

ACOUSTIC REPORT

Ref No: CS 7277

**Royal Free Hospital
Temporary Theatres**

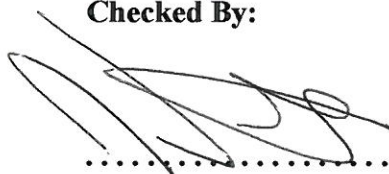
5th November 2012

Prepared By:


.....

John E Redknap MBA, MIOA, MCMI

Checked By:


.....

David Whymark - Director

Client:

**Royal Free Hampstead NHS Trust
Pond Street
Hampstead
London NW3 2QG**

Conabeare Acoustics Limited

10 Chiltern Enterprise Centre, Station Road, Theale, Berkshire. RG7 4AA
Telephone 0118 930 3650 Facsimile 0118 930 3912
sales@conabeare.co.uk

FORWARD

There is a requirement for two temporary modular theatres over the Oaks Garden Terrace, which is above the HAAS and radiotherapy entrance at the Royal Free Hospital. Consequently, the hospital wish to establish the current Background Sound Level before any work commences. Conabeare Acoustics Limited has therefore been commissioned to undertake an Environmental Sound Survey of the area.

The results of the survey will establish the Background Sound Level to enable future checks to be made on the likely impact that noise from any plant will have on that level at the nearest sound sensitive residential location.

SUMMARY

The lowest measured Background Sound Levels $L_{A90.15MIN}$ were as follows:

$L_{A90-15min}$	51.7dB(A) between 07:00 hours to 19:00 hours (Day Time)
$L_{A90-15min}$	51.2dB(A) between 19:00 hours to 23:00 hours (Evening)
$L_{A90-15min}$	50.0dB(A) between 23:00 hours to 07:00 hours (Night Time)

Conabeare Acoustics Limited

10 Chiltern Enterprise Centre, Station Road, Theale, Berkshire. RG7 4AA
Telephone 0118 930 3650 Facsimile 0118 930 3912
sales@conabeare.co.uk

CONTENTS

1. Author
2. Client
3. Introduction
4. Noise Principles
5. The Site
6. Measurement Methodology
7. Planning noise requirements
8. Assessment
9. Sound Level Measurements
10. Glossary of Terms
11. Location Photograph

Conabeare Acoustics Limited

10 Chiltern Enterprise Centre, Station Road, Theale, Berkshire. RG7 4AA
Telephone 0118 930 3650 Facsimile 0118 930 3912
sales@conabeare.co.uk

1. Author

John E Redknap MBA, MIOA, MCMI

The author has been practising in noise control engineering since 1985. He has gained a wide range of experience over this period and is employed as a Sales Engineer for **Conabeare Acoustics Ltd.**

2. Client

The survey and report has been undertaken on behalf of:

**Royal Free Hospital
Pond Street
Hampstead
London NW3 2QG**

3. Introduction

There is a requirement for two temporary modular theatres over the Oaks Garden Terrace, which is above the HAAS and radiotherapy entrance at the Royal Free Hospital. Consequently, the hospital wish to establish the current Background Sound Level before any work commences. Conabeare Acoustics Limited has therefore been commissioned to undertake an Environmental Sound Survey of the area.

The results of the survey will establish the Background Sound Level to enable future checks to be made on the likely impact that noise from any plant will have on that level at the nearest sound sensitive residential location.

4. Noise Principles

The Environmental Sound Survey has been carried out in accordance with the principles of BS7445-1 (2003) to establish the existing Background Sound Levels. The Background Sound Level measured is in terms of A-weighted sound pressure level L_{A90} with a time interval of 15 minutes.

Conabeare Acoustics Limited

10 Chiltern Enterprise Centre, Station Road, Theale, Berkshire. RG7 4AA
Telephone 0118 930 3650 Facsimile 0118 930 3912
sales@conabeare.co.uk

5. The Site

The proposed location of the two temporary modular theatres is over the Oaks Garden Terrace, which is above the HAAS and radiotherapy entrance at the Royal Free Hospital. Other plant was noted on the surrounding roof areas and so the general ambient noise level in the area is expected to be a combination of existing mechanical plant and local traffic noise.

