

Sanctuary Acoustics

Acoustic Consultancy

NOISE ASSESSMENT FOR
LADBROKES PLC

AN ASSESSMENT OF NOISE FROM PROPOSED EXTERNAL AIR-CONDITIONING UNITS IMPINGING ONTO FIRST FLOOR RESIDENTIAL DWELLINGS AT 18 – 20 SOUTH STREET, LANCING

ADUR & WORTHING
PLANNING SERVICES

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BY

ANTHONY FROST MSC IENG MIOA

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EXECUTIVE SUMMARY

Sanctuary Acoustics was asked by Ladbrokes Plc to assess the existing background noise levels in the vicinity of their proposed extended Ladbrokes betting shop located at 18 – 20 South Street, Lancing. The site is within an existing mixed residential and commercial/retail area. The building currently occupying 20 South Street is an existing Ladbrokes betting shop while the adjoining premises at 18 South Street is currently vacant having previously been occupied as a Lettings agency. Situated above this ground floor row of commercial and retail premises are first floor flats. The proposed newly extended and refurbished Ladbrokes will be equipped with a new air-conditioning and heating system to which the external plant is to be located to the rear of the existing Ladbrokes shop at a position between the existing rear access door and the side access road that allows vehicular access to the rear, including access for the flats 20A, 18A and 16A as well as the business premises known as The Old Bakehouse which is occupied by the Glawood Group of Companies. The dwellings above the existing and proposed extended Ladbrokes betting shop are flats 18A and 20A, with flat 20A being only an approximate distance of 4.5 metres from the proposed location for the external units. As such the primary purpose of this noise assessment is to assess the existing background noise levels and provide comment on the air conditioning system proposed and mitigation to control noise egress were applicable. The existing noise sources that were noted throughout the noise measurement period were road traffic on South Street particularly buses and motorbikes although cars and vans were also frequent on South Street. There is a bus stop on South Street located opposite the Ladbrokes site were passengers were noted to congregate and talk whilst waiting for the bus. Pedestrians were also noted to frequently walk passed the site. Other noted noise sources were activity in the BT compound to the rear, regular level crossing sirens due to the close proximity to Lancing railway station; some train noise was audible at times and birdsong, notably seagulls and starlings.

The noise impact assessment has been conducted in order to satisfy a pre-planning condition raised by Sarah Crease, Planning Technician at Adur & Worthing Council due to concerns raised regarding the potential impingement of noise from external units, e.g. air-conditioning units onto nearby residential dwellings.

To summarise:

1. The pre-planning condition relating to the proposed refurbishment and extension of the Ladbrokes betting shop in South Street states that; *A Noise Impact Assessment is required for the proposed air conditioning unit in order to assess the proposal. The Council's Local Validation List states that 'applications for developments that raise issues of disturbance by noise to the occupants of nearby existing buildings, and for developments that are considered to be noise sensitive and which are close to existing sources of noise should be supported by a noise assessment prepared by a suitably qualified acoustician. Further guidance is provided in Planning Policy Guidance 24: Planning and Noise (September 1994).*
2. The noise measurement location for the assessment was selected near to the rear façade of the existing Ladbrokes betting shop at 20 South Street were it is proposed to house the external air conditioning units in proximity to the first floor dwelling at 20A South Street
3. The noise measurements and observations note that road traffic noise and pedestrian footfall on South Street was significant. Other notable noise sources were the trains and level crossing sirens from nearby Lancing station.

Additional noise sources were bird song, people coming and going from neighbouring properties and some intermittent activity from the BT compound beyond the boundary fence.

4. The most significant background noise level (L_{A90}) measured was 45.3dB(A) taken between 4pm and 5pm, (rush hour) and the lowest measured background noise level (L_{A90}) was 41.7dB(A) taken between 8.30pm and 9.30pm. As the external units are to be operated through the duration of the Ladbrokes trading day, the lowest measured result takes precedence.
5. The proposed Ladbrokes air conditioning unit, which will be from the Daikin RZQG range will produce a sound pressure level of 45dB(A), when in night-time mode for the top 3 models, RZQG100, RZQG125 and RZQG140. These 3 models, depending on which model is specified will produce between 50dB(A) & 52dB(A) when in cooling mode and 52dB(A) & 53dB(A) when in heating mode.
6. The location for the external plant will be on the external ground floor rear wall which is located at a distance of 4.5 metres from the first floor dwelling at 20A South Street. The external plant will act as a point source by which there will be a 6dB reduction in sound pressure level for every doubling of distance. Therefore if the external unit operating in its noisier heating mode is producing a sound pressure level of 53dB at 1 metre, at 2 metres it will be 47dB and at 4 metres, (the rear façade of 20A South Street), it should be measuring at a sound pressure level of 41dB.
7. BS 4142 states that the rating level should be 5dB less than background noise levels. Therefore, should the external air-conditioning plant be located at the ground floor façade it should be housed in an acoustic shroud or hood that will provide a minimum noise attenuation of 5dB. Alternatively the mechanical plant could be housed in the rear 'lean to' of 18 South Street which currently houses the toilets for that retail/commercial unit.
8. Provided the external air-conditioning unit is housed in an acoustic shroud or hood or alternatively in the rear 'lean to' of 18 South Street, noise from the plant should not be an issue.

