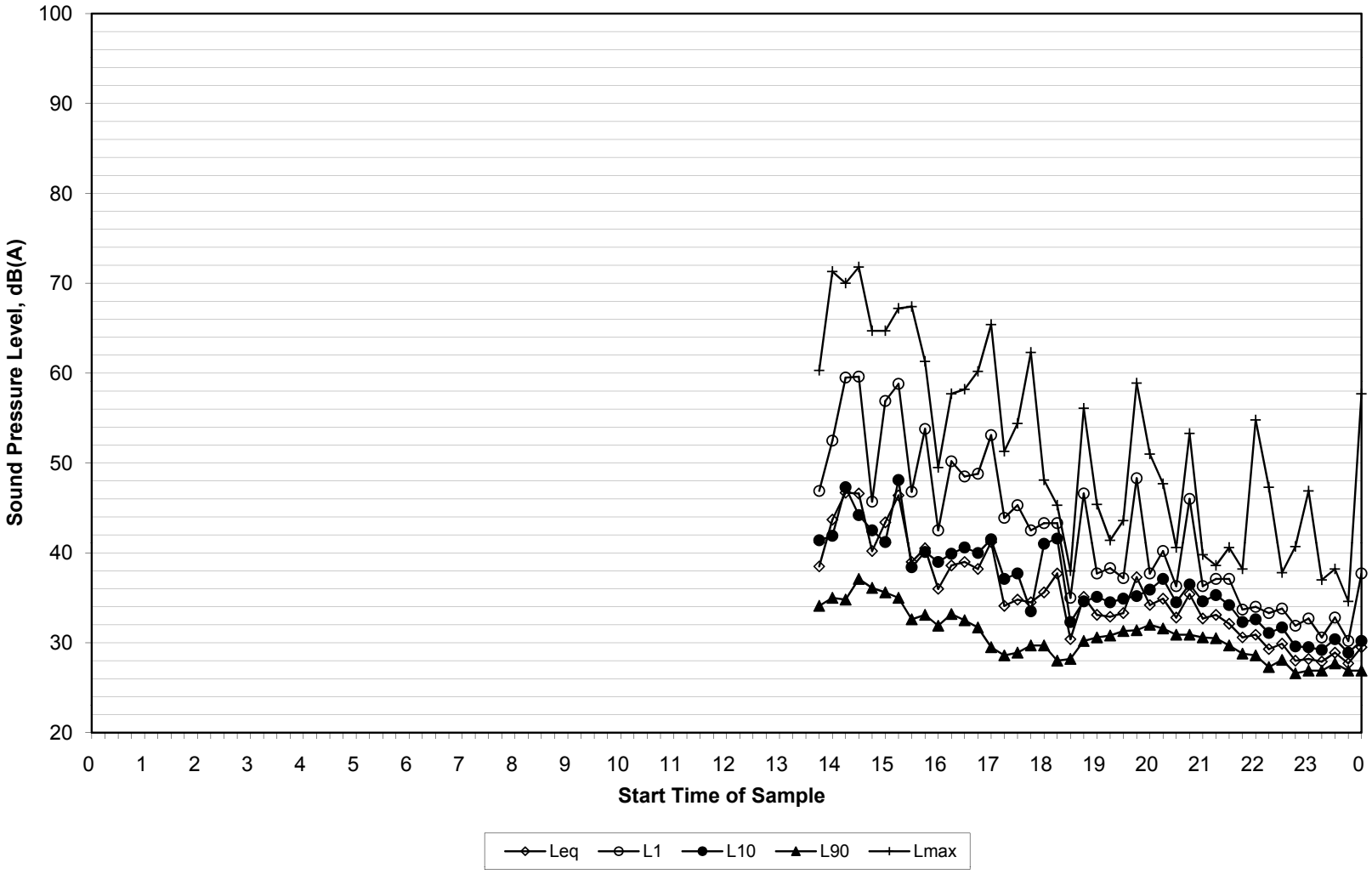
Friday, 16 November 2012



Location 1
Mundamia Rezoning - North

Ambient Sound Pressure Levels

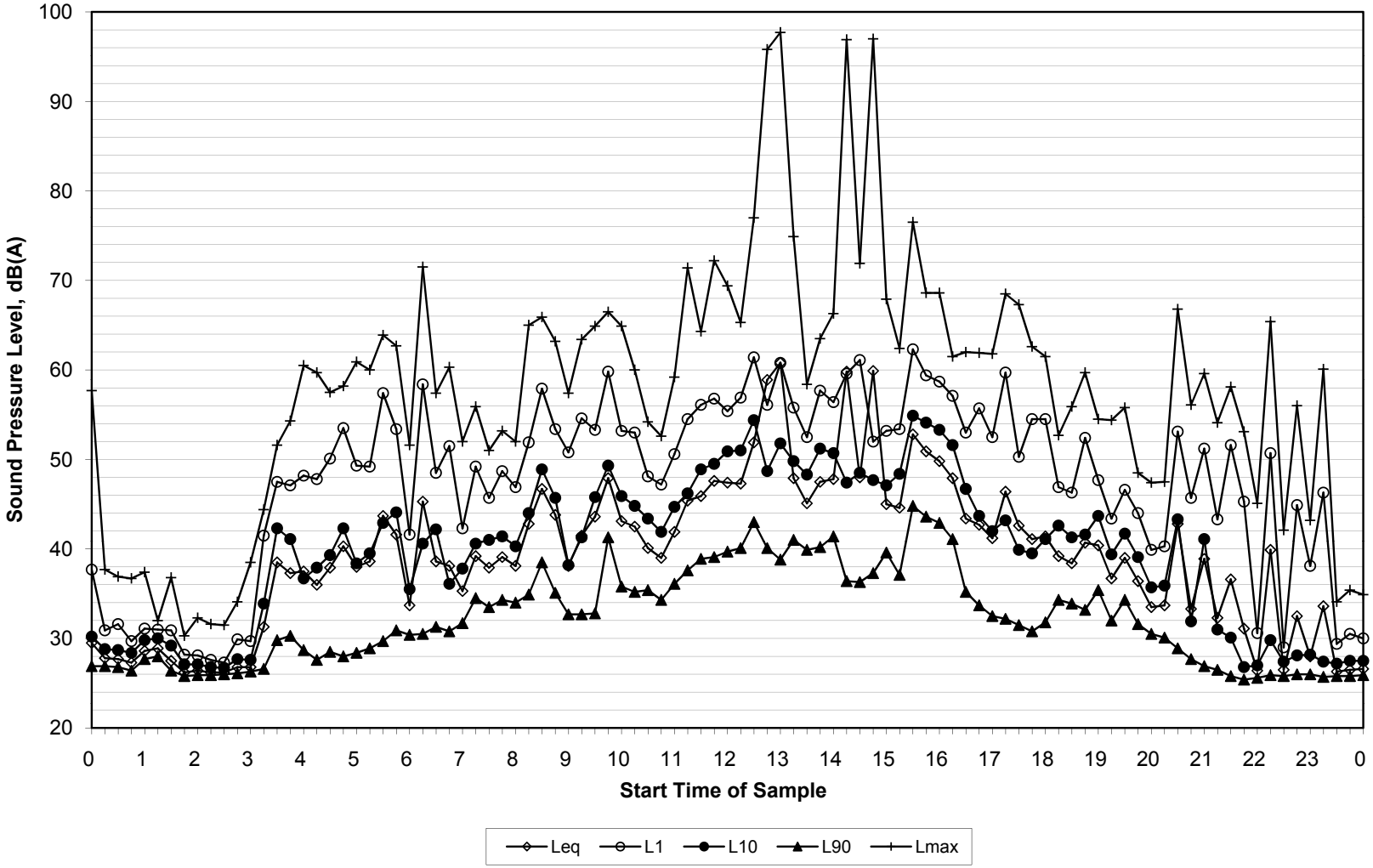
