ADT 1556

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**27 BRITANNIA STREET, LONDON**

**ENVIRONMENTAL NOISE IMPACT ASSESSMENT**

**ACOUSTIC CONSULTANCY REPORT 1556/ENIA**

## 1.0 BRIEF

**1.1** To undertake an environmental noise survey in order to determine the currently prevailing noise levels around the proposed development site.

**1.2** To assess the proposed development site in accordance with the methods described in Planning Policy Guidance PPG24 and the relevant portions of the Camden Development Policies DPD.

**1.3** To calculate levels of external noise intrusion to the residential elements of the scheme and set acoustic performance specifications for the building envelope.

**1.4** To assess internal acoustic separation between residential and non-residential areas of the development.

**1.5** To set noise limits for new, fixed plant installations.

## 2.0 BASIS OF ASSESSMENT

### 2.1 Site Location

The proposed development site is located at the junction of Britannia Street and Wicklow Street, approximately 50 metres to the east of Grays Inn Road behind the Royal National Throat Nose and Ear Hospital.

Britannia Street forms the north-western site boundary, with Wicklow Street wrapping around the west, south and south-east sides. To the north-east is a railway running in a cutting, which forms one of the approaches to Kings Cross Station about 200 metres away to the north-west.

The site is located in the Kings Cross Conservation Area, and the surrounding area comprises a mixture of residential and commercial development.

### 2.2 Proposed Development

The development comprises applications for planning permission and conservation area consent associated with the partial demolition, rebuilding and extension of 15-27 Britannia Street in connection with the re-use of the site as student accommodation (263 bedrooms) with the provision of communal areas and an external courtyard; and the change of use of 15 Britannia Street for residential accommodation (2 two-bedroom apartments) and a self contained office suite (117 sq. m), and the change of use of unnumbered properties on Wicklow Street to residential accommodation (2 one-bedroom apartments) and a performance space/ gallery for use by students.

### 2.3 Ambient Noise Levels

The ambient noise levels around the development site are controlled by a combination of:-

i) local and more distant road traffic noise

ii) train noise from the Thameslink line

iii) plant noise emanating from Deafness Research UK at the rear of the nearby hospital.

An environmental noise survey has been undertaken to establish how these sources contribute to the noise climate around the perimeter of the existing buildings.

## 3.0 SURVEY PROCEDURE AND RESULTS

### 3.1 Instrumentation

The environmental noise survey was undertaken using the following instrumentation:-

2 no. 01 dB Solo 1 Class 1 Sound Level Meter
2 no. 01dB MCE 212 ½ inch Measurement Microphone
Norsonic SA-110 Real Time Analyser
Bruel and Kjaer Type 4176 ½ inch Microphone
Rion NL-31 Class 1 Integrating Sound Level Meter
Rion UC-53A ½ inch Measurement Microphone
Rion NC-74 Acoustic Calibrator
Microphone Windshields

The sound level meters were calibrated prior to use, and on completion of the survey. No significant drift occurred.

## 3.2 Procedure

An unmanned environmental noise survey was undertaken between 15:00 hours on Thursday 6th May and 15:00 hours on Monday 10th May 2010.

Four measurement positions were located as marked on the attached site plan and as described below:-

i) on the eastern elevation of the existing building, overlooking the railway

ii) on the southern elevation overlooking Wicklow Street

iii) on the western elevation overlooking Wicklow Street

iv) on the north elevation overlooking Britannia Street

At each position, the measurement microphone was suspended out of a 2nd floor window, approximately 1 metre from the external facade of the building.

## 3.3 Recorded Data

The meters used for the survey have different datalogging capabilities, and the recorded data was as follows:-

position 1 - short term $L_{eq}$ octave band and dB(A) levels and the $L_{Amax(S)}$ using 125 ms integration time

position 2 - $L_{Aeq}$, $L_{A90}$ and $L_{Amax(S)}$ and octave band $L_{eq}$ using a 5 minute measurement period

position 3 - $L_{Aeq}$, $L_{A90}$ and $L_{Amax}$ with meter set to 'F' time weighting using a 5 minute measurement period

position 4 - $L_{eq}$, $L_{90}$ and $L_{max}$ octave band and 'A' weighted levels with meter set to 'F' time weighting using a 1 hour period

The short term $L_{eq}$ levels recorded at position 1 have been post-processed to determine the $L_{Aeq}$, $L_{A90}$ and octave band $L_{eq}$ for consecutive 5 minute periods.

At position 3, the background ($L_{A90}$) levels were virtually constant throughout the survey period, due to the effect of the plant noise emanating from the hospital building. As the datalogging meter at position 3 did not have any filters, one of the 01 dB meters was used to measure the frequency distribution of the plant noise.

## 3.4 Results

The $L_{90}$, $L_{eq}$ and $L_{max}$ dB(A) levels have been plotted on the attached time history graphs for the four measurement positions as follows:-

position 1 - graph 1556/TH1 for each 5 minute period

position 2 - graph 1556/TH2 for each 5 minute period

position 3 - graph 1556/TH3 for each 5 minute period

position 4 - graph 1556/TH4 for each 1 hour period

Typical weekday octave band $L_{eq}$ spectra for positions 1, 2 and 4 have been plotted on the attached graphs 1556/G1 and G2 for the daytime and nighttime periods respectively.

Additionally, the typical frequency distribution of the plant noise recorded at position 3 has been plotted on the attached graph 1556/G3.

(Please refer to Appendix A for explanation of the statistical noise units and the "A" weighted dB scale - dB(A) - used in this Report).

### 3.5 Weather Conditions

As the survey was unmanned, a detailed description of the weather conditions is not available. However, the conditions were fine, dry and fairly still at the start and end of the survey period and the forecast was for similar conditions throughout.

## 4.0 PPG24 APPRAISAL

### 4.1 Introduction

PPG24 was introduced in 1994 by the Department of the Environment to assist Local Authorities in determining planning applications for both “noise-sensitive”, and “noise generating” developments.

The proposed residential development is deemed to be a “noise-sensitive” development, and PPG24 therefore requires the site to be classified in terms of “Noise Exposure Categories” (NECs), a concept introduced by this document.

### 4.2 Classification of the Site

PPG24 defines four categories of noise source including “road traffic”, “rail traffic”, “air traffic” and “mixed sources”.