6. Measurement Methodology

A SVAN 949 (Precision) Environmental Sound Level Analyser, fitted with an Electret Microphone was set up on the Oaks Garden Terrace, with the tripod and equipment secured to an existing timber post – see the attached location photograph.

The survey was carried out from 09:44 hours on Tuesday 23rd October 2012, until 09:29 hours on Wednesday 24th October 2012.

The Analyser was programmed to produce the following indices:

$L_{AEQ-15min}$, $L_{A90-15min}$, $L_{A10-15min}$

Attached for your reference is a Glossary of these terms.

The analyser was checked for calibration before the survey commenced and at the end of survey with a CEL 284/2 Class 1 calibrator with no measurable deviation.

The weather during the survey period was generally dry, with overcast skies and a light mist.

Having reviewed the results of our survey, it is our opinion that the weather experienced over the survey period has not had any detrimental effect on the recorded readings and therefore on our recommendations.

7. Planning Noise Requirements

The Planning noise requirement of this area usually states, that any proposed plant should be at least 10dBA below the Background Sound level (L_{A90}) measured at 1 metre from the nearest effected residential property. Allowance should also be made for any tonal noise emanating from the proposed units.

Conabeare Acoustics Limited

10 Chiltern Enterprise Centre, Station Road, Theale, Berkshire. RG7 4AA
Telephone 0118 930 3650 Facsimile 0118 930 3912
sales@conabeare.co.uk

8. Assessment

The level at which the design target should be set is normally specified by the planning authority in their planning consent conditions. In the absence of any such specification, we would recommend setting a limit on the proposed plant sound level as follows, with the proviso that any sound produced by this plant must be quite free of any audibly evident, tonality or similar characteristics.

The lowest measured Background Sound Levels $L_{A90-15min}$ were as follows:

$L_{A90-15min}$	51.7dB(A) between 07:00 hours to 19:00 hours (Day Time)
$L_{A90-15min}$	51.2dB(A) between 19:00 hours to 23:00 hours (Evening)
$L_{A90-15min}$	50.0dB(A) between 23:00 hours to 07:00 hours (Night Time)

The combined sound level of all new plant when measured at the nearest sound sensitive window should therefore not exceed:

$L_{A90-15min}$	41.7dB(A) between 07:00 hours to 19:00 hours (Day Time)
$L_{A90-15min}$	41.2dB(A) between 19:00 hours to 23:00 hours (Evening)
$L_{A90-15min}$	40.0dB(A) between 23:00 hours to 07:00 hours (Night Time)

The above limits should be achieved with all plant operating normally, any plant exhibiting characteristics which are tonal or intermittent in nature should be designed to criteria 5dB(A) more stringent than those levels shown above.

Allowances should be made for the additional effect of multiple noise sources if applicable.

In our opinion all of the above would generally be acceptable to the local authority for this area, but all design targets should as a matter of course should be verified with the local Environmental Health or Planning Departments.

9. Sound Level Measurements

The statistical readings obtained during the survey are attached to this report and are presented in both graphical and tabular form.

Conabeare Acoustics Limited

10 Chiltern Enterprise Centre, Station Road, Theale, Berkshire. RG7 4AA
Telephone 0118 930 3650 Facsimile 0118 930 3912
sales@conabeare.co.uk