Thursday, 8 November 2012



Location 2
Mundamia Rezoning - South

Ambient Sound Pressure Levels

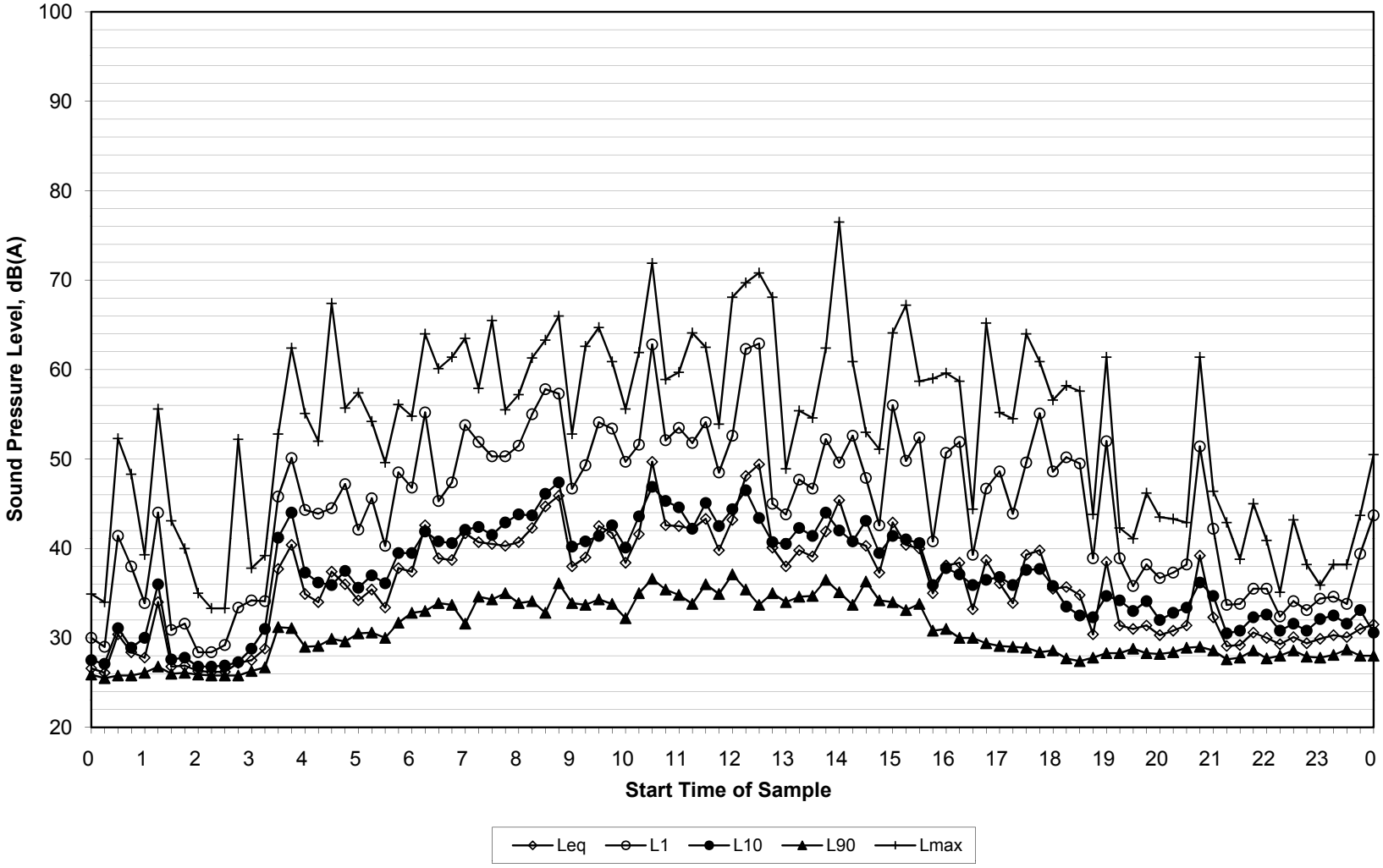