At position 1, the dominant noise source is rail noise, so the NECs should be determined for rail traffic. At the other three positions, the levels are affected by road traffic, rail traffic and plant noise, so the NECs should be determined for mixed sources. The relevant NEC bands are summarised in the following table:-

| Time Period | Dominant Source | Band "A" | Band "B" | Band "C" | Band "D" |
|---|---|---|---|---|---|
| 07:00 - 23:00 | rail traffic | < 55 | 55 - 66 | 66 - 74 | > 74 |
| | mixed sources | < 55 | 55 - 63 | 63 - 72 | > 72 |
| 23:00 - 07:00 | rail traffic | < 45 | 45 - 59 | 59 - 66 | > 66 |
| | mixed sources | < 45 | 45 - 57 | 57 - 66 | > 66 |

As the survey data were all measured approximately 1 metre from the facade of the building, 3 dB(A) has to be subtracted to convert them to free field levels and thereby allow comparison with the NEC bands. The following table summarises the corrected average $L_{Aeq}$ levels at each position for the day-time and night-time periods.

| Time Period | Position | Thu/Fri | Fri/Sat | Sat/Sun | Sun/Mon | Mon/Tue |
|---|---|---|---|---|---|---|
| 07:00 - 23:00 | 1 | 64 | 64 | 60 | 60 | 63 |
| | 2 | 57 | 58 | 56 | 55 | - |
| | 3 | 59 | 61 | 59 | 58 | 60 |
| | 4 | 58 | 63 | 60 | 59 | 62 |
| 23:00 - 07:00 | 1 | 60 | 59 | 56 | 58 | - |
| | 2 | 54 | 54 | 54 | 53 | - |
| | 3 | 59 | 58 | 58 | 59 | - |
| | 4 | 58 | 59 | 58 | 57 | - |

A comparison of the corrected noise levels tabulated above with the relevant NEC boundaries reveals that the site classifications are as follows.

| Time Period | Position | Thu/Fri | Fri/Sat | Sat/Sun | Sun/Mon | Mon/Tue |
|---|---|---|---|---|---|---|
| 07:00 - 23:00 | 1 | B | B | B | B | B |
| | 2 | B | B | B | A/B | - |
| | 3 | B | B | B | B | B |
| | 4 | B | B/C | B | B | B |
| 23:00 - 07:00 | 1 | C | B/C | B | B | - |
| | 2 | B | B | B | B | - |
| | 3 | C (*) | C (*) | C (*) | C (*) | - |
| | 4 | C | C | C | B/C | - |

(*) the nighttime levels at this position were completely dominated by plant noise and are therefore not strictly a valid datum from which to determine an NEC category.

Reference to the attached time history graphs reveals that night-time $L_{max(S)}$ levels are generally below the threshold of 82 dB(A) required for an automatic NEC ''C' classification.

Annex 1 of PPG24 states that the noise levels used to determine the NEC of a site should be representative of "typical" conditions. Reference to the above table shows that for the daytime period, the site typically falls into NEC 'B' at all positions.

If one were to ignore the impact of the plant noise emanating from the Deafness Research UK building, much of the site would fall into NEC 'B' for the nighttime period as well, apart from the Britannia Street elevation which typically falls into NEC 'C'.

### 4.3 Discussion of Classifications

Policy DP28 of the current (2010) Camden Development Policies DPD provides noise and vibration thresholds.

Noise levels on residential sites adjoining railways and roads at which planning permission will *not* be granted equate to the PPG24 NEC 'D' zone boundaries, and reference to Section 4.2 above reveals that noise levels in NEC 'D' have not been measured on the site.

The noise levels at which attenuation measures are required roughly equate to the NEC 'C' zone boundary, and parts of this development fall into NEC 'C'.

The interpretation of PPG24 to this development through the framework of the Camden Development Policies DPD would be that planning permission could be granted, subject to the use of suitable attenuation measures.

## 5.0 CONTROL OF EXTERNAL NOISE INTRUSION

### 5.1 Introduction

When assessing external noise intrusion into new dwellings, including the student accommodation and the apartments, it must be borne in mind that the noise climate may change in the future. However, the following discussion is based on the results of the environmental noise survey described in Section 3.0 of this report.

### 5.2 Incident Noise Levels

As the proposed development site is affected by multiple noise sources of varying magnitude, the noise levels incident upon the various facades of the proposed development will vary considerably, both with distance from the noise source(s) and also the height above ground.

The data recorded at the four monitoring positions therefore only presents a snapshot of the conditions at four discrete locations. The results of the noise survey have therefore been used in conjunction with Cadna/A noise mapping software to predict the how the incident daytime and nighttime noise levels will vary around the proposed development.

The resulting noise maps 1556/NM0 - NM7 for the ground to 7$^{th}$ floors of the building are appended to this report.

## 5.3 Internal Noise Design Criteria

BS 8233: 1999 suggests that for reasonable habitable conditions within dwellings, external noise intrusion should not exceed the following levels:-

| | | | |
|---|---|---|---|
| Living Rooms | (07:00 - 23:00 hours) | - | 40 dB $L_{Aeq\ 16\ hours}$ |
| Bedrooms | (23:00 - 07:00 hours) | - | 35 dB $L_{Aeq\ 16\ hours}$ |

## 5.4 External Noise Intrusion with the Windows Open

It is generally accepted that for buildings affected by traffic noise, the noise level inside a room with an open window will be between 10 and 15 dB(A) lower than the noise level outside the window - the actual level will depend to some extent on the style of window and the size of opening.

The practical implication of this is that the noise levels detailed in Section 5.3 above will only be achieved with open windows if the external noise levels are lower than:-

| | | |
|---|---|---|
| daytime (07:00 - 23:00 hours) | - | 50 - 55 dB $L_{Aeq\ 16\ hour}$ |
| nighttime (23:00 - 07:00 hours) | - | 45 - 50 dB $L_{Aeq\ 8\ hour}$ |

Reference to the attached noise maps shows that the incident noise levels are within the limits defined above on the internal courtyard elevations. This means that in these areas no special sound insulation measures would be required.

For rooms on the Britannia Street, Wicklow Street and east elevations forming the outer perimeter of the residential block, external noise intrusion levels would be excessive with the windows open and the sound insulation requirements are discussed below.