10. Glossary of Terms

L_{A90}	The sound pressure level in dB(A) which is exceeded for 90% of the time and is taken to be the effective lowest background sound level for the period by such methods of sound rating as that recommended in British Standard 4142. It will also be used as a basis for selecting limiting sound levels from new plant by Local Planning Authorities when setting Planning Consent Conditions.
L_{eq}	The “equivalent continuous sound level” for the measuring period, defined as the level in dB(A) which, if held constant over the measuring period, would produce the same amount of sound energy as does the actual varying ambient sound level. It is a measure of the amount of sound energy affecting the site from sources other than new plant or operations.
L_{A10}	The sound level exceeded for 10% of the time over the sample period. Originally used as a measure of subjective reaction to traffic noise in particular, it can also be taken as an indication of the practical maximum sound level that the building envelope will have to protect against.
dB(A)	Describes measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people’s assessment of loudness. A change of 3dB(A) is the minimum perceptible under normal conditions, and a change of 10dB(A) corresponds roughly to halving or doubling the loudness of a sound.

Conabeare Acoustics Limited

10 Chiltern Enterprise Centre, Station Road, Theale, Berkshire. RG7 4AA
 Telephone 0118 930 3650 Facsimile 0118 930 3912
sales@conabeare.co.uk

11. Location Photograph

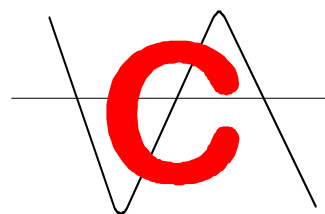


Microphone mounted on a tripod and the equipment is secured to an existing timber post at the end of the terrace, with the Bartram's Residential Hostel in the background.

Conabeare Acoustics Limited

10 Chiltern Enterprise Centre, Station Road, Theale, Berkshire. RG7 4AA
Telephone 0118 930 3650 Facsimile 0118 930 3912
sales@conabeare.co.uk

Header info for the file[1] @CAL6813		
Device type	SVAN 949	
Serial No.	8572	
Internal software version ...	5.13	
File system version	5.12	
Original file name	@CAL6813	
Measurement hour	09:44'54	
Measurement day	23/10/12	
Device function	OCTAVE 1/1	
Title text:		
Input	Microphone	
Mic. polarization	0 V	
Mic. field correction	FREE	
Mic. outdoor filter	OFF	
Compensation filter	OFF	
Measurement range	105 dB	
Leq integration	Linear	
Trig. mode	OFF	
Start delay	1 s	
Integration time def.	15 m	
Repetition cycle	Infinity	
Number of spectra	1	
Octave 1/1 lines	15+3	
Octave 1/1 filter	Lin	
Octave 1/1 in buffer	OFF	
Number of histograms	3+18	
Calibration type	Sensitivity	
Calibration time	09:40'26	
Calibration date	23/10/12	
Rotation measurement	OFF	
Profile:		#1
Weighting filter	A	
Detector type	Fast	
Buffer contents definition ..	None	
Calibration factor	1.3 dB	