Friday, 9 November 2012



Location 2
Mundamia Rezoning - South

Ambient Sound Pressure Levels

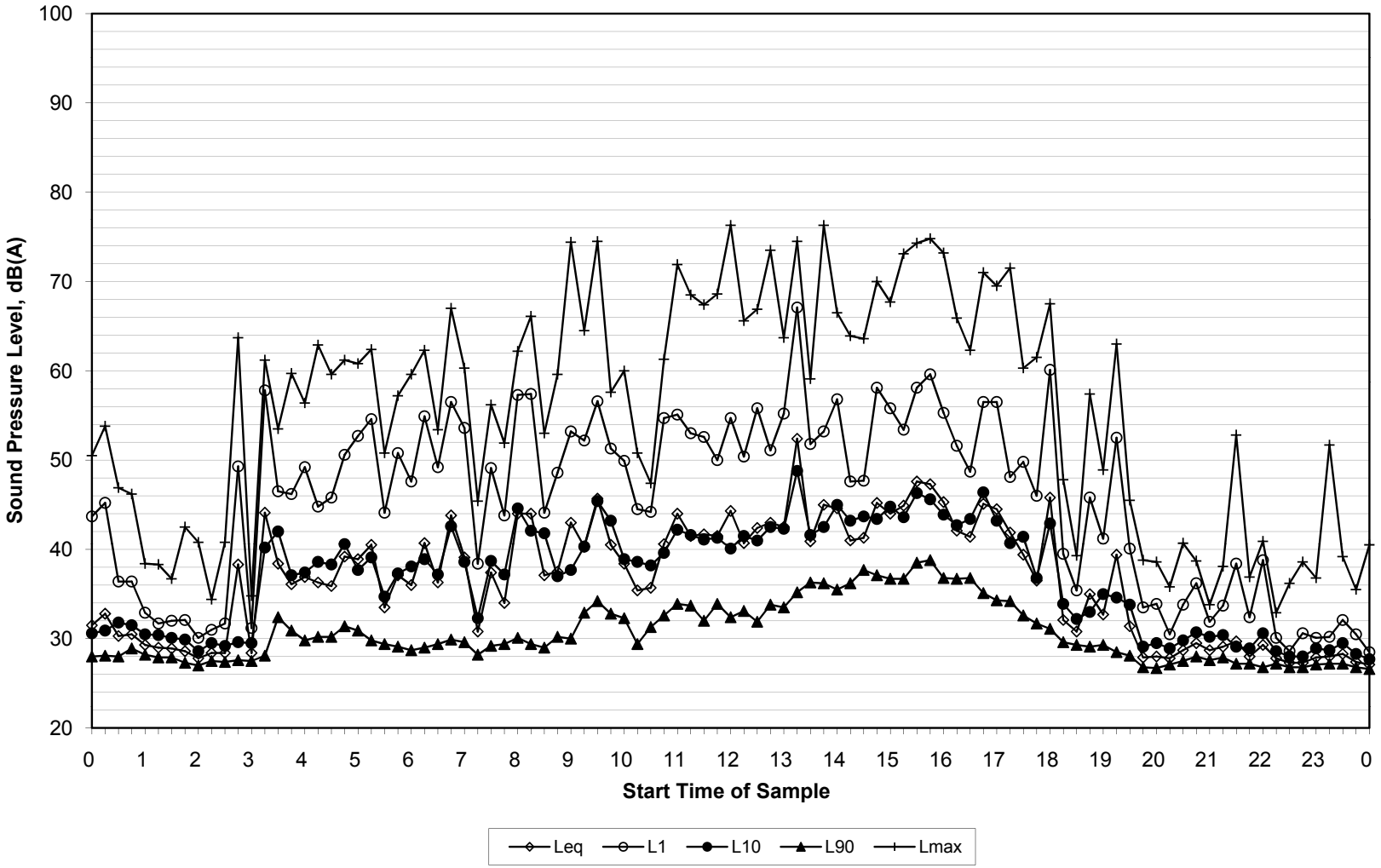
Saturday, 10 November 2012



Location 2