1. INTRODUCTION

Sanctuary Acoustics was asked by Ladbrokes Plc to assess the existing background noise levels in the vicinity of their proposed extended Ladbrokes betting shop located at 18 – 20 South Street, Lancing. The site is within an existing mixed residential and commercial/retail area. The building currently occupying 20 South Street is an existing Ladbrokes betting shop while the adjoining premises at 18 South Street is currently vacant having previously been occupied as a Lettings agency. Situated above this ground floor row of commercial and retail premises are first floor flats. The proposed newly extended and refurbished Ladbrokes will be equipped with a new air-conditioning and heating system to which the external plant is to be located to the rear of the existing Ladbrokes shop at a position between the existing rear access door and the side access road that allows vehicular access to the rear, including access for the flats 20A, 18A and 16A as well as the business premises known as The Old Bakehouse which is occupied by the Glawood Group of Companies. The dwellings above the existing and proposed extended Ladbrokes betting shop are flats 18A and 20A, with flat 20A being only an approximate distance of 4.5 metres from the proposed location for the external units. As such the primary purpose of this noise assessment is to assess the existing background noise levels and provide comment on the air conditioning system proposed and mitigation to control noise egress were applicable. The existing noise sources that were noted throughout the noise measurement period were road traffic on South Street particularly buses and motorbikes although cars and vans were also frequent on South Street. There is a bus stop on South Street located opposite the Ladbrokes site were passengers were noted to congregate and talk whilst waiting for the bus. Pedestrians were also noted to frequently walk passed the site. Other noted noise sources were activity in the BT compound to the rear, regular level crossing sirens due to the close proximity to Lancing railway station; some train noise was audible at times and birdsong, notably seagulls and starlings.

The noise impact assessment has been conducted in order to satisfy a pre-planning condition raised by Sarah Crease, Planning Technician at Adur & Worthing Council due to concerns raised regarding the potential impingement of noise from external units, e.g. air-conditioning units onto nearby residential dwellings.

The pre-planning condition states;

1 A Noise Impact Assessment is required for the proposed air conditioning unit in order to assess the proposal. The Council's Local Validation List states that 'applications for developments that raise issues of disturbance by noise to the occupants of nearby existing buildings, and for developments that are considered to be noise sensitive and which are close to existing sources of noise should be supported by a noise assessment prepared by a suitably qualified acoustician. Further guidance is provided in Planning Policy Guidance 24: Planning and Noise (September 1994).

In a telephone conversation between Sanctuary Acoustics and Sarah Crease, it was stated that the use of *Planning Policy Guidance 24: Planning and Noise* or PPG24 is generally used for new residential dwellings or those subject to a material change of use. It was also pointed out that PPG24 was repealed in March 2012 and replaced by the new National Planning Policy Framework (NPPF) with further reference to the Noise Policy Statement for England (NPSE).

In this instance were a noise assessment from air conditioning units onto nearby residential dwellings is required, the use of *British Standard 4142:1997 Method for Rating industrial noise affecting mixed residential and industrial areas* is used.

In order to assess the existing noise environment, the following were investigated although it must be stated that the operational hours of the shop will be within daytime hours (currently 9.30am to 10pm):

- Equivalent continuous sound pressure level measurements (L_{Aeq}), Background noise levels (L_{A90}) and the Maximum sound pressure level measurement L_{Amax} were undertaken at the existing shops rear façade at the proposed location to house external air conditioning plant.
- The 24-hour clock is divided into daytime which is commonly interpreted for a period of 16 hours from 07:00 to 23:00 and night-time as 8 hours from 23:00 to 07:00.
- BS 4142 states that measurements taken during the daytime be of 1-hour duration with 5-minute durations at night. As the proposed betting shop will not be open between 11pm and 7am the need for night-time noise measurements was not undertaken. The five daytime measurements undertaken were each of 1-hour duration. It was considered best practise to conduct measurements over different periods on a weekday to determine how the noise climate alters and what other outside sources may be determining factors on the noise levels within the vicinity.
- 1-hour noise measurements were conducted from 10am to 11am, 11.30am to 12.30pm, 4pm to 5pm, 7pm to 8pm and 8.30pm to 9.30pm.

The noise survey began on the morning of Monday 16th September 2013.

The noise survey commenced with a 1-hour measurement at 9.30am to assess the noise levels within the vicinity of the Ladbrokes Betting Shop at 20 South Street.

Noise measurements are typically taken at a minimum distance of 3.5m from facades to avoid specular reflections. *BS 4142:1997 Method for Rating industrial noise affecting mixed residential and industrial areas* states in section 5.3 Measurement positions; *"To minimise the influence of reflections, make the measurements at least 3.5m from any reflecting surface other than the ground".*

The sound level meter was positioned on a tri-pod 1.5m above ground level and 3.5m from the external rear facade.

Figure 1 depicts the measurement location to the rear façade of the existing Ladbrokes Betting Shop and the proposed location for the external air conditioning units at 20 South Street, Lancing.



Figure 1: Measurement location to the rear of the existing ground floor shop premises at 20 South Street. The dwelling at 20A South Street is situated above the pitched roof. Below the barred window were the two refuse bins are currently located is the proposed location for the external air-conditioning units.