## 5.5 External Noise Intrusion with the Windows Closed

Preliminary analysis indicates with the windows closed, external noise intrusion into the outward facing rooms would be controlled to within the levels detailed in Section 5.3 above with the following constructions, on the basis of generic sound insulation data:

i) cavity masonry external walls or wide airspace double plasterboard linings to lightweight cladding

ii) standard thermal double glazing (e.g. 4/12/4)

iii) acoustically treated trickle ventilation openings to all habitable rooms at ground level and all rooms on the Britannia Street and Wicklow Street (south-west portion) elevations.

## 6.0 INTERNAL ACOUSTIC SEPARATION

### 6.1 General Guidance

The development includes a performance / gallery space to be occupied by the University, a common room for the benefit of tenants and a mezzanine level office. At this planning application stage the internal structures which will determine the level of sound insulation between the non-residential and residential units are yet to be finalised.

As a general guide, noise levels in the performance space are expected to be up to around 85 dB(A) under normal circumstances. The building has been designed such that there are no habitable rooms directly above the performance space, thereby eliminating direct airborne sound transmission entirely, leaving only structure-borne sound transmission and noise breakout from the roof to be considered.

It should be fairly straightforward to control sound transmission via those routes to a level of 35 dB(A) or less, the night-time noise design criterion recommended in Section 5.3 above, to allow for a crossover between residential sleeping patterns and University teaching hours. Possible construction methods could include acoustic linings to the walls of the performance space, an isolated floor slab and a roof formed in concrete or acoustically reinforced with a deep void multi-layer, insulated plasterboard ceiling.

In respect of noise breakout from the ground floor common room to the residential units above the selection of sound insulation treatments will depend on the building management policy, in that normal building structures designed to the Building Regulations requirements should be sufficient for an informal meeting room, while any uses featuring amplified music would require specialist acoustic treatment.

It is reasonable to assume that noise transmission from offices to adjoining residential units can be controlled to an acceptable level with building structures designed and constructed to the current Building Regulations requirements.

## 7.0 CONTROL OF PLANT NOISE EMISSIONS

### 7.1 Environmental Noise Design Criteria

Cumulative noise from new, fixed plant installations should be designed to the following BS 4142 rating levels at 1 metres from any noise-sensitive facade, set 5 dB(A) below the lowest measured background ($L_{90}$) level in accordance with Appendix 1 of the UDP:

| Location | Cumulative noise limit $L_{eq,\ 5\ mins}$ |
|---|---|
| Britannia Street | 53 |
| Wicklow Street (west) | 45 |
| Wicklow Street (south) | 39 |

## 8.0 CONCLUSIONS

**8.1** An environmental noise survey has been undertaken over the critical periods of the day and night.

**8.2** The results, when assessed using the PPG24 method, result in classifications of NEC 'B' and 'C' according to location and time of day.

**8.3** Analysis predicts that the proposed building envelope, including glazing and ventilation to the acoustic specification provided, should control external noise intrusion to satisfactory levels.

**8.4** Noise breakout from the ground floor University accommodation to the residential accommodation above will be the subject of detailed consideration at a later stage, though it is anticipated that the level of breakout can fairly easily be controlled to the same level as external noise intrusion.

**8.5** Environmental noise design criteria for new fixed plant associated with the development have been set in accordance with the Camden Development Policies DPD.

**FOR ACOUSTIC DESIGN TECHNOLOGY**

## APPENDIX A

The annoyance produced by noise is dependant upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and any variations in its level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

dB(A) The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average person. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level.

When the noise being measured has a variable amplitude, such as traffic noise, it is necessary to qualify the basic dB(A) unit. This may be done using a statistical index $L_n$ dB(A), where n is an integer between 1 and 99, and is the percentage of the sample time for which the stated dB(A) level is exceeded. In defining the use of the index, both the value of n and the length of the sample period must be stated.

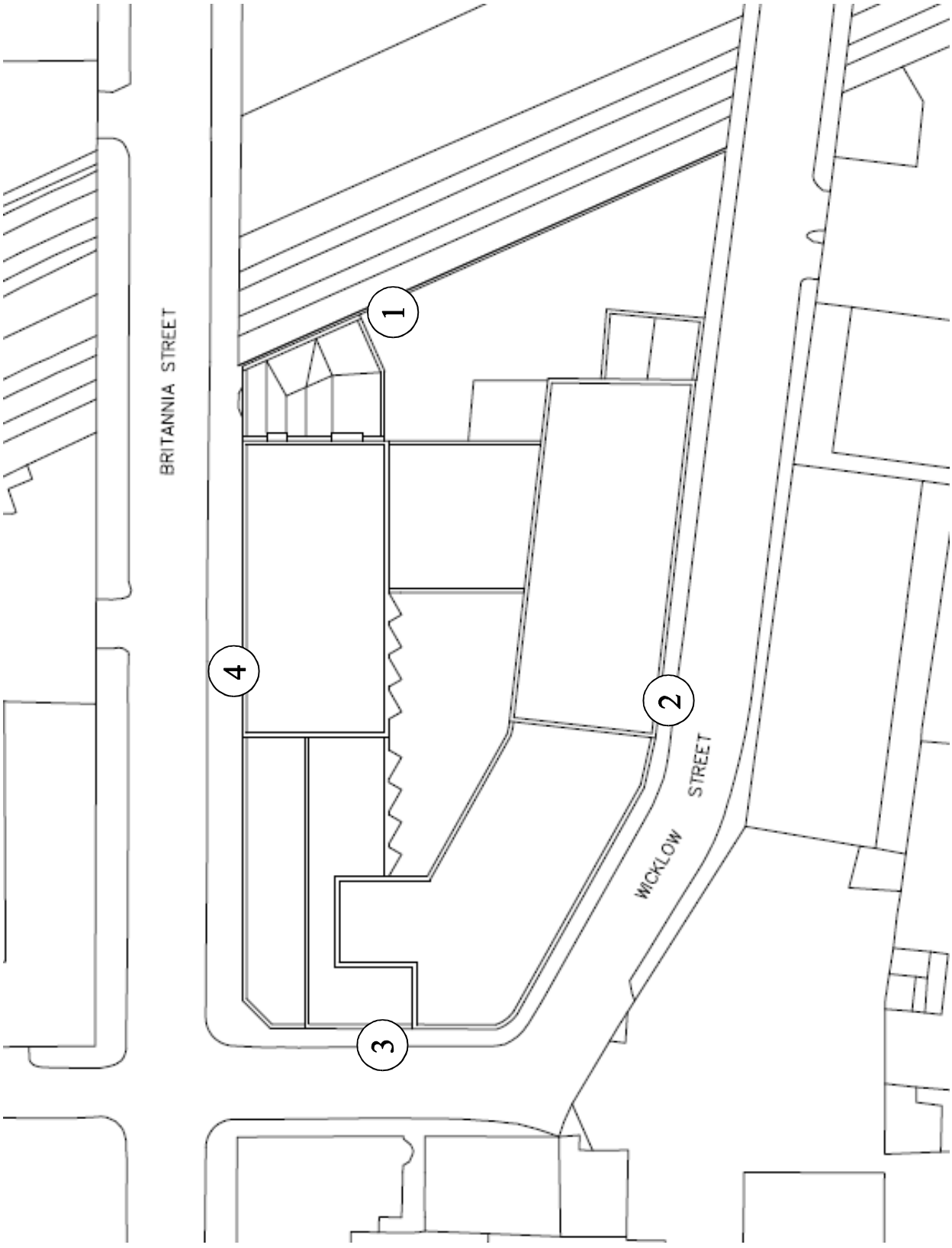
$L_{10}$ $L_{10}$, being the dB(A) level exceeded for 10% of the time, has been shown to be a good indicator for traffic noise intrusion, and is used in assessing the effect of traffic noise on residential or commercial premises.

