Technical Report

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FAO	*Fred Brindle*
Email	*f.brindle@wcpqs.co.uk*

Project

Noise Assessment
One Hatfield, Hatfield

Prepared for

William Clark Partnership
4 Hardy Close
Nelson Court Business Centre Preston
PR2 2XP

By

James Stokes *MPhys (Hons), AMIOA*

Sound Research Laboratories

Southern Office & Laboratory
Holbrook House, Little Waldingfield, Sudbury, Suffolk CO10 0TH
Tel: +44(0)1787 247595 e-mail:srl@srltsl.com

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Summary

SRL was commissioned by William Clark Partnership to provide a noise assessment of the One Hatfield Healthcare site on the Hatfield Business Park. The site is at the extremity of the existing business park, with a residential access road to the north of the site and a busy roundabout (connecting several areas of the business park) to the south of the site. The dominant noise source is the A1(M), located roughly 200m to the east. Other sources contributing to the overall noise climate included nearby road traffic and air traffic from Luton Airport. The residential access road had low levels of traffic and was dominated by cars; however the road to the south of the site had a much greater traffic flow, with a large number of HGVs.

We have surveyed noise levels at key times and locations around the site to calculate the typical daytime and night time noise levels affecting the healthcare building.

Our assessment shows that natural ventilation using unrestricted open windows will probably not be capable of meeting the acoustic requirements in Health Technical Memorandum (HTM) 08-01. Most commonly encountered modern facade constructions would be suitable. When windows are closed, the HTM 08-01 guidelines for internal noise levels will be achievable in all rooms using a glazing with a minimum sound reduction performance of 35dB (R_w).

The ventilation strategy for the scheme is not yet known. As a guide to assist you we have provided the allowable areas of facade opening (windows, louvers, trickle vents or a combination of these) that could be provided without acoustic attenuation to still meet the HTM 08-01 requirements. The suitability of this level of openings as a means of ventilating the various areas should be assessed by the ventilation designer.

Where clinically acceptable, additional openable windows could be included to be used at the discretion of the patients/practitioners however internal ambient noise levels will be higher than the HTM 08-01 internal ambient noise level criteria and they are not required to be for the ventilation strategy.

We have also measured background noise levels at nearby noise-sensitive receptors during the quietest times that building services plant is expected to operate. This has allowed us to set overall noise limits for this plant in accordance with BS4142:2014.

For and on behalf of
SRL Technical Services Limited
Tel: 01787 247595
Email: jstokes@srltsl.com

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1.0 Introduction

SRL was commissioned by William Clark Partnership to provide a noise assessment of the One Hatfield Healthcare site on the Hatfield Business Park. Our assessment of the site focuses on the two main environmental acoustic aspects:

- Noise intrusion from external sources to rooms in the One Hatfield healthcare development.
- Plant noise emissions from the building to the nearest noise-sensitive receptors.

1.1 Site location (see Figure C2)

The site is at the extremity of the existing Hatfield Business Park, with a residential access road (Manor Road) to the north of the site and a business park road (Hatfield Avenue) to the south of the site. A large roundabout on Hatfield Avenue connected several areas of the business park. Manor road had low levels of traffic and was dominated by cars; however the road to the south of the site had a much greater traffic flow, with a large number of HGVs.

The A1(M) is located roughly 200m to the east of the site – the road is enclosed by a tunnel to the south-east of the site, however to the north-east of the site, the tunnel ends and the road rises to ground level. Another large road (Comet Way) runs alongside the A1(M) and had high levels of traffic.

Luton Airport is located roughly 20km to the north-west of the site.

The most acoustically sensitive receptors are the nearest residential properties on Manor Road. The other buildings on the Hatfield Business Park are not considered acoustically sensitive.

1.2 Site noise climate

During the day, the dominant noise source is road traffic on the nearby motorway (A1(M)), and the business park road (Hatfield Avenue) which is frequently used by HGVs. Unsurprisingly, the highest levels were measured during the evening 'rush-hour' on weekdays.

Aircraft high overhead are periodically audible.

At night, ambient noise levels were consistently lower, as might be expected.