The noise measurements were undertaken using a Norsonics 132 Sound Level Meter (Serial Number 1322854) which was calibrated before and after the noise measurements were taken using a Cirrus CR:514 Acoustic Calibrator (Serial Number 59124). Both items of equipment have traceable calibration certificates and are designated as Type 2 instruments which are inline with IEC 60651 & 60804 and IEC 60942 respectively. The Sound Level Meter was mounted on a tri-pod 1.5m above ground level. The results of the noise measurements and their acoustic parameters are detailed in section 2, Measurements and Observations. The full 1/1 octave band data for the measurements are detailed at the end of this report in Annex A.

2. Measurements and Observations

The measurements began at 10am with a 1 hour measurement at the rear external façade close to the proposed external air-conditioning units as depicted in figure 1.

For each of the noise measurements undertaken, the observations and results are detailed in tabular form including descriptions of the weather conditions.

A glossary of the acoustic parameters/terms used can be found in Annex B.

The noise results obtained for measurement 1 between 10am and 11am are detailed in table 1.

Location	1. Rear façade of 20 South Street in close proximity to the first floor dwelling, 20A South Street.
Time & Duration	10.00 – 11.00 1-Hour Duration
Weather & Site Conditions	Broken cloud/blue sky, sunny intervals, occasional light breezes with gusts up to 4.5km/h, 12^0C Site Conditions – Road traffic on South Street audible, particular buses and other larger vehicles. Pedestrians and waiting bus passengers on South Street. Train noise and sirens from the level crossing. Occasional noise from BT compound beyond the rear boundary fence. 85.6dB L_{Amax} is a police vehicle siren during 40th minute.
Measurement Parameter	**Measurement Reading**
L_{Aeq}	52.7dB(A)
L_{A10}	53.6dB(A)
L_{Amin}	40.4dB(A)
L_{Amax}	85.6dB(A)
L_{A90}	44.7dB(A)

Table 1: The results taken at the above location for measurement 1

The observations noted over the period 10am to 11am are detailed in table 2.

Location	1. Rear façade of 20 South Street in close proximity to the first floor dwelling, 20A South Street.
Time & Duration	10.00 – 11.00 1-Hour Duration
Weather & Site Conditions	Broken cloud/blue sky, sunny intervals, occasional light breezes with gusts up to 4.5km/h, 12^0C Site Conditions – Road traffic on South Street audible, particular buses and other larger vehicles. Pedestrians and waiting bus passengers on South Street. Train noise and sirens from the level crossing. Occasional noise from BT compound beyond the rear boundary fence. 85.6dB L_{Amax} is a police vehicle siren during 40th minute.
Minutes Passed	**Observations**
0 – 60	Road vehicles on South Street
0 – 60	Intermittent train noise and sirens from level crossing
0 – 60	Pedestrians on South Street
0 – 1	Employee at the Old Bake House walking across gravel (L_{Amax} 58.2dB(A))
6	Level crossing sirens. (L_{Amax} 61.7dB(A))
10	HGV on South Street. (L_{Amax} 62.2dB(A))
11	Van bypass. (L_{Amax} 67.9dB(A))
15	Airplane overhead.
20	Screech from bus brakes as it approached bus stop opposite Ladbrokes on South Street. (L_{Amax} 68.1dB(A))
23	Level crossing sirens
24	Single propeller light aircraft overhead
25	Train bypass
27	Train bypass
30	Light aircraft overhead. (L_{Amax} 69.9dB(A))
37	Mechanical unit comes on in BT compound beyond fence
40	Police siren on South Street. (L_{Amax} 85.6dB(A))
45	Neighbour moving refuse bin
49	Train bypass
52	UPS delivery to the Glawood office in the Old Bake House

Table 2: The observations noted during measurement 1

The noise results obtained for measurement 2, 11.30am to 12.30pm are detailed in table 3.

Location	1. Rear façade of 20 South Street in close proximity to the first floor dwelling, 20A South Street.
Time & Duration	11.30 – 12.30 1-Hour Duration
Weather & Site Conditions	Broken cloud/blue sky, sunny intervals, occasional light breezes with gusts up to 10.7km/h, 13^0C Site Conditions – Road traffic on South Street audible, particular buses and other larger vehicles. Pedestrians and waiting bus passengers on South Street. Train noise and sirens from the level crossing. Occasional noise from BT compound beyond the rear boundary fence. 79.6dB L_{Amax} is a car horn during 1st minute.
Measurement Parameter	**Measurement Reading**
L_{Aeq}	54.0dB(A)
L_{A10}	56.1dB(A)
L_{Amin}	41.8dB(A)
L_{Amax}	79.6dB(A)
L_{A90}	45.1dB(A)

Table 3: The results taken at the above location 1 for measurement 2

The observations for measurement 2 are detailed in table 4.