Mundamia Rezoning - South

Ambient Sound Pressure Levels

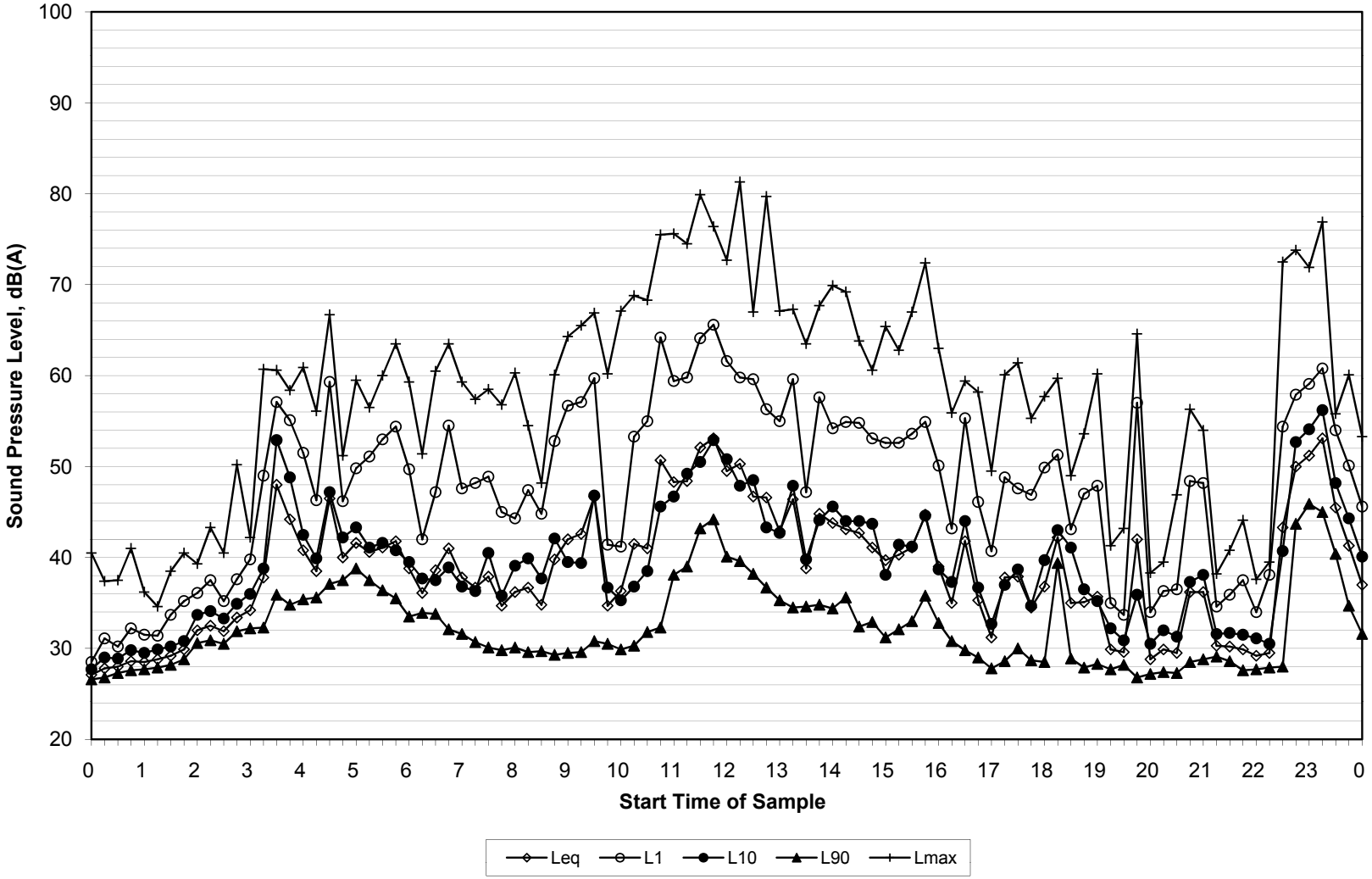
Sunday, 11 November 2012



Location 2
Mundamia Rezoning - South