$L_{90}$ $L_{90}$ is the dB(A) level exceeded for 90% of the time, and is used as a measure of background noise level, as it excludes the effects of occasional transient levels, such as individual passing cars or aircraft.

In addition to the statistical noise indices defined above, the following noise units are also used to define variable amplitude noise sources:

$L_{eq}$ The $L_{eq}$ is defined as the notional steady sound pressure level which, over a stated period of time, would contain the same amount of acoustical energy as the actual fluctuating sound measured over the same period - ie: it is a measure of the "average" noise level.

$L_{max}$ The $L_{max}$ is the maximum sound pressure level over the stated period of time.

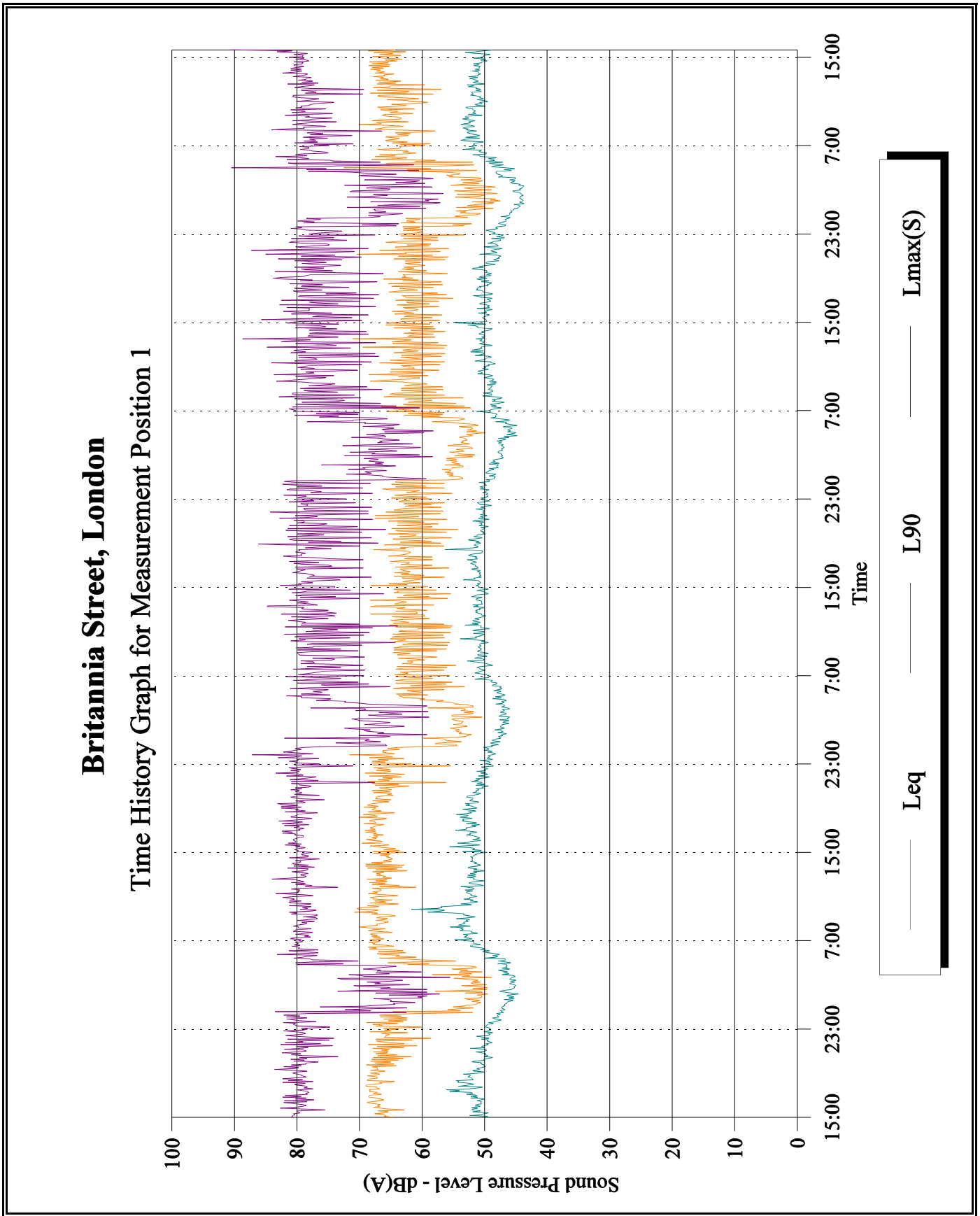



ACOUSTIC DESIGN TECHNOLOGY
Noise and Vibration Consultants

**DESCRIPTION**

Site plan showing measurement positions 1 - 4

| PROJECT | DATE | DRAWING NO. |
|---|---|---|
| Britannia St, London | 15 Nov 2010 | 1556/SP1 |