Location	1. Rear façade of 20 South Street in close proximity to the first floor dwelling, 20A South Street.
Time & Duration	11.30 – 12.30 1-Hour Duration
Weather & Site Conditions	Broken cloud/blue sky, sunny intervals, occasional light breezes with gusts up to 10.7km/h, 13^0C Site Conditions – Road traffic on South Street audible, particular buses and other larger vehicles. Pedestrians and waiting bus passengers on South Street. Train noise and sirens from the level crossing. Occasional noise from BT compound beyond the rear boundary fence. 79.6dB L_{Amax} is a car horn during 1st minute.
Minutes Passed	**Observations**
0 – 60	Road vehicles on South Street
0 – 60	Intermittent train noise and sirens from level crossing
0 – 60	Pedestrians on South Street
1	Car horn. (L_{Amax} 79.6dB(A))
5	Airplane overhead
12	Airplane overhead
0 – 26	Pensioners chatting at the bus stop on South Street
14	Train bypass
14	Helicopter overhead
24	Light aircraft overhead
26	Single decker bus stops at the bus stop on South Street opposite the Ladbrokes betting shop
33	Two light aircraft nearby
35	Train bypass
43	Seagulls nearby
45 – 46	Emergency vehicle sirens in the distance
46	Light aircraft overhead
47	Car door slam
48	Train bypass
52	Light aircraft overhead

Table 4: The observations noted during measurement 2

Table 5 details the measurement results of the hour long 4pm to 5pm measurement.

Location	1. Rear façade of 20 South Street in close proximity to the first floor dwelling, 20A South Street.
Time & Duration	16.00 – 17.00 1-Hour Duration
Weather & Site Conditions	Broken cloud, sunny intervals, occasional light breezes with gusts up to 6.7km/h, 14^{0}C Site Conditions – Road traffic on South Street audible, particular buses and other larger vehicles. Pedestrians and waiting bus passengers on South Street. Train noise and sirens from the level crossing. Occasional noise from BT compound beyond the rear boundary fence. 70.8dB L_{Amax} is a seagull nearby during the 33rd minute.
Measurement Parameter	**Measurement Reading**
L_{Aeq}	51.9dB(A)
L_{A10}	55.2dB(A)
L_{Amin}	40.5dB(A)
L_{Amax}	70.8dB(A)
L_{A90}	45.3dB(A)

Table 5: The results taken at the above measurement location for measurement 3

The observations noted highlighting the relevant noise sources during this measurement period are as follows in table 6.

Location	1. Rear façade of 20 South Street in close proximity to the first floor dwelling, 20A South Street.
Time & Duration	16.00 – 17.00 1-Hour Duration
Weather & Site Conditions	Broken cloud, sunny intervals, occasional light breezes with gusts up to 6.7km/h, 14^{0}C Site Conditions – Road traffic on South Street audible, particular buses and other larger vehicles. Pedestrians and waiting bus passengers on South Street. Train noise and sirens from the level crossing. Occasional noise from BT compound beyond the rear boundary fence. 70.8dB L_{Amax} is a seagull nearby during the 33rd minute.
Minutes Passed	**Observations**
0 – 60	Road vehicles on South Street
0 – 60	Intermittent train noise and sirens from level crossing
0 – 60	Pedestrians on South Street
8	Car horn. (L_{Amax} 64.4dB(A))
12	Machinery next door. (L_{Amax} 65.4dB(A))
14	Children on South Street. (L_{Amax} 67.1dB(A))
22 – 29	Intermittent drilling noise from next door premises
33	Seagull overhead. (L_{Amax} 70.8dB(A))
38	Light aircraft low overhead
38	Train bypass
39	Jet airplane high overhead
49	Car horn sounded repeatedly

Table 6: The observations noted at the above measurement location during measurement 3

The 1-hour measurement conducted between 7pm and 8pm and the results attained are detailed in table 7. Figure 2 depicts this measurement in progress.

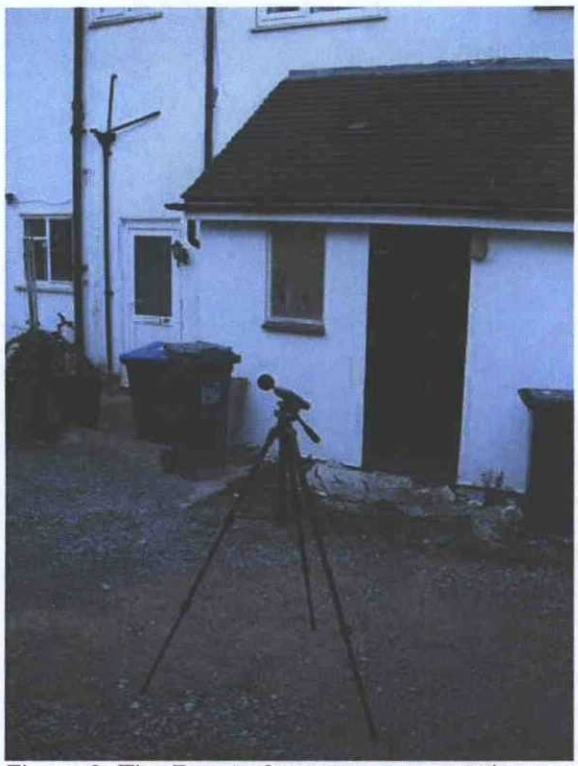

Figure 2: The 7pm to 8pm measurement in progress.