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1.3 Design criteria

1.3.1 Noise intrusion from external sources

Guidelines for noise intrusion from external sources to healthcare buildings are provided in HTM 08-01. The criteria for typical room types applicable to this kind of healthcare development are stated below in Table 1. Note that for single-bed and multi-bed wards there are multiple criteria because both 'average' (L_{Aeq}) and 'short duration maximum' (L_{Amax}) noise levels must be considered.

Table 1: *Criteria for noise intrusion from external sources (from HTM 08-01)*

Room Type	Example	Criteria for noise intrusion to be met inside the spaces from external sources (dB)
Ward – single person	Single-bed ward, single-bed recovery areas and on-call room, relatives' overnight stay	40 $L_{Aeq, 1hr\ daytime}$ 35 $L_{Aeq, 1hr\ night}$ 45 $L_{Amax, f\ night}$
Ward – multi-bed	Multi-bed ward, recovery areas	45 $L_{Aeq, 1hr\ daytime}$ 35 $L_{Aeq, 1hr\ night}$ 45 $L_{Amax, f\ night}$
Small office-type spaces	Private offices, small treatment rooms, interview rooms, consulting rooms	40 $L_{Aeq, 1hr}$
Circulation spaces	Corridors, hospital street, atria	55 $L_{Aeq, 1hr}$
Public areas	Dining areas, waiting areas, playrooms	50 $L_{Aeq, 1hr}$
Personal hygiene (en-suite)	Toilets, showers	45 $L_{Aeq, 1hr}$
Personal hygiene (public and staff)	Toilets, showers	55 $L_{Aeq, 1hr}$
Large food-preparation areas	Main kitchens	55 $L_{Aeq, 1hr}$

The above criteria are to be achieved in conjunction with a suitable ventilation strategy to provide adequate ventilation to these areas.

1.3.2 Plant noise emissions

Local Authority criteria

Noise from building services plant and equipment needs to be controlled in relation to the pre-existing background noise at nearby noise-sensitive receptors.

In the absence of defined plant noise criteria from the local authority, a reasonable approach is for noise from building services plant and equipment to have a 'rating level' which is no higher than the existing lowest background noise level (L_{A90}), measured 1m

away from the nearest noise sensitive facades. 'Rating level' is defined in BS 4142:2014 *"Method for rating and assessing industrial and commercial sound".*

Note that BS 4142:2014 is the recently updated standard for assessing plant noise breaking out to adjacent noise sensitive areas. In the previous version (1997) the 'rating level' could be up to 5dB higher than the measured plant noise level for plant noise with a characteristic or distinguishable sound (such as a hum). The latest version (2014) now includes a number of penalties for acoustic features such as tonality, impulsivity and intermittency. This means the 'rating level' can be up to 16dB higher than the measured plant noise level, however this is in an extreme case.

As this method of assessment is more complex than previously, we have only provided 'rating level' limits. When plant has been selected, the calculated 'rating level' must be assessed against these limits.

1.4.2 HTM 08-01 criteria

The impact of noise from plant on the new building itself must also be considered, but this is not likely to be of concern to the Local Authority. HTM 08-01 suggests that plant noise is controlled to no higher than 50dB L_{Aeq} or the current background noise level, whichever is higher, in external public areas, courtyards etc. of healthcare buildings..

In addition, plant noise should also be controlled to no more than 45dB L_{Aeq} outside any windows where the ventilation strategy relies on them being open.

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2.0 Noise assessment and recommendations

2.1 Environmental noise intrusion

To assess the noise intrusion I have used our survey results to calculate external noise levels at the measurement positions representative of the building facades (refer to Figure C2). The resulting values are shown below in Table 2. Note that these noise levels do not take into account any acoustic shielding provided by the building itself. This could be significant at Positions 2 and 3. The values in the table are therefore 'worst case'.