Ambient Sound Pressure Levels

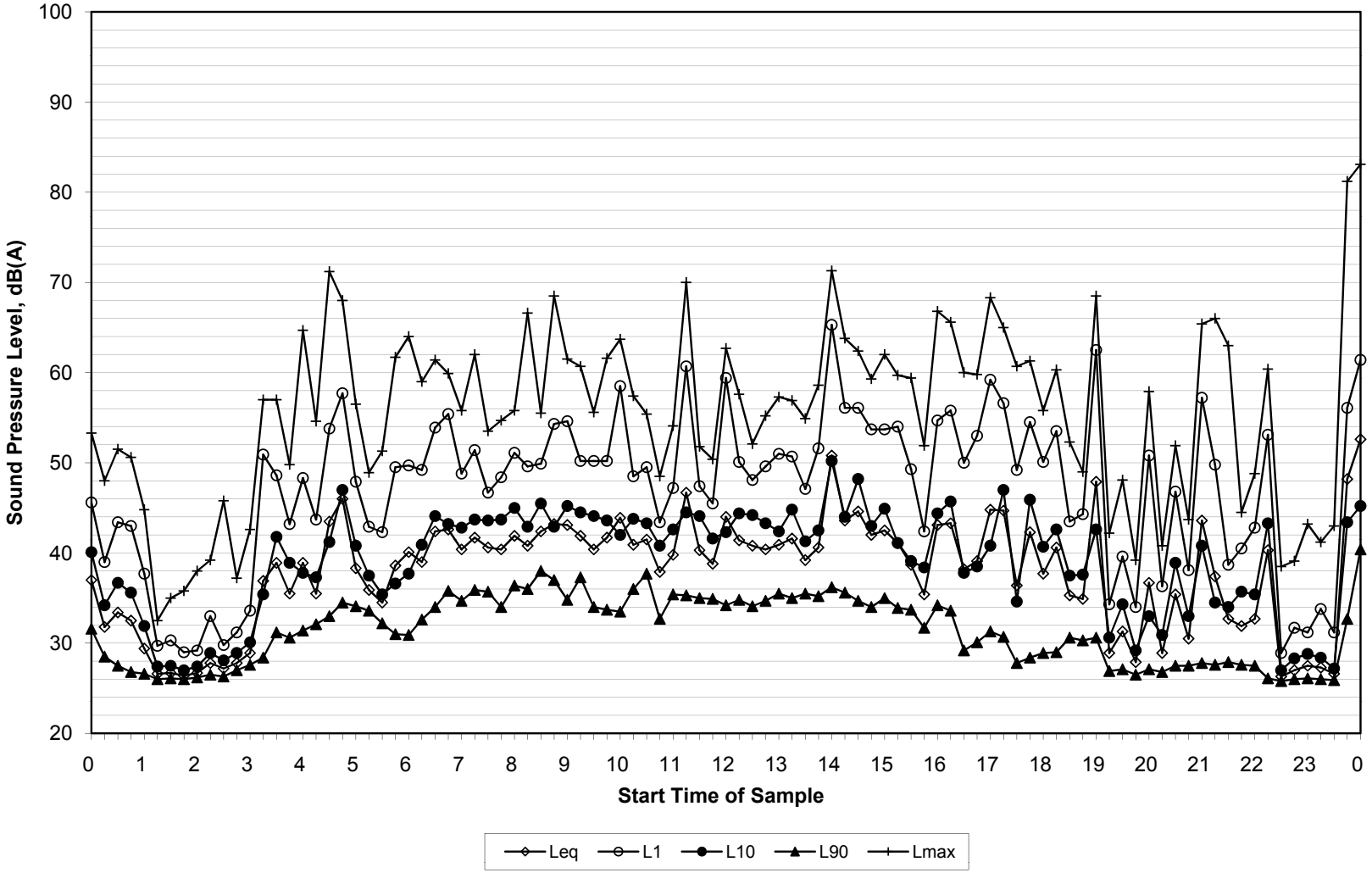
Monday, 12 November 2012



Location 2
Mundamia Rezoning - South

Ambient Sound Pressure Levels