Location	1. Rear façade of 20 South Street in close proximity to the first floor dwelling, 20A South Street.
Time & Duration	19.00 – 20.00 1-Hour Duration
Weather & Site Conditions	Clear sky now but still with some high isolated cloud, occasional light breezes but no gusts as wind speed has dropped. Bird song from starlings and seagulls at the start of the measurement, 8^0C. Site Conditions – Road traffic on South Street audible. Pedestrians on South Street. Train noise and sirens from the level crossing. Noise from BT compound beyond the rear boundary fence is now restricted to intermittent mechanical noise, i.e. extraction or cooling equipment. 72.7dB L_{Amax} is a motorbike on South Street during the 44th minute.
Measurement Parameter	**Measurement Reading**
L_{Aeq}	50.3dB(A)
L_{A10}	53.2dB(A)
L_{Amin}	39.5dB(A)
L_{Amax}	72.7dB(A)
L_{A90}	43.1dB(A)

Table 7: The results taken at the above measurement location for measurement 4

The observations noted during this measurement are detailed in table 8.

Location	1. Rear façade of 20 South Street in close proximity to the first floor dwelling, 20A South Street.
Time & Duration	19.00 – 20.00 1-Hour Duration
Weather & Site Conditions	Clear sky now but still with some high isolated cloud, occasional light breezes but no gusts as wind speed has dropped. Bird song from starlings and seagulls at the start of the measurement, 8^0C. Site Conditions – Road traffic on South Street audible. Pedestrians on South Street. Train noise and sirens from the level crossing. Noise from BT compound beyond the rear boundary fence is now restricted to intermittent mechanical noise, i.e. extraction or cooling equipment. 72.7dB L_{Amax} is a motorbike on South Street during the 44th minute.
Minutes Passed	**Observations**
0 – 60	Road vehicles on South Street
0 – 60	Intermittent train noise and sirens from level crossing
0 – 60	Pedestrians on South Street
1	Van bypass. (L_{Amax} 59.7dB(A))
6	Pedestrian talking at a high level on South Street. (L_{Amax} 62.9dB(A))
10	Seagull. (L_{Amax} 63.8dB(A))
13	Seagull. (L_{Amax} 70.5dB(A))
22	Train bypass
44	Motorbike on South Street. (L_{Amax} 72.7dB(A))
52 – 56	Extraction/Ventilation Plant comes on in BT compound

Table 8: The observations noted at the above measurement location during measurement 4

The fifth 1-hour measurements undertaken at the measurement locations are detailed in table 9.

Location	1. Rear façade of 20 South Street in close proximity to the first floor dwelling, 20A South Street.
Time & Duration	20.30 – 21.30 1-Hour Duration
Weather & Site Conditions	Clear sky now but still with some high isolated cloud, occasional light breezes but no gusts as wind speed has dropped. 8^0C. Site Conditions – Road traffic on South Street audible although decreased in volume. Pedestrians on South Street also decreased in volume. Train noise and sirens from the level crossing more audible due to less masking from road traffic noise but also appeared less in volume. Noise from BT compound beyond the rear boundary fence is now restricted to intermittent mechanical noise, i.e. extraction or cooling equipment. 69.1dB L_{Amax} is a pedestrian on South Street during the 26th minute.
Measurement Parameter	**Measurement Reading**
L_{Aeq}	47.6dB(A)
L_{A10}	50.2dB(A)
L_{Amin}	38.7dB(A)
L_{Amax}	69.1dB(A)
L_{A90}	41.7dB(A)

Table 9: The results taken at the above location 1 for Measurement 5

The observations noted during this measurement period are detailed in table 10.

Location	1. Rear façade of 20 South Street in close proximity to the first floor dwelling, 20A South Street.
Time & Duration	20.30 – 21.30 1-Hour Duration
Weather & Site Conditions	Clear sky now but still with some high isolated cloud, occasional light breezes but no gusts as wind speed has dropped. 8^0C. Site Conditions – Road traffic on South Street audible although decreased in volume. Pedestrians on South Street also decreased in volume. Train noise and sirens from the level crossing more audible due to less masking from road traffic noise but also appeared less in volume. Noise from BT compound beyond the rear boundary fence is now restricted to intermittent mechanical noise, i.e. extraction or cooling equipment. 69.1dB L_{Amax} is a pedestrian on South Street during the 26th minute.
Minutes Passed	**Observations**
0 – 60	Road vehicles on South Street
0 – 60	Intermittent train noise and sirens from level crossing
0 – 60	Pedestrians on South Street
2	Car bypass. (L_{Amax} 63.5dB(A))
16	Car with high performance exhaust. (L_{Amax} 68.5dB(A))
26	Pedestrian. (L_{Amax} 69.1dB(A))

Table 10: The observations noted at the above measurement location during measurement 5

The noise in the vicinity is currently derived from different sources; road traffic noise on South Street, train noise and the level crossing at Lancing station, pedestrian footfall on South Street and some individual noise events from the neighbouring properties and bird song. Figure 3 depicts a train in view at Lancing station beyond the rear boundary fence and figure 4 depicts the close proximity to Lancing station level crossing as it is about to drop.



Figure 3: The green and white livery of the train at Lancing station.



Figure 4: Level crossing barriers about to drop.

The lowest background noise level (L_{A90}) was measured between 8.30pm to 9.30pm at 41.7dB(A). It will therefore be this level to which noise from the Ladbrokes will be assessed.