Table 2: *Calculated external noise levels*

Parameter	Measured noise levels (dB)			
	Position 1	Position 2	Position 3	Position 4
Highest daytime average ($L_{Aeq, 1hr}$)	58	59	55	54
Highest night-time average ($L_{Aeq, 1hr}$)	59	59	56	58
Typical* highest night-time short-duration maximum ($L_{Amax, f}$)	67	70	66	66

*This value is not the highest measured single value but is representative of a typical $L_{Amax, f.}$

Site noise levels are relatively high, however most commonly encountered modern facade constructions would be suitable. When windows are closed, the HTM 08-01 guidelines for internal noise levels will be comfortably achieved in all rooms using glazing with a minimum sound reduction performance of 35dB (R_w). An example of a type of glazing capable of achieving this performance is 6/16/6.8 ‘Insulight’ laminated glazing.

Note that this excludes noise from low-flying helicopters (eg. taking off or landing at the hospital helipad) and other irregularly occurring noisy events (eg. fireworks).
BS 8233:1999 *"Sound insulation and noise reduction for buildings - Code of practice"* states that an open window will typically provide 10 to 15dB sound reduction. Table 3 shows the predicted indoor ambient noise levels in rooms on the facades represented by the measurement positions if windows are open.

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Table 3: *Predicted internal noise levels with open windows*

Parameter	HTM 08-01 Noise Criteria for wards* (dB)	Predicted internal ambient noise levels (dB)			
		Position 1	Position 2	Position 3	Position 4
Highest daytime average ($L_{Aeq, 1hr}$)	**40**	43 - 48	44 - 49	40 - 45	39 - 44
Highest night-time average ($L_{Aeq, 1hr}$)	**35**	44 - 49	44 - 49	41 – 46	43 - 48
Typical* highest night-time short-duration maximum ($L_{Amax, f}$)	**45**	52 - 57	55 – 60	51 - 56	51 – 56

Note: * We have used the noise criteria for wards to assess the feasibity of opening windows as the HTM 08-01 criteria for wards are the most onerous.

These predicted internal ambient noise levels show that the HTM 08-01 internal noise level criteria are likely to be exceeded in all room types when windows are open.

It is worth noting that if openable windows are included, to be used at the discretion of the occupants, that more sensitive rooms (ie: wards) would experience marginally lower noise levels on the facades relating to positions 3 and 4.

To assist in determining suitable ventilation strategies for the building the table below provides the allowable unattenuated facade opening that could be allowed whilst still achieving the HTM 08-01 acoustic requirements. If more facade opening is required for ventilation, attenuation will be required or alternative strategy such as mechanical ventilation. In each case we have provided the minimum optimised Sound Reduction Index (SRI) performance of glazing required to meet HTM 08-01 internal ambient noise level criteria when used in conjunction with the suggested open areas.

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Table 4: *Maximum open areas for ventilation and minimum SRI specification for glazing*

		Optimised SRI for glazing (dB)						
Room Type	**Maximum open area for ventilation (mm^2)**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**
Small wards (16m^2 - 42m^2)	2,000	18	23	24	31	40	40	46
Large wards (> 42m^2)	15,000	18	22	24	30	42	34	40
All other room types	50,000	Any standard 4/12/4 double glazing						

Note that this specification is based on our rough approximation of room and window dimensions and should be assessed on a room-by-room basis once room sizes and locations are specified.

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2.2 Plant noise emissions

To achieve our proposed plant noise criteria, the total rating level of noise from building services plant must be no higher than the existing lowest background noise level (L_{A90}) at the nearest noise-sensitive receptors. BS4142:2014 states that when this criterion is met, it is an indication of the specific sound source having a low impact, depending on the context.

The background levels were measured by the noise logger at a location representative of the nearest noise-sensitive receptors. The logger was located on the opposite side of the road from the nearest receptor where noise levels would be similar.

The typical lowest background noise levels measured at this location are given in Table 5.

Table 5: *Lowest measured background levels at nearby noise-sensitive receptors*

Location	Night-time (dB L_{A90})	Daytime* (dB L_{A90})
Logger position Residential properties to North on Manor Road	**45**	**49**

*Note: * Daytime, in this context, refers to a typical working day of 08:00 to 18:00.*

The maximum plant noise 'rating levels' that will meet our recommended criteria must therefore be no higher than the levels given in Table 5.

Note that the specific plant noise L_{Aeq} levels could be up to 18dB lower than the plant noise 'rating level' limits.

Also note that plant noise must be controlled to no more than 50dB L_{Aeq} in external public areas of the development during the daytime and night-time.