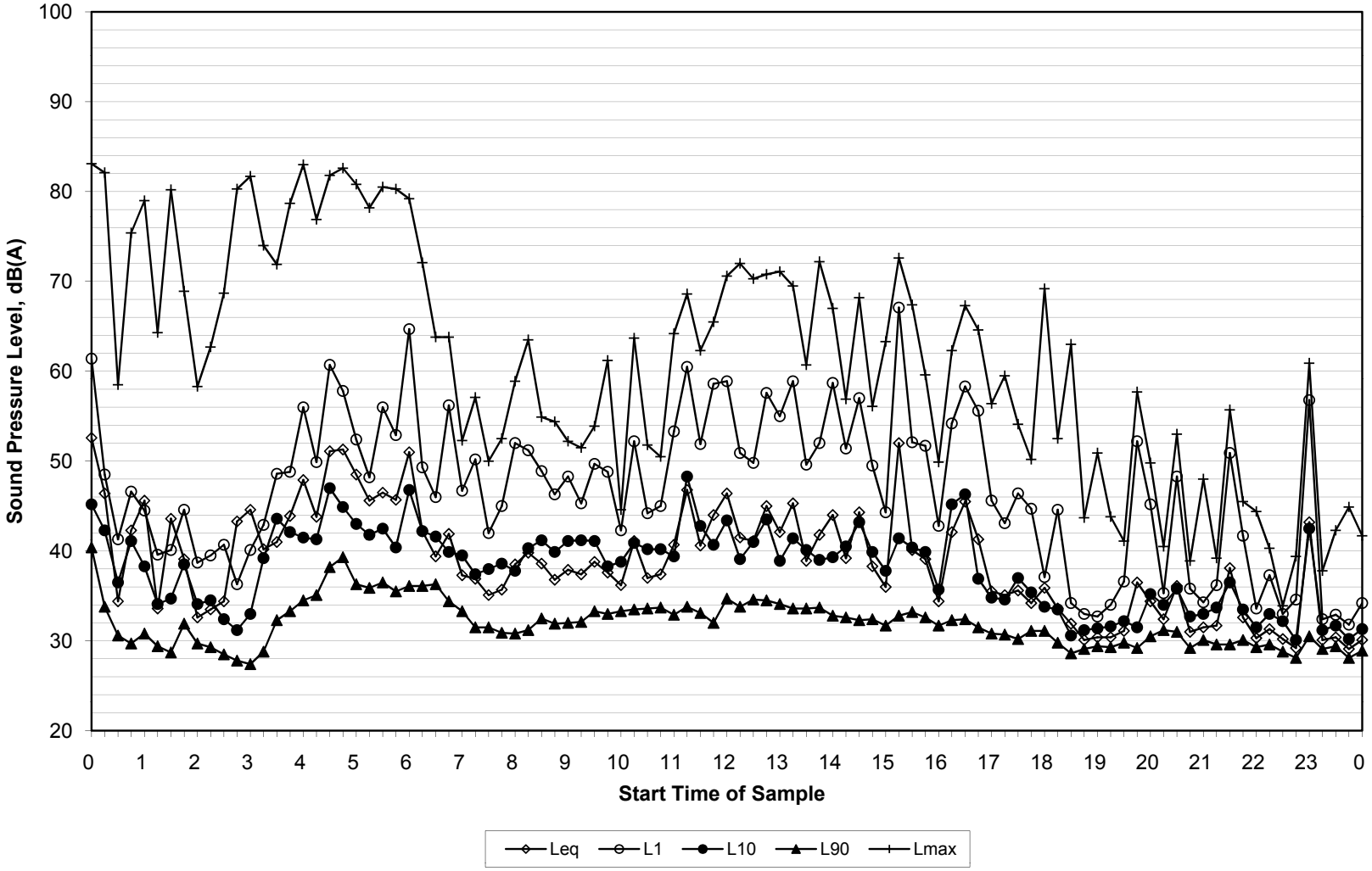
Tuesday, 13 November 2012



Location 2
Mundamia Rezoning - South

Ambient Sound Pressure Levels