3. Conclusions

The proposed air-conditioning and ventilation system has not yet been fully specified but is likely to produce a sound pressure level of between 51dB and 53dB. The usual air-conditioning and heating system used by Ladbrokes Plc is produced by Daikin. An external air-conditioning model from the RZQG range as detailed in table 11 is generally specified by the M&E Engineers although the actual system will be designed by them depending on the size and capacity of the Ladbrokes betting shop and the required exchange of air per litre per second per person. Page 7 of the Daikin manufacturer's specifications sheet for this particular range details the sound pressure level of the units during various functions. The sound pressure level readings are at 1 metre inline with other Daikin products data sheets that detail sound pressure levels at 1 metre.

Table 11 details the sound pressure levels from the manufacturer's specifications data sheet.

Operation Mode		RZQG71LV1B	RZQG100LV1B	RZQG125LV1B	RZQG140LV1B
Cooling	Nom.	48dB(A)	50dB(A)	51dB(A)	52dB(A)
Heating	Nom.	50dB(A)	52dB(A)	53dB(A)	53dB(A)
Night quiet mode	Level 1	43dB(A)	45dB(A)	45dB(A)	45dB(A)

Table 11: Proposed external unit sound pressure level data. The original plan drawing highlights the use of the RZQG100 model

The distance from the rear ground floor facade of 20 South Street to the first floor rear façade of 20A South Street is 4.5m. The distance from the proposed external air conditioning unit to be located at the rear façade will therefore be approximately 4 metres.

Sound decays over distance and therefore what sound will be attenuated over this short distance could be calculated.

For example, the Daikin RZQG140LV1B has a Sound Pressure Level of 51dB(A) when cooling and 53dB(A) when heating at 1 metre as detailed in the Daikin noise assessment data.

By using this product data together with the distance from the proposed source (air con unit) to the receiver (rear façade of 20A South Street, first floor) we can calculate distance attenuation and relate that to existing background noise levels.

The distance calculations are as follows;

Distance Attenuation

The air conditioning unit, although a stationary machine contains moving parts, the distance being considered is from the air conditioning unit (the source) and the receiver (rear façade of 20A South Street, first floor), 4m, the source therefore will be considered as a point source.

Noise sources are considered and grouped into 3 forms depending on the source of noise and its location and distance to the receiver, namely Plane Source, Line Source and Point Source.

The air-conditioning units will behave as a point source. The reduction in sound pressure level resulting from a sound from a point source will be 6dB for every time the distance is doubled. Therefore taking the worst case scenario of the air conditioning units operating in the heating mode and therefore producing 53dB at 1m, at 2m the sound pressure level would be 47dB and at 4m, which would be close to the rear façade of 20A South Street, the sound pressure level would be 41dB.

This can be confirmed as follows with the receiver at 4m and the source taken at 1m;

$=10\log (4/1)^2$

$=20\log 4$

$=20 \times 0.6$

=12dB attenuation over 4 metres, source (air-con) to receiver (20A South Street).

Therefore the Daikin RZQG140LV1B whilst in Heating mode would be expected to measure 41dB at the dwelling façade, 39dB whilst in cooling mode or 33dB when operating in night-time mode.

However, BS 4142, Section 8 refers to a rating level and discusses the comparison between the specific noise levels i.e. when the site is in operation or a particular piece of machinery is in use, in this case if an air conditioning unit is in operation and the background noise level, i.e. when the air conditioning unit is quiet or in-operable. Sub-section 8.1 states that; *Certain acoustic features can increase the likelihood of complaint over that expected from a simple comparison between the specific noise level and the background noise level. Where present at the assessment location, such features are taken into account by adding 5 dB to the specific noise level to obtain the rating level.* Sub-section 8.2 states to the adding of 5 dB to the specific noise level if one or more features are contained in the noise which includes

distinguishable, discrete continuous notes or distinct impulses or the noise is irregular enough to attract attention.

If 5dB were to be added for such an acoustic feature, then 41dB at the façade of 20A South Street would become 46dB.

BS 4142 further states from Section 9 that an assessment of the likelihood of complaints can be made by subtracting the measured background noise level from the rating level – *A difference of around +10dB or more indicates that complaints are likely. A difference of around +5dB is of marginal significance but if the rating level is more than 10dB below the measured background noise level then this is a positive indication that complaints are unlikely.*

The lowest background noise level measured was 41.7dB(A) or rounded up to 42dB(A) between 8.30pm and 9.30pm which is a time when traffic volume and pedestrian footfall on South Street was notably decreasing.

Therefore on applying a +5dB correction for discrete acoustics features this would take the noise level at the façade of the first floor flat above the lowest measured existing background noise level.

It is therefore recommended that an acoustic hood or shroud be fitted around the external air-conditioning plant. Such a shroud would need to provide minimum 5dB noise attenuation.

Although the rear façade of the existing shop at 20 South Street is the preferred location, a 'lean to' at the rear of 18 South Street which currently houses the toilets for that retail/commercial unit could be adapted to house the proposed external air conditioning plant as the existing staff toilet facilities in 20 South Street are to be retained. Figure 5 highlights this 'lean to'.