When noise data and operational characteristics for the proposed plant are available we will be able to calculate noise levels at the sensitive receptors and advise whether additional noise mitigation measures are required.

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Appendix A - Survey Details

A1. Location of Survey

Proposed Healthcare Development site, Hatfield Business Park, Hatfield Avenue, Hatfield, AL10 6LN

A2. Date & Time of Survey

12:40 (16/04/15) to 07:50 (21/04/15)

A3. Personnel Present During Survey and Qualifications

James Stokes (SRL)

James has been working as an acoustician at SRL for over a year, and is an Associate Member of the Institute of Acoustics (AMIOA). He also holds a masters degree in Physics (MPhys) with honours from the University of Manchester. SRL Technical Services Ltd is a member of the Association of Noise Consultants (ANC).

James has been involved with many projects relating to construction, buildings, and environmental acoustics throughout his career. Much of this work has involved advising clients, and providing various recommendations to improve acoustic performances, or control noise as necessary. He has used the methodology of BS 4142 to assess several fixed installations, and in many instances has also done the pre and post installation surveys.

A4. Weather Conditions during Survey

16 April 2015 – 12:40	
Temperature	17°C
Wind speed (approx)	≤ 1 m/s
Wind direction	SE
Precipitation	0mm
Fog	n/a
Wet ground	n/a
Cloud cover	Approx 5% cloud
21 April 2015 – 07:50	
Temperature	3°C
Wind speed (approx)	≤ 1 m/s
Wind direction	n/a
Precipitation	0mm
Fog	n/a
Wet ground	n/a
Cloud cover	0%

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Logged data was also recorded to verify the accuracy of the measurements.
The weather data indicates the measured noise levels are accurate and do not require any correction.

A5. Instrumentation

HE3 – Sound Level Meter – Manned Measurements

Description	SRL No.	Make	Type	S/N
Sound Level Analyzer	519	Brüel & Kjær	2250	2559287
Preamplifier	519	Brüel & Kjær	ZC0032	5419
Microphone	519	Brüel & Kjær	4189	2689671

LARSON DAVIS 248 – Noise Logger

Description	SRL No.	Make	Type	S/N
Sound Level Analyzer	193	Larson Davis	824	1038
Preamplifier	677	Larson Davis	PRM902	1534

A6. Calibration Procedure

Before and after the survey the measurement apparatus was check calibrated to an accuracy of ±0.3 dB using the appropriate calibrator. These calibrators produce a sound pressure level of 93.8 dB re 2 x 10^{-5} Pa at a frequency of 1 kHz. No significant drift was observed.

A.7 Survey Procedure

Ambient noise levels were monitored at various positions around the site as shown in Figures C1 to C3. The measurements are tabulated in Appendix B, and explanations of the parameters used are given in Appendix D.

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Appendix B - Noise Survey Results

Noise intrusion

Table B1: *Day-time period manned measurements, positions 1 to 4*

Position	Start Time	Elapsed Time (min)	L_{Aeq} (dB)	AVG L_{Aeq} (dB)	L_{AF90} (dB)	L_{AFmax} (dB)
1	07:00	10	59	58	58	65
1	08:09	10	56		55	63
2	07:12	10	62	62	58	74
2	08:21	10	62		60	74
3	07:24	10	57	57	54	67
3	08:32	10	57		55	72
4	07:37	10	54	54	52	60
4	08:51	10	54		52	66

Table B2: *End of the night-time period manned measurements, positions 1 to 4*

Position	Start Time	Elapsed Time (min)	L_{Aeq} (dB)	AVG L_{Aeq} (dB)	L_{AF90} (dB)	L_{AFmax} (dB)
1	06:06	5	60	59	59	67
1	06:30	5	58		57	64
2	06:12	5	63	62	60	70
2	06:36	5	61		58	71
3	06:18	5	58	58	56	73
3	06:42	5	57		55	66
4	06:24	5	56	58	54	63
4	06:48	5	59		55	72