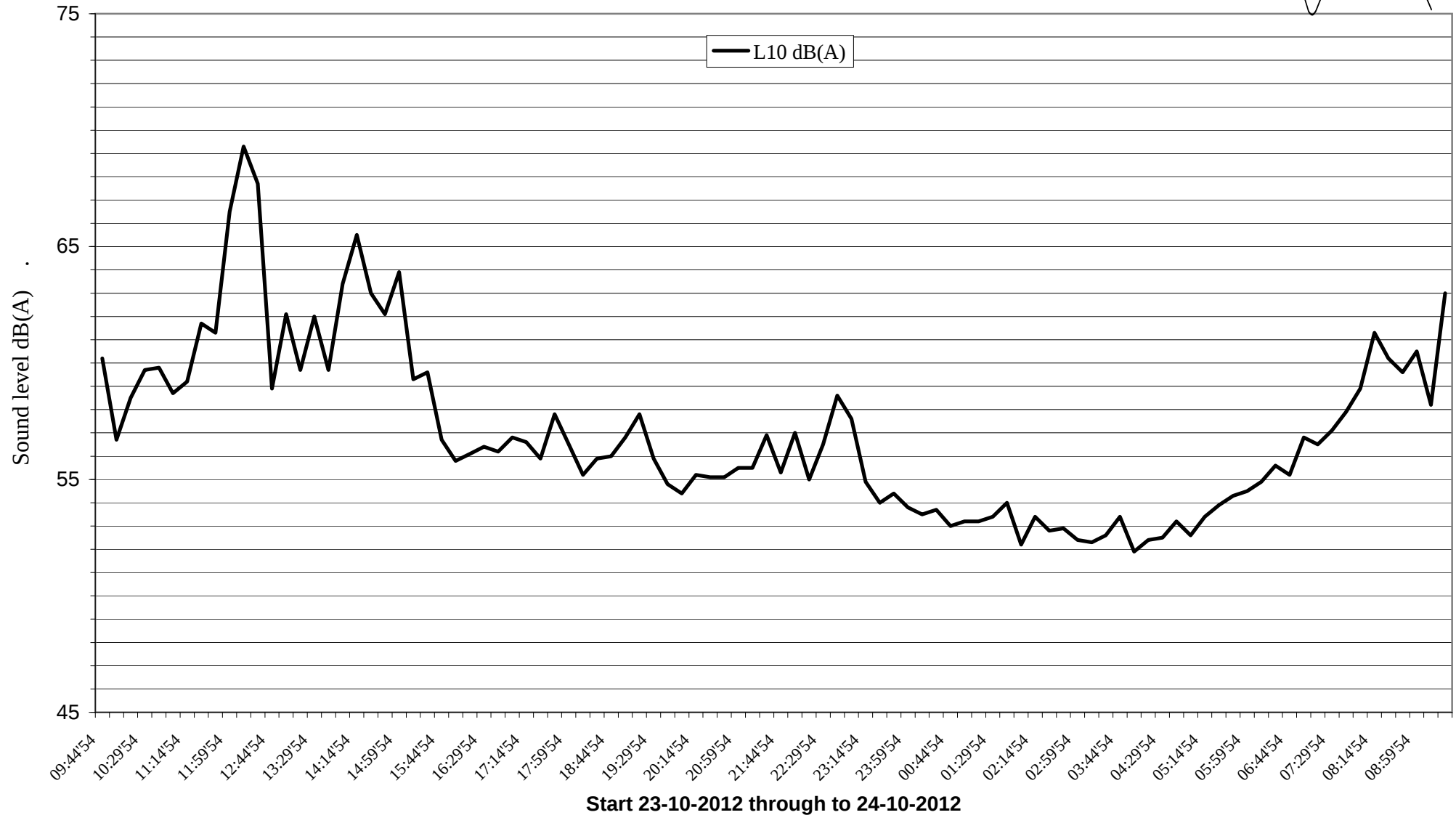
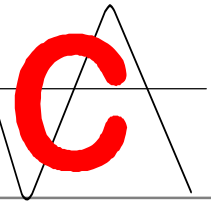