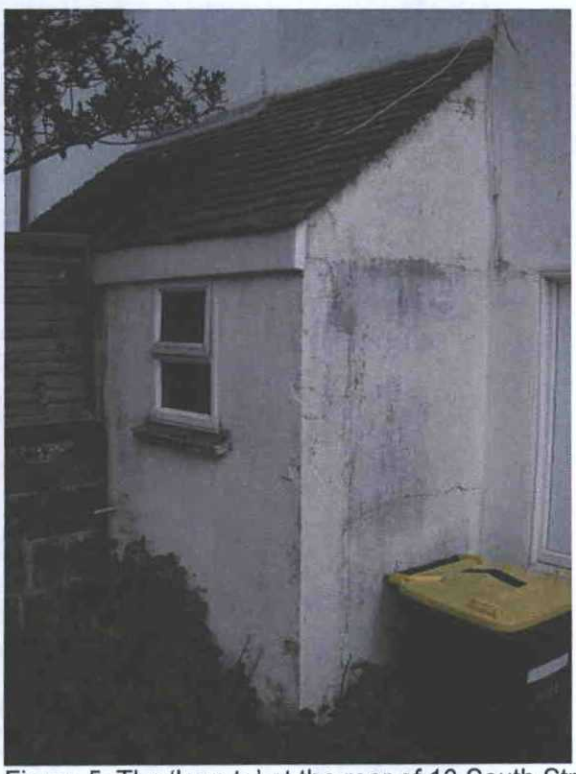

Figure 5: The 'lean to' at the rear of 18 South Street.

This therefore confirms that by installing a model from the Daikin RZQG range of external air conditioning units or a similar external air conditioning unit that does not produce a sound pressure level greater than 53dB, then providing it is fitted with an acoustic shroud or housed in the 18 South Street 'lean to' noise from the plant shouldn't be an issue.

4. Recommendations and Final Conclusion

The noise survey has concluded that the noise limits based upon criteria in *BS 4142:1997 Method for rating industrial noise affecting mixed residential and industrial areas* would be achieved with the proposed installation of recommended new external air conditioning plant to be located at the rear of the premises in the preferred location provided the mechanical plant is housed within an acoustic hood or shroud which would achieve a minimum noise attenuation of 5dB. Should the implications of an acoustic shroud not be practical or refused by other means, then the second and alternative location of housing the plant in the rear 'lean to' of 18 South Street that currently house the staff toilets within that retail/commercial unit could be utilised instead.

The installation of new external plant at the rear of the ground floor commercial unit will not have an adverse effect on the noise climate in the vicinity provided the work in the paragraph above is undertaken.

5. SUMMARY.

Sanctuary Acoustics was asked by Ladbrokes Plc to assess the existing background noise levels in the vicinity of their proposed extended Ladbrokes betting shop located at 18 – 20 South Street, Lancing. The site is within an existing mixed residential and commercial/retail area. The building currently occupying 20 South Street is an existing Ladbrokes betting shop while the adjoining premises at 18 South Street is currently vacant having previously been occupied as a Lettings agency. Situated above this ground floor row of commercial and retail premises are first floor flats. The proposed newly extended and refurbished Ladbrokes will be equipped with a new air-conditioning and heating system to which the external plant is to be located to the rear of the existing Ladbrokes shop at a position between the existing rear access door and the side access road that allows vehicular access to the rear, including access for the flats 20A, 18A and 16A as well as the business premises known as The Old Bakehouse which is occupied by the Glawood Group of Companies. The dwellings above the existing and proposed extended Ladbrokes betting shop are flats 18A and 20A, with flat 20A being only an approximate distance of 4.5 metres from the proposed location for the external units. As such the primary purpose of this noise assessment is to assess the existing background noise levels and provide comment on the air conditioning system proposed and mitigation to control noise egress were applicable. The existing noise sources that were noted throughout the noise measurement period were road traffic on South Street particularly buses and motorbikes although cars and vans were also frequent on South Street. There is a bus stop on South Street located opposite the Ladbrokes site were passengers were noted to congregate and talk whilst waiting for the bus. Pedestrians were also noted to frequently walk passed the site. Other noted noise sources were activity in the BT compound to the rear, regular level crossing sirens due to the close proximity to Lancing railway station; some train noise was audible at times and birdsong, notably seagulls and starlings.

The noise impact assessment has been conducted in order to satisfy a pre-planning condition raised by Sarah Crease, Planning Technician at Adur & Worthing Council due to concerns raised regarding the potential impingement of noise from external units, e.g. air-conditioning units onto nearby residential dwellings.

To summarise:

1. The pre-planning condition relating to the proposed refurbishment and extension of the Ladbrokes betting shop in South Street states that; *A Noise Impact Assessment is required for the proposed air conditioning unit in order to assess the proposal. The Council's Local Validation List states that 'applications for developments that raise issues of disturbance by noise to the occupants of nearby existing buildings, and for developments that are considered to be noise sensitive and which are close to existing sources of noise should be supported by a noise assessment prepared by a suitably qualified acoustician. Further guidance is provided in Planning Policy Guidance 24: Planning and Noise (September 1994).*
2. The noise measurement location for the assessment was selected near to the rear façade of the existing Ladbrokes betting shop at 20 South Street were it is proposed to house the external air conditioning units in proximity to the first floor dwelling at 20A South Street
3. The noise measurements and observations note that road traffic noise and pedestrian footfall on South Street was significant. Other notable noise sources were the trains and level crossing sirens from nearby Lancing station. Additional noise sources were bird song, people coming and going from

neighbouring properties and some intermittent activity from the BT compound beyond the boundary fence.