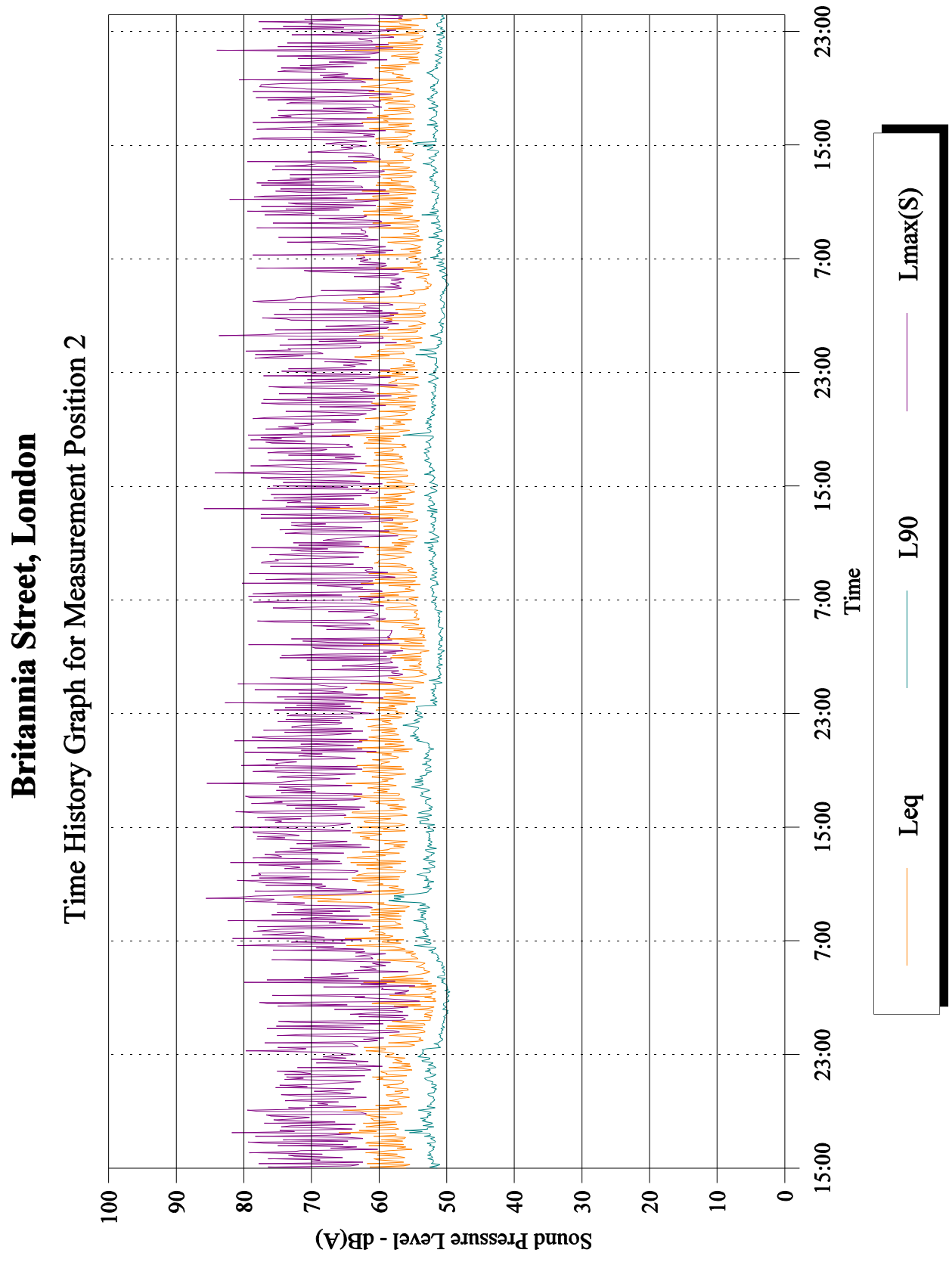



ACOUSTIC DESIGN TECHNOLOGY
Noise and Vibration Consultants

**DESCRIPTION**

Time history graph for measurement position 1

| PROJECT | DATE | DRAWING NO. |
|---|---|---|
| Britannia St, London | 6th - 10th May 2010 | 1556TH1 |