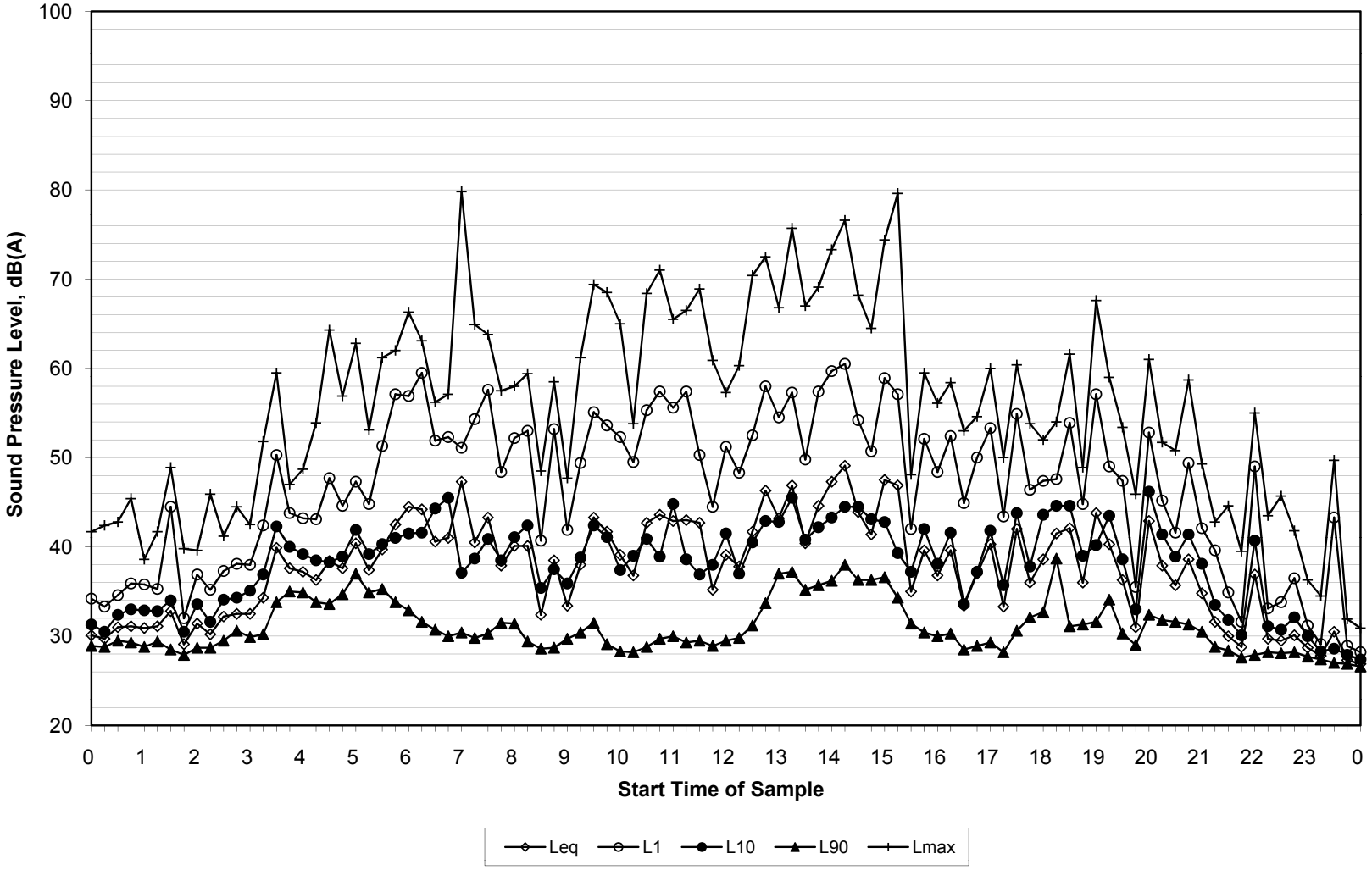
Wednesday, 14 November 2012



Location 2
Mundamia Rezoning - South

Ambient Sound Pressure Levels

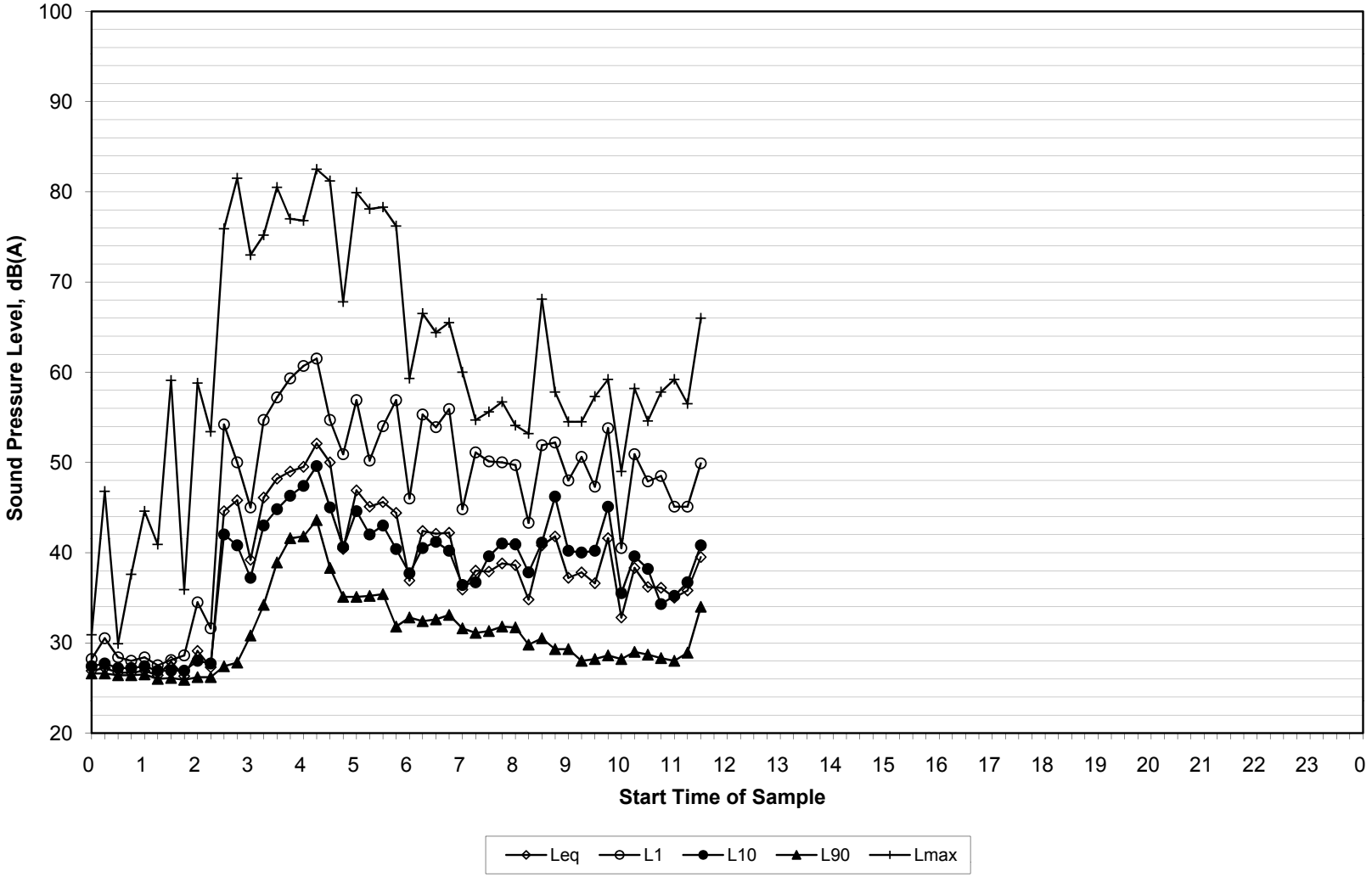
Thursday, 15 November 2012



Location 2
Mundamia Rezoning - South

Ambient Sound Pressure Levels

Friday, 16 November 2012



Location 2
Mundamia Rezoning - South