4. The most significant background noise level (L_{A90}) measured was 45.3dB(A) taken between 4pm and 5pm, (rush hour) and the lowest measured background noise level (L_{A90}) was 41.7dB(A) taken between 8.30pm and 9.30pm. As the external units are to be operated through the duration of the Ladbrokes trading day, the lowest measured result takes precedence.
5. The proposed Ladbrokes air conditioning unit, which will be from the Daikin RZQG range will produce a sound pressure level of 45dB(A), when in night-time mode for the top 3 models, RZQG100, RZQG125 and RZQG140. These 3 models, depending on which model is specified will produce between 50dB(A) & 52dB(A) when in cooling mode and 52dB(A) & 53dB(A) when in heating mode.
6. The location for the external plant will be on the external ground floor rear wall which is located at a distance of 4.5 metres from the first floor dwelling at 20A South Street. The external plant will act as a point source by which there will be a 6dB reduction in sound pressure level for every doubling of distance. Therefore if the external unit operating in its noisier heating mode is producing a sound pressure level of 53dB at 1 metre, at 2 metres it will be 47dB and at 4 metres, (the rear façade of 20A South Street), it should be measuring at a sound pressure level of 41dB.
7. BS 4142 states that the rating level should be 5dB less than background noise levels. Therefore, should the external air-conditioning plant be located at the ground floor façade it should be housed in an acoustic shroud or hood that will provide a minimum noise attenuation of 5dB. Alternatively the mechanical plant could be housed in the rear 'lean to' of 18 South Street which currently houses the toilets for that retail/commercial unit.
8. Provided the external air-conditioning unit is housed in an acoustic shroud or hood or alternatively in the rear 'lean to' of 18 South Street, noise from the plant should not be an issue.

6. ANNEX A

Location 1 - Measurement 1

Spectrum Time Slot:	16/09/2013 10:00:22 - 11:00:21	
Frequency [Hz]	L_{eq} [dB]	L_{90} [dB]
8	72.9	50.2
16	66.0	51.6
31.50	64.1	57.2
63	60.9	54.3
125	55.9	48.7
250	52.1	44.3
500	47.7	41.4
1000	47.1	39.4
2000	45.3	34.6
4000	43.3	27.1
8000	35.0	19.9
16000	20.9	19.8
A	52.7	44.7

Location 1 - Measurement 2

Spectrum Time Slot:	16/09/2013 11:30:53 - 12:30:52	
Frequency [Hz]	L_{eq} [dB]	L_{90} [dB]
8	73.8	50.8
16	67.2	53.0
31.50	65.6	59.2
63	62.7	55.1
125	59.7	49.0
250	55.5	45.1
500	51.3	41.7
1000	48.4	39.6
2000	45.0	35.0
4000	37.7	28.1
8000	29.6	20.0
16000	19.3	19.8
A	54.0	45.1

Location 1 - Measurement 3

Spectrum Time Slot:	16/09/2013 16:00:17 - 17:00:16	
Frequency [Hz]	L_{eq} [dB]	L_{90} [dB]
8	83.2	51.7
16	76.3	54.4
31.50	69.4	59.1
63	63.5	55.1
125	56.7	48.2
250	51.6	44.4
500	47.8	41.6
1000	47.4	40.3
2000	43.6	35.3
4000	37.7	28.0
8000	28.5	19.9
16000	20.6	19.8
A	51.9	45.3

Location 1 - Measurement 4

Spectrum Time Slot:	16/09/2013 19:01:07 - 20:01:06	
Frequency [Hz]	L_{eq} [dB]	L_{90} [dB]
8	51.2	45.2
16	57.6	50.8
31.50	62.3	55.3
63	62.4	53.2
125	55.8	46.7
250	50.6	43.2
500	45.8	39.7
1000	45.5	38.7
2000	42.3	32.4
4000	36.3	22.9
8000	28.6	19.8
16000	22.9	20.6
A	50.3	43.1

Location 1 - Measurement 5

Spectrum Time Slot:	16/09/2013 20:30:45 - 21:30:44	
Frequency [Hz]	L_{eq} [dB]	L_{90} [dB]
8	59.9	46.0
16	56.2	48.4
31.50	58.6	52.5
63	58.4	50.6
125	54.4	44.7
250	47.9	41.7
500	43.5	38.6
1000	42.8	37.0
2000	39.3	30.8
4000	32.4	21.7
8000	23.8	19.8
16000	22.4	20.5
A	47.6	41.7

7. ANNEX B

Acoustics Glossary of Terms

$L_{Aeq,T}$ – Equivalent continuous sound pressure level. This is the A-weighted sound pressure level in decibels (dB) of a continuous, steady sound that within a specified time interval, T, has the same mean squared sound pressure as a sound that varies with time.

L_{A10} – The A-weighted mean square sound pressure level that is exceeded for 10% of the time.

L_{A90} – The A-weighted mean square sound pressure level that is exceeded for 90% of the time. Referred to as the background noise level.

L_{Amin} – The lowest A-weighted noise level recorded during a noise event.

L_{Amax} – The highest A-weighted noise level recorded during a noise event.