ACOUSTIC DESIGN TECHNOLOGY
Noise and Vibration Consultants

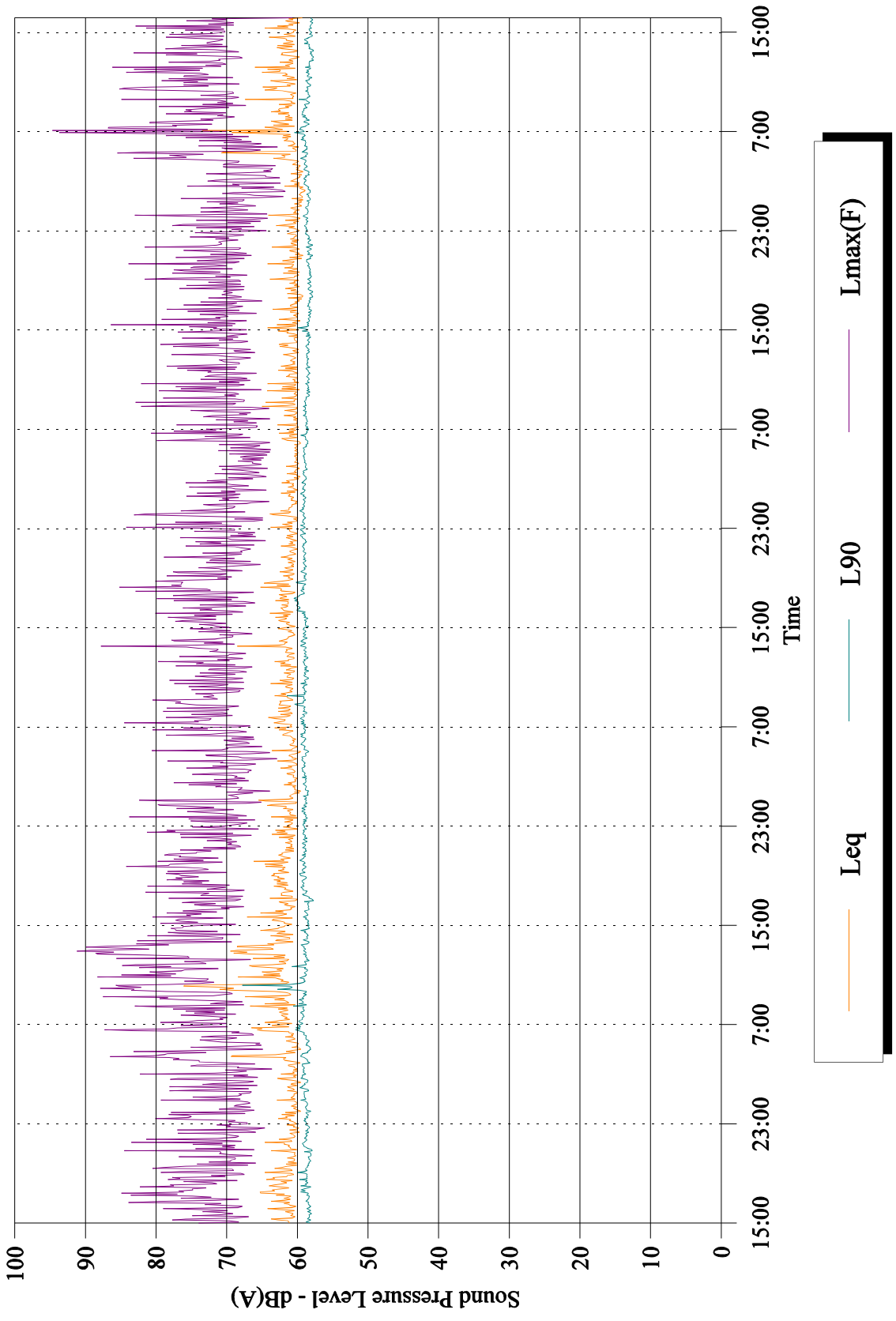
**DESCRIPTION**

Time history graph for measurement position 2

| PROJECT | DATE | DRAWING NO. |
|---|---|---|
| Britannia St, London | 6th - 9th May 2010 | 1556/TH2 |

**Britannia Street, London**

Time History Graph for Measurement Position 3




ACOUSTIC DESIGN TECHNOLOGY
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**DESCRIPTION**

Time history graph for measurement position 3

| PROJECT | DATE | DRAWING NO. |
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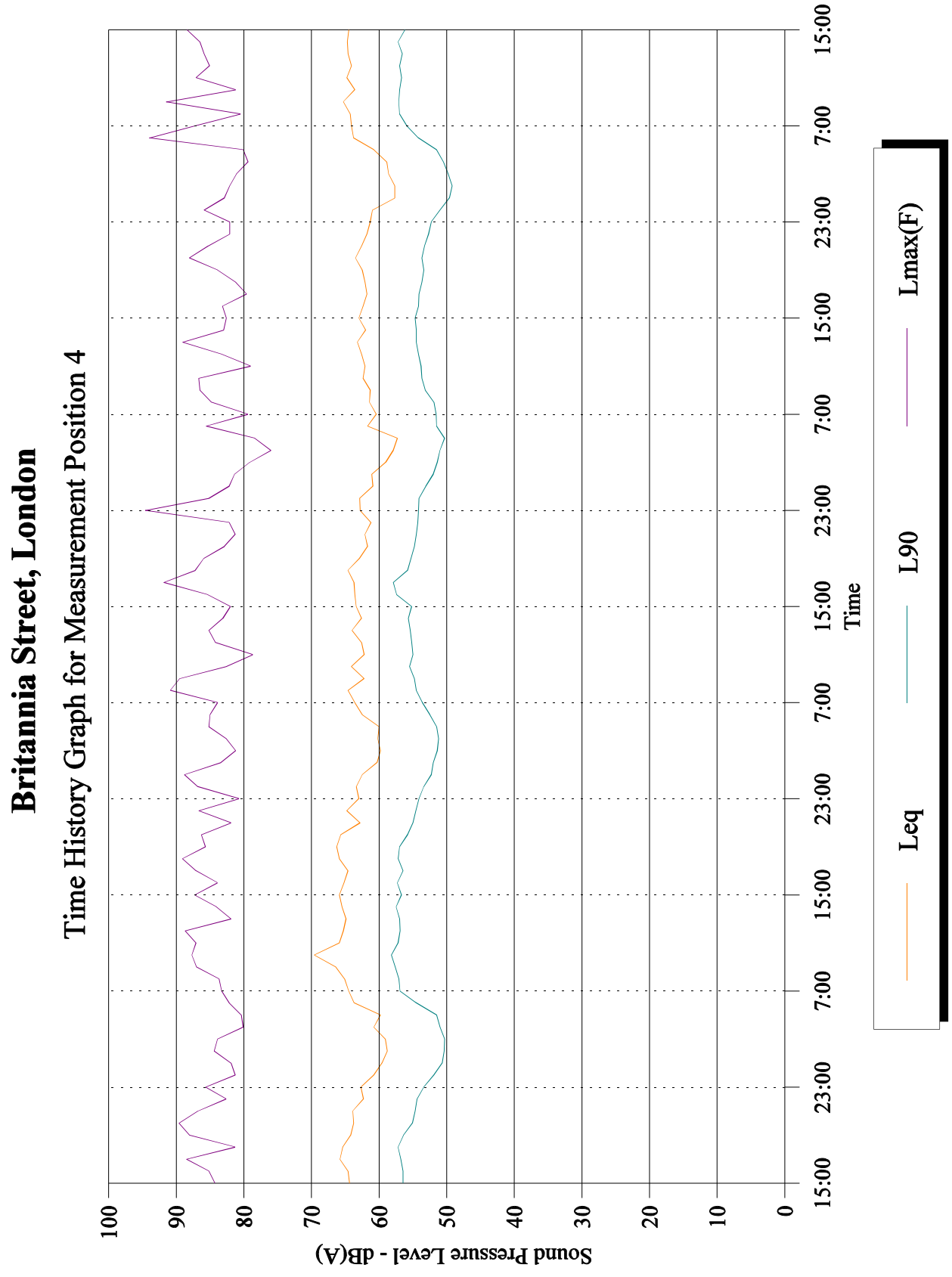
| Britannia St, London | 6th - 10th May 2010 | 1556/TH3 |