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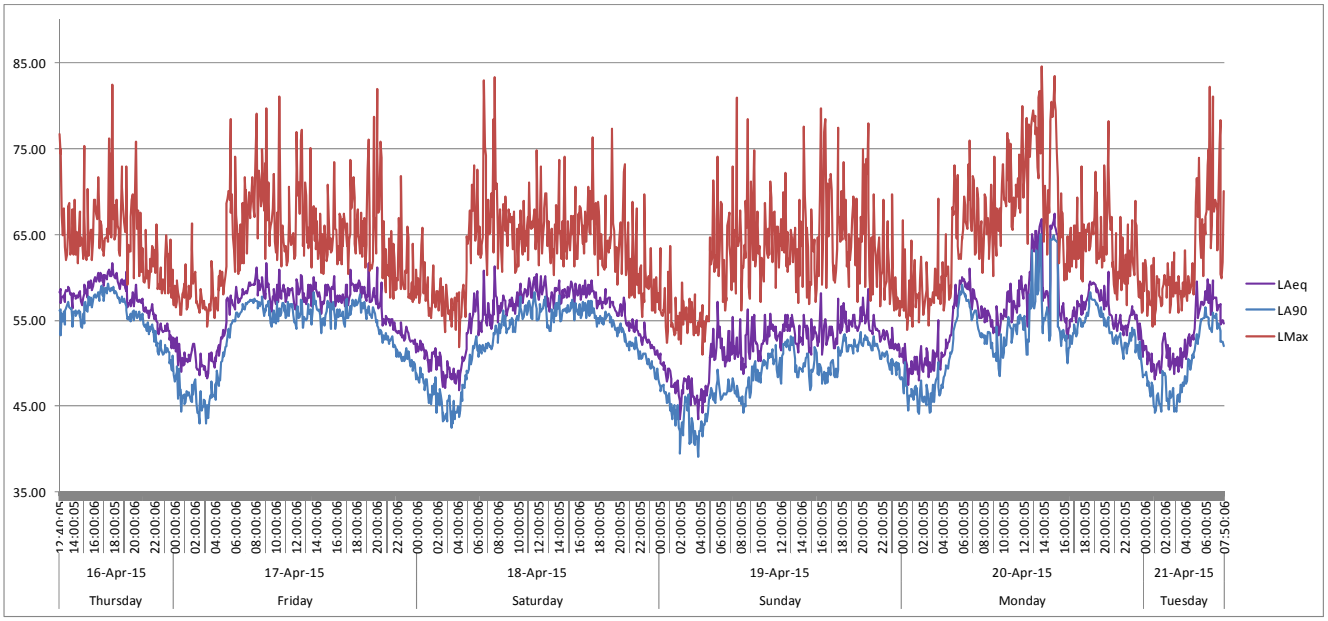
Figure B1: *Logger Data - time histories*



These levels were measured from 12:40 (16/04/15) to 07:50 (21/04/15)

Noise logger data is available on request

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Appendix C: Site plans and measurement positions

Figure C1: *Close-up of site showing manned survey positions 1 to 4 and logger location*