Main results:										
File	Date	Start	Filter	Detect	Time	units	Leq (A)	L1 dB(A)	L10 dB(A)	L90 dB(A)
@CAL6813	23/10/12	09:44'54	A	Fast	00:15'00	dB	58.4	68.4	60.2	52.5
@CAL6814	23/10/12	09:59'54	A	Fast	00:15'00	dB	55.9	63.3	56.7	52.6
@CAL6815	23/10/12	10:14'54	A	Fast	00:15'00	dB	58.8	69.7	58.5	52.3
@CAL6816	23/10/12	10:29'54	A	Fast	00:15'00	dB	58.8	70.0	59.7	53.0
@CAL6817	23/10/12	10:44'54	A	Fast	00:15'00	dB	58.2	68.4	59.8	53.2
@CAL6818	23/10/12	10:59'54	A	Fast	00:15'00	dB	59.1	69.8	58.7	53.0
@CAL6819	23/10/12	11:14'54	A	Fast	00:15'00	dB	57.8	67.7	59.2	53.2
@CAL6820	23/10/12	11:29'54	A	Fast	00:15'00	dB	62.0	74.2	61.7	53.1
@CAL6821	23/10/12	11:44'54	A	Fast	00:15'00	dB	60.1	71.5	61.3	53.4
@CAL6822	23/10/12	11:59'54	A	Fast	00:15'00	dB	62.0	71.2	66.5	53.6
@CAL6823	23/10/12	12:14'54	A	Fast	00:15'00	dB	68.5	73.7	69.3	67.1
@CAL6824	23/10/12	12:29'54	A	Fast	00:15'00	dB	62.8	70.1	67.7	54.1
@CAL6825	23/10/12	12:44'54	A	Fast	00:15'00	dB	57.6	66.0	58.9	53.4
@CAL6826	23/10/12	12:59'54	A	Fast	00:15'00	dB	60.2	71.3	62.1	53.6
@CAL6827	23/10/12	13:14'54	A	Fast	00:15'00	dB	60.1	71.3	59.7	53.3
@CAL6828	23/10/12	13:29'54	A	Fast	00:15'00	dB	59.9	69.9	62.0	53.7
@CAL6829	23/10/12	13:44'54	A	Fast	00:15'00	dB	57.7	65.7	59.7	53.3
@CAL6830	23/10/12	13:59'54	A	Fast	00:15'00	dB	61.0	72.5	63.4	53.3
@CAL6831	23/10/12	14:14'54	A	Fast	00:15'00	dB	62.5	73.1	65.5	54.4
@CAL6832	23/10/12	14:29'54	A	Fast	00:15'00	dB	60.6	71.1	63.0	54.0
@CAL6833	23/10/12	14:44'54	A	Fast	00:15'00	dB	60.9	71.0	62.1	53.8
@CAL6834	23/10/12	14:59'54	A	Fast	00:15'00	dB	62.8	74.8	63.9	54.1
@CAL6835	23/10/12	15:14'54	A	Fast	00:15'00	dB	58.0	67.7	59.3	52.8
@CAL6836	23/10/12	15:29'54	A	Fast	00:15'00	dB	57.6	66.7	59.6	52.7
@CAL6837	23/10/12	15:44'54	A	Fast	00:15'00	dB	56.8	67.2	56.7	52.2
@CAL6838	23/10/12	15:59'54	A	Fast	00:15'00	dB	54.5	60.5	55.8	52.2
@CAL6839	23/10/12	16:14'54	A	Fast	00:15'00	dB	55.2	61.1	56.1	52.1
@CAL6840	23/10/12	16:29'54	A	Fast	00:15'00	dB	55.2	61.5	56.4	52.2
@CAL6841	23/10/12	16:44'54	A	Fast	00:15'00	dB	54.5	58.9	56.2	52.3
@CAL6842	23/10/12	16:59'54	A	Fast	00:15'00	dB	55.0	61.5	56.8	52.4
@CAL6843	23/10/12	17:14'54	A	Fast	00:15'00	dB	54.6	59.9	56.6	52.1
@CAL6844	23/10/12	17:29'54	A	Fast	00:15'00	dB	54.9	63.6	55.9	52.0
@CAL6845	23/10/12	17:44'54	A	Fast	00:15'00	dB	57.2	68.3	57.8	52.2
@CAL6846	23/10/12	17:59'54	A	Fast	00:15'00	dB	54.6	60.9	56.5	52.1
@CAL6847	23/10/12	18:14'54	A	Fast	00:15'00	dB	54.6	63.4	55.2	51.8
@CAL6848	23/10/12	18:29'54	A	Fast	00:15'00	dB	54.2	60.2	55.9	51.7
@CAL6849	23/10/12	18:44'54	A	Fast	00:15'00	dB	54.5	62.3	56.0	51.9
@CAL6850	23/10/12	18:59'54	A	Fast	00:15'00	dB	55.1	62.0	56.8	52.2
@CAL6851	23/10/12	19:14'54	A	Fast	00:15'00	dB	56.5	66.4	57.8	51.8
@CAL6852	23/10/12	19:29'54	A	Fast	00:15'00	dB	54.6	63.3	55.9	51.5