ACOUSTIC DESIGN TECHNOLOGY
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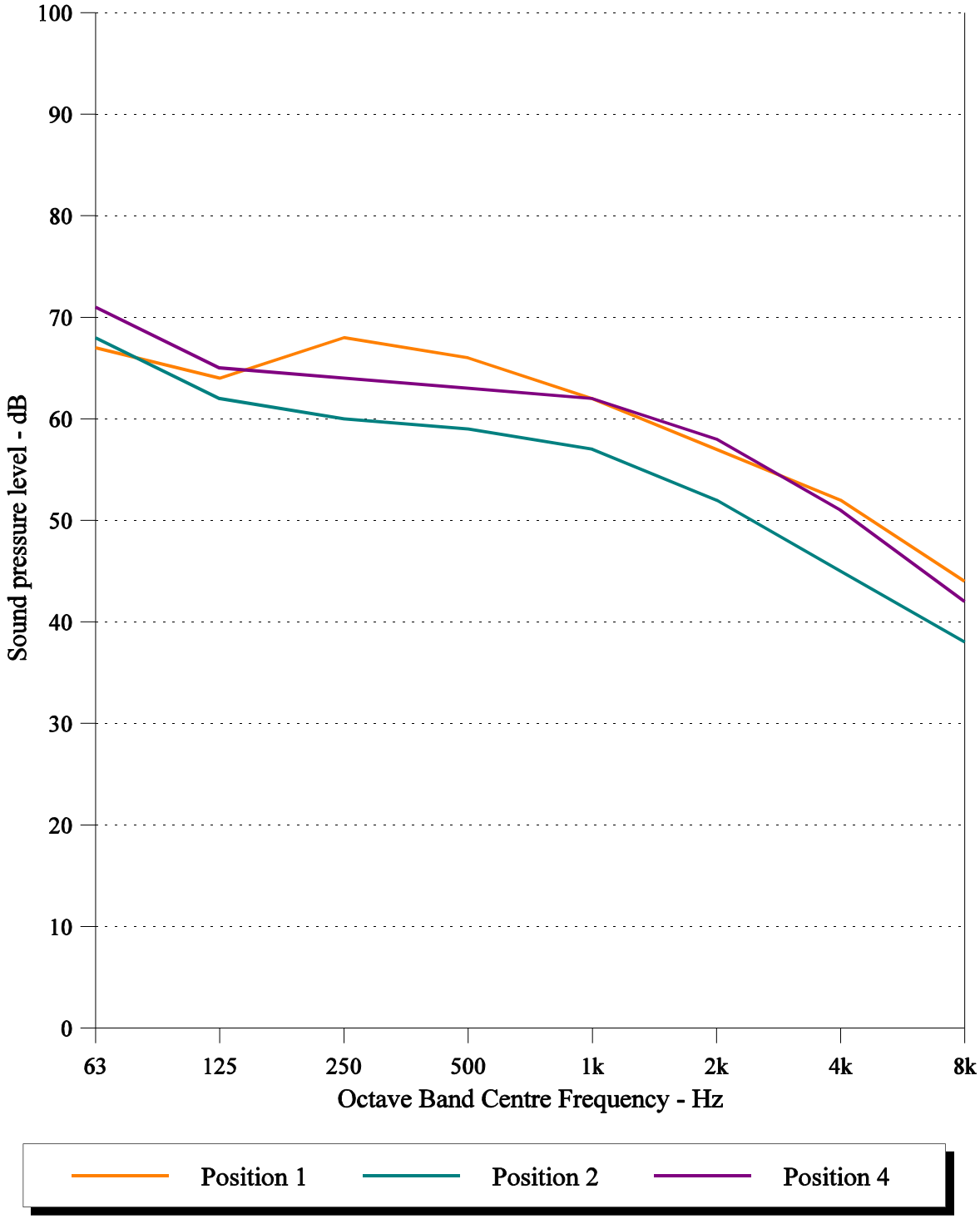
**DESCRIPTION**

Time history graph for measurement position 4

| PROJECT | DATE | DRAWING NO. |
|---|---|---|
| Britannia St, London | 6th - 10th May 2010 | 1556/TH4 |

# Britannia Street, London

## Typical Daytime Leq Spectra




ACOUSTIC DESIGN TECHNOLOGY
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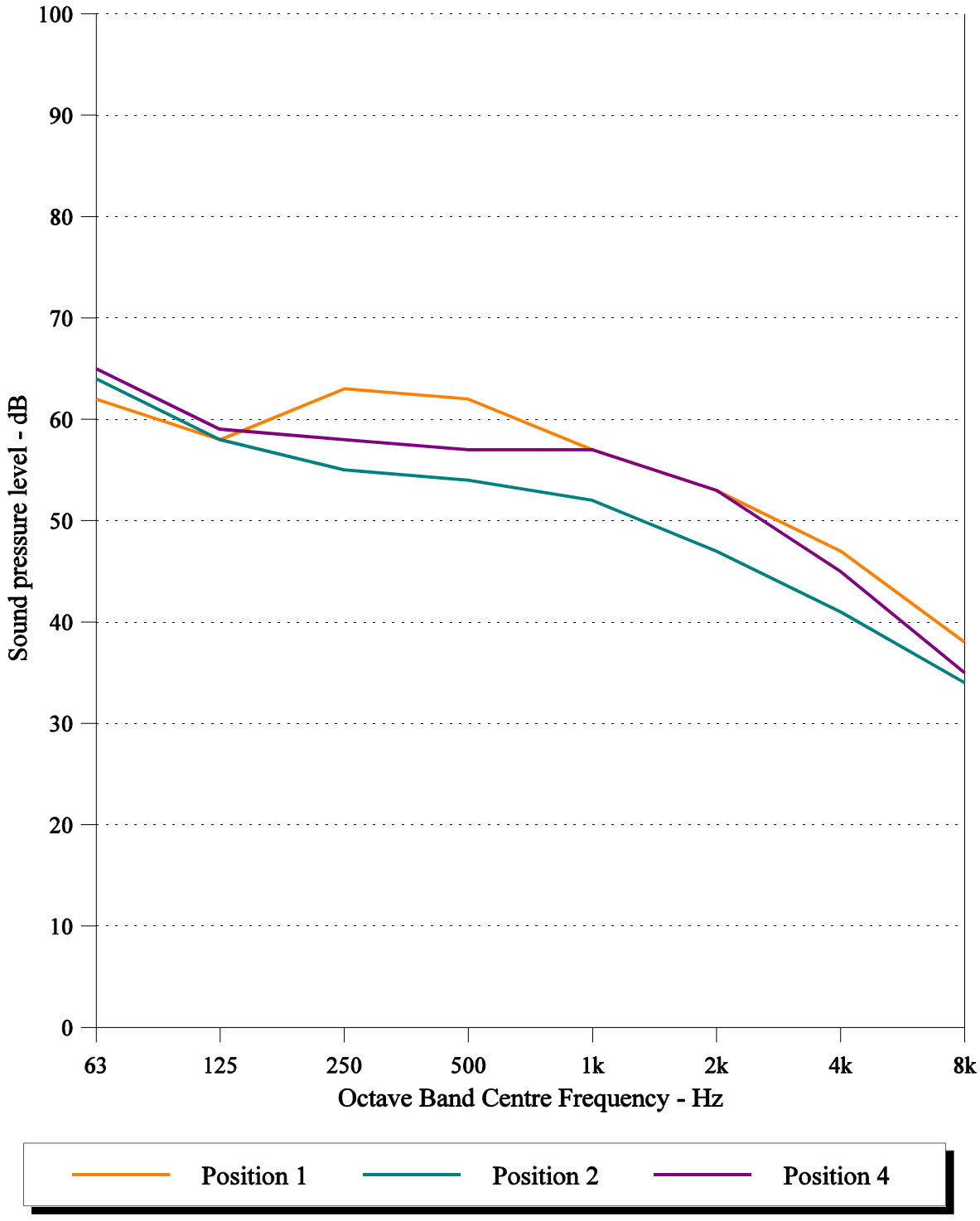
**DESCRIPTION**