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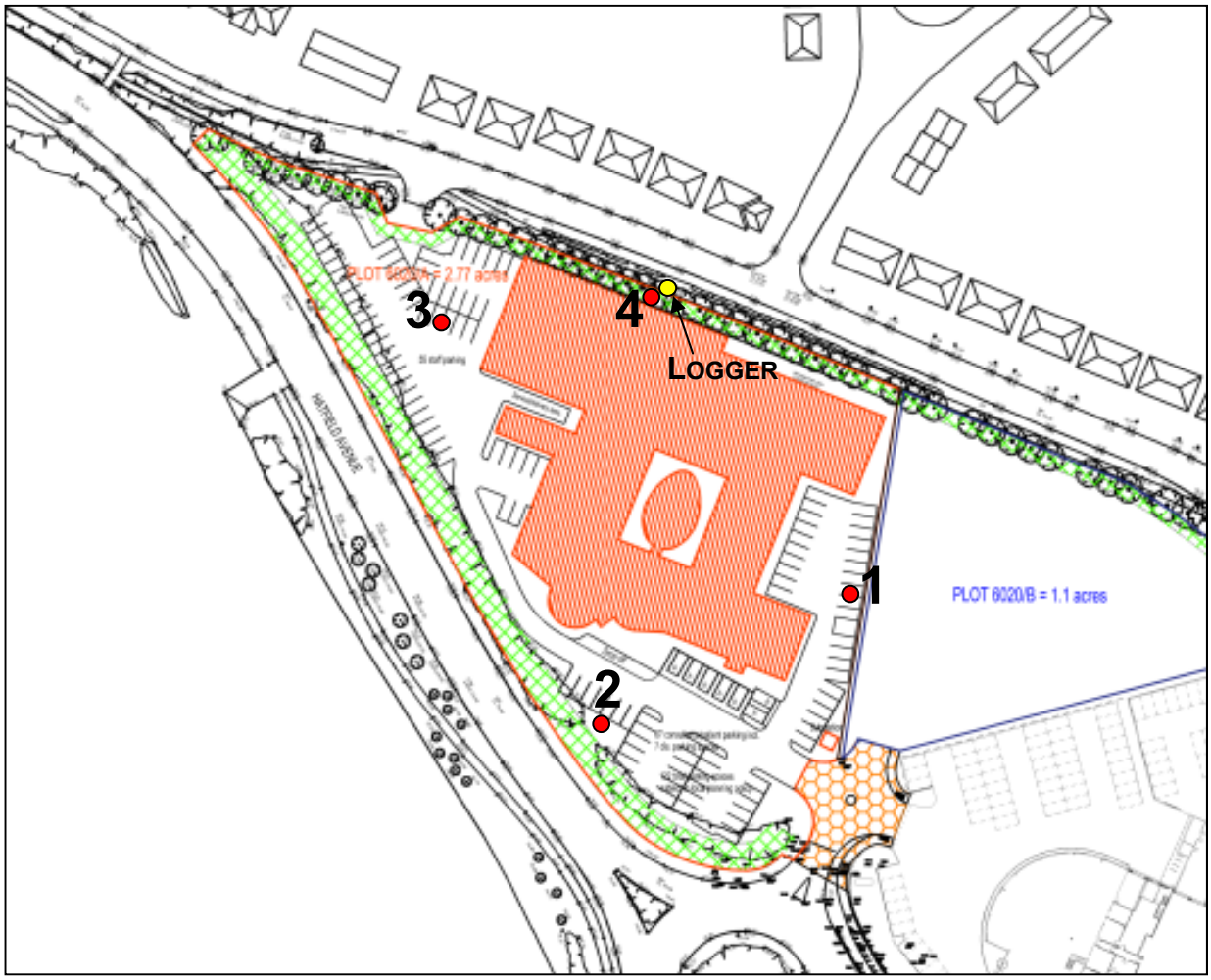
Figure C2: *Plan of proposed site showing how survey positions relate to the building*



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Appendix D: Noise measurement parameter definitions

L_{Aeq} The "A" weighted equivalent continuous sound pressure level. A representation of a continuous sound level containing the same amount of sound energy as the measured varying noise, over the measurement period. It can be considered as the "average" noise level.

L_{A90} The "A" weighted sound pressure level that is exceeded for 90% of the measurement period. It is commonly used as the "Background Noise Level".

L_{Amax} The maximum "A" weighted sound level during a given time.

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S R L

Southern Office & Laboratory
Holbrook House
Little Waldingfield
Sudbury
Suffolk
CO10 0TF
Tel: +44(0)1787 247595

Northern Office
Lynnfield House
Church Street
Altrincham
Cheshire
WA14 4DZ
Tel: +44(0)161 929 5585

London Office
70 Cowcross Street
London
EC1M 6EJ
Tel: +44 (0)207 251 3585

South Africa Office
Ground Floor, Liesbeek House
River Park
Gloucester Road
Mowbray
7700
South Africa
Tel: +27(0)21 680 5305
e-mail: srl@srlsa.co.za

Birmingham Office
Cornwall Buildings
45 Newhall Street
Birmingham
B3 3QR
Tel +44 (0)121 213 6342

Website: www.srltsl.com
e-mail: srl@srltsl.com

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Registered Name and Address:
SRL Technical Services Limited
Holbrook House
Little Waldingfield
Sudbury
Suffolk
CO10 0TF
Registered Number: 907694 England

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