Main results:										
File	Date	Start	Filter	Detect	Time	units	Leq (A)	L1 dB(A)	L10 dB(A)	L90 dB(A)
@CAL6853	23/10/12	19:44'54	A	Fast	00:15'00	dB	53.4	58.0	54.8	51.3
@CAL6854	23/10/12	19:59'54	A	Fast	00:15'00	dB	52.9	56.0	54.4	51.2
@CAL6855	23/10/12	20:14'54	A	Fast	00:15'00	dB	53.7	60.7	55.2	51.3
@CAL6856	23/10/12	20:29'54	A	Fast	00:15'00	dB	55.4	66.4	55.1	51.2
@CAL6857	23/10/12	20:44'54	A	Fast	00:15'00	dB	54.0	62.2	55.1	51.3
@CAL6858	23/10/12	20:59'54	A	Fast	00:15'00	dB	54.0	61.8	55.5	51.2
@CAL6859	23/10/12	21:14'54	A	Fast	00:15'00	dB	53.8	60.5	55.5	51.3
@CAL6860	23/10/12	21:29'54	A	Fast	00:15'00	dB	55.9	67.5	56.9	51.2
@CAL6861	23/10/12	21:44'54	A	Fast	00:15'00	dB	53.4	57.6	55.3	51.2
@CAL6862	23/10/12	21:59'54	A	Fast	00:15'00	dB	54.4	61.1	57.0	51.2
@CAL6863	23/10/12	22:14'54	A	Fast	00:15'00	dB	54.8	66.2	55.0	51.2
@CAL6864	23/10/12	22:29'54	A	Fast	00:15'00	dB	55.2	64.8	56.5	51.3
@CAL6865	23/10/12	22:44'54	A	Fast	00:15'00	dB	56.2	66.0	58.6	51.7
@CAL6866	23/10/12	22:59'54	A	Fast	00:15'00	dB	55.7	65.9	57.6	51.4
@CAL6867	23/10/12	23:14'54	A	Fast	00:15'00	dB	53.3	60.2	54.9	51.0
@CAL6868	23/10/12	23:29'54	A	Fast	00:15'00	dB	52.6	56.2	54.0	50.5
@CAL6869	23/10/12	23:44'54	A	Fast	00:15'00	dB	52.7	58.0	54.4	50.5
@CAL6870	23/10/12	23:59'54	A	Fast	00:15'00	dB	52.1	55.7	53.8	50.3
@CAL6871	24/10/12	00:14'54	A	Fast	00:15'00	dB	51.9	55.9	53.5	50.2
@CAL6872	24/10/12	00:29'54	A	Fast	00:15'00	dB	52.2	58.7	53.7	50.2
@CAL6873	24/10/12	00:44'54	A	Fast	00:15'00	dB	51.6	55.8	53.0	50.1
@CAL6874	24/10/12	00:59'54	A	Fast	00:15'00	dB	51.7	56.5	53.2	50.1
@CAL6875	24/10/12	01:14'54	A	Fast	00:15'00	dB	51.5	56.8	53.2	50.0
@CAL6876	24/10/12	01:29'54	A	Fast	00:15'00	dB	51.7	56.1	53.4	50.1
@CAL6877	24/10/12	01:44'54	A	Fast	00:15'00	dB	51.9	56.3	54.0	50.1
@CAL6878	24/10/12	01:59'54	A	Fast	00:15'00	dB	51.4	55.6	52.2	50.0
@CAL6879	24/10/12	02:14'54	A	Fast	00:15'00	dB	51.7	57.2	53.4	50.1