Typical daytime $L_{eq}$ Spectra

| PROJECT | DATE | DRAWING NO. |
|---|---|---|
| Britannia St, London | 10th May 2010 | 1556/G1 |

# Britannia Street, London

## Typical Nighttime Leq Spectra

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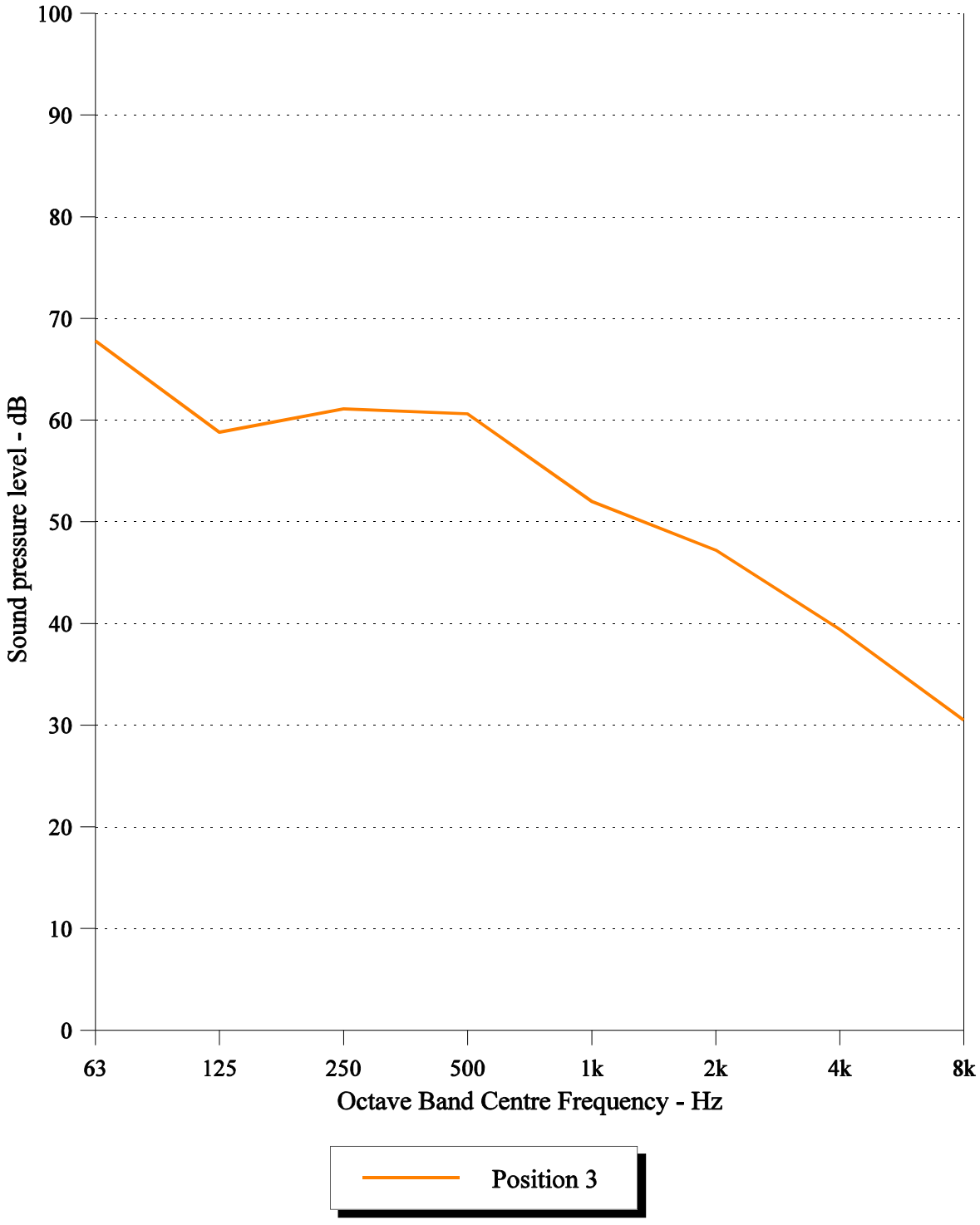
**DESCRIPTION**

Typical nighttime $L_{eq}$ Spectra

| PROJECT | DATE | DRAWING NO. |
|---|---|---|
| Britannia St, London | 10th May 2010 | 1556/G2 |

# Britannia Street, London

## Plant Noise Spectrum

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| DESCRIPTION | | |
|---|---|---|
| Plant noise spectrum at position 3 | | |
| **PROJECT** | **DATE** | **DRAWING NO.** |
| Britannia St, London | 10th May 2010 | 1556/G3 |