@CAL6880	24/10/12	02:29'54	A	Fast	00:15'00	dB	51.5	56.5	52.8	50.1
@CAL6881	24/10/12	02:44'54	A	Fast	00:15'00	dB	51.3	56.3	52.9	50.0
@CAL6882	24/10/12	02:59'54	A	Fast	00:15'00	dB	51.2	55.9	52.4	50.0
@CAL6883	24/10/12	03:14'54	A	Fast	00:15'00	dB	51.1	55.4	52.3	50.0
@CAL6884	24/10/12	03:29'54	A	Fast	00:15'00	dB	51.3	56.1	52.6	50.0
@CAL6885	24/10/12	03:44'54	A	Fast	00:15'00	dB	51.5	55.9	53.4	50.1
@CAL6886	24/10/12	03:59'54	A	Fast	00:15'00	dB	51.1	55.6	51.9	50.0
@CAL6887	24/10/12	04:14'54	A	Fast	00:15'00	dB	51.3	55.9	52.4	50.1
@CAL6888	24/10/12	04:29'54	A	Fast	00:15'00	dB	51.3	56.2	52.5	50.1
@CAL6889	24/10/12	04:44'54	A	Fast	00:15'00	dB	51.6	56.3	53.2	50.1
@CAL6890	24/10/12	04:59'54	A	Fast	00:15'00	dB	51.4	55.5	52.6	50.1
@CAL6891	24/10/12	05:14'54	A	Fast	00:15'00	dB	52.0	59.0	53.4	50.2
@CAL6892	24/10/12	05:29'54	A	Fast	00:15'00	dB	57.3	68.5	53.9	50.2
@CAL6893	24/10/12	05:44'54	A	Fast	00:15'00	dB	52.3	56.4	54.3	50.3
@CAL6894	24/10/12	05:59'54	A	Fast	00:15'00	dB	52.5	57.8	54.5	50.4
@CAL6895	24/10/12	06:14'54	A	Fast	00:15'00	dB	53.0	56.9	54.9	50.9
@CAL6896	24/10/12	06:29'54	A	Fast	00:15'00	dB	54.6	59.5	55.6	52.1
@CAL6897	24/10/12	06:44'54	A	Fast	00:15'00	dB	53.5	57.7	55.2	51.4
@CAL6898	24/10/12	06:59'54	A	Fast	00:15'00	dB	54.6	60.7	56.8	51.6
@CAL6899	24/10/12	07:14'54	A	Fast	00:15'00	dB	54.9	59.4	56.5	52.7
@CAL6900	24/10/12	07:29'54	A	Fast	00:15'00	dB	55.1	61.7	57.1	51.9
@CAL6901	24/10/12	07:44'54	A	Fast	00:15'00	dB	55.9	61.6	57.9	52.8
@CAL6902	24/10/12	07:59'54	A	Fast	00:15'00	dB	58.3	68.7	58.9	53.7
@CAL6903	24/10/12	08:14'54	A	Fast	00:15'00	dB	59.4	67.1	61.3	53.5
@CAL6904	24/10/12	08:29'54	A	Fast	00:15'00	dB	58.8	68.3	60.2	54.0
@CAL6905	24/10/12	08:44'54	A	Fast	00:15'00	dB	58.0	67.2	59.6	53.4
@CAL6906	24/10/12	08:59'54	A	Fast	00:15'00	dB	59.7	70.4	60.5	53.2
@CAL6907	24/10/12	09:14'54	A	Fast	00:15'00	dB	56.9	64.5	58.2	53.2
@CAL6908	24/10/12	09:29'54	A	Fast	00:15'00	dB	59.7	66.7	63.0	53.4

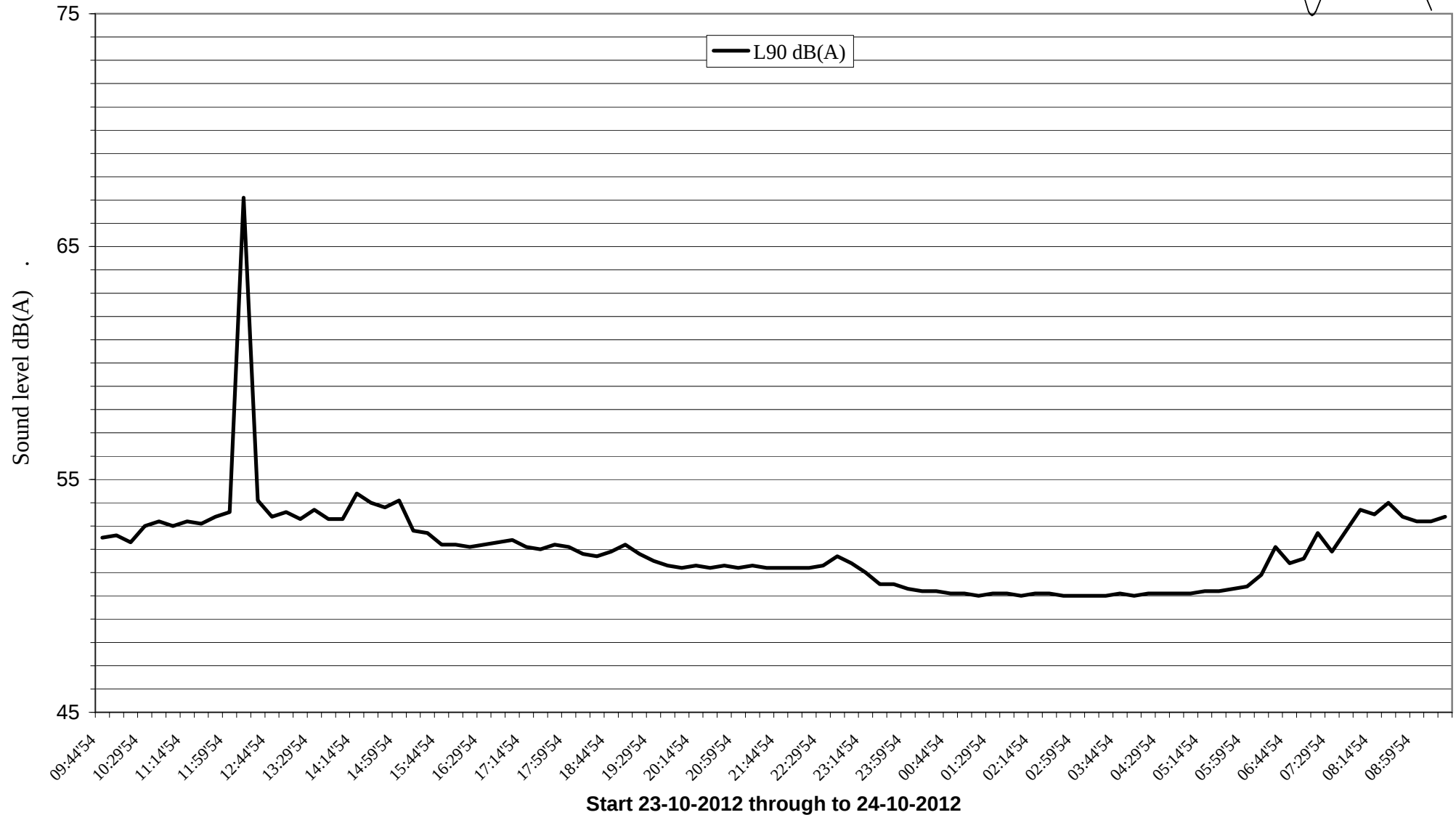
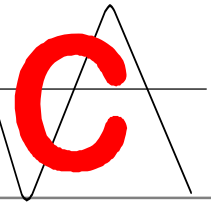
Royal Free London NHS Foundation Trust

Pond Street London NW3 2QG - Temporary Theatres



Royal Free London NHS Foundation Trust

Pond Street London NW3 2QG - Temporary Theatres



Royal Free London NHS Foundation Trust

Pond Street London NW3 2QG - Temporary Theatres

