

# **BALTIC 1014 LTD**

# NOISE ASSESSMENT

# SEEL STREET, LIVERPOOL

8 December 2015

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## **1.0 INTRODUCTION**

- 1.1 Acoustic & Engineering Consultants Limited (AEC) has been appointed by Falconer Chester Hall Architects (FCH) on behalf of Baltic 1014 Ltd to assess the noise levels affecting the proposed student accommodation block on land adjacent to Seel Street, Liverpool.
- 1.2 This report presents the results of the daytime and night-time noise level measurements undertaken on the site and an assessment of the potential implications for the acoustic design of the site taking into account available guidance and the Local Authority's requirements.
- 1.3 Acoustic terminology used throughout the report is described in brief in Appendix A.

# 2.0 BACKGROUND AND SITE DESCRIPTION

- 2.1 A scheme to redevelop land on Seel Street, Liverpool, into student accommodation has been prepared by FCH and the site location is identified on Figure 1.
- 2.2 Seel Street is located within the night-club area of Liverpool. It is understood that the land to the south of the site is to be redeveloped into a mixed-use commercial and residential block.
- 2.3 Seel Street is used by taxis and pedestrians walking between bars and clubs.
- 2.4 Opposite the site on Seel Street are The Nadler and Epic hotels. Between the two hotels is Concert Street which leads to Concert Square, approximately 70m to the north.
- 2.5 Concert square is a busy outdoor seating area which is surrounded by bars which play amplified music and are open until between 0300h and 0500h on a Friday and Saturday night.
- 2.6 To the south of the proposed development site, is Wolstenholme Square which is used as a cut through by taxis.
- 2.7 The buildings directly to the east and west of the proposed development site are currently unoccupied.

#### 3.0 NOISE CLIMATE

- 3.1 Daytime and night-time noise levels were measured by AEC on Saturday 21 November between 2100 and 0300h.
- 3.2 Measurements were undertaken at 3 locations around the development site, identified as A to C on Figure 1. Full details of the noise surveys are presented In Appendix B with measured noise data represented in Table B1, with a brief description provided below.
- 3.3 Location A was selected to measure the ambient and maximum noise levels from activity on Seel Street and music noise from Concert Square, impacting on the proposed development site. During the daytime the ambient noise level due to amplified music and car pass-bys was 65dBLAeq, 10 minute.
- 3.4 At night, the ambient noise level was relatively consistent around 65dBL<sub>Aeq, 10minute</sub>. Maximum noise levels did not typically exceed 76dBL<sub>Amax</sub> during the night-time period. Short term measurements, undertaken without any vehicular movements on Seel Street, indicate that amplified music noise levels from Concert Square were around 64dBL<sub>Aeq</sub> and 69dBL<sub>Amax</sub>.



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- 3.5 Measurements were undertaken on the corner on the junction of Concert Street and Concert Square, Location B. The noise climate at this location was due to music and crowds on Concert Square, the ambient noise level ranged from 82 to 86dBL<sub>Aeq</sub> with maximum noise levels up to 96dBL<sub>Amax</sub>.
- 3.6 During the measurement period, there was no noise breaking out of the building to the south, therefore, a measurement was undertaken in Wolstenholme Square (Location C) to represent the noise climate on the façade of the development facing away from Seel Street. The ambient noise level at this location, due to distant road traffic, was 56dBL<sub>Aeq</sub> and maximum noise levels were no greater than 69dBL<sub>Amax</sub>.
- 3.7 The lowest background noise level was measured at Location C, and this level of 52dBL<sub>A90</sub>, has been taken to be the background noise level in the area.

### 4.0 BASIS OF ASSESSMENT

#### Noise Ingress

- 4.1 Liverpool City Council has generally adopted a requirement for the external envelopes of residential accommodation in the city centre to incorporate windows with 10mm glass/thermal cavity/6mm glass and for habitable rooms to be provided with acoustically attenuated mechanical ventilation to remove the need to open windows.
- 4.2 These proposals are understood to be required to control internal noise levels in habitable rooms to typically no greater than those limits identified in the World Health Organisation (WHO) document '*Guidelines for Community Noise*'. WHO states that to avoid annoyance and sleep disturbance, inside dwellings, the noise level should not exceed 30dBLAeq, 8 hour and 45dBLAmax at night in bedrooms and 35dBLAeq, 16 hour during the day.
- 4.3 These levels are the same as those presented in the updated BS 8233:2014 '*Guidance on sound insulation and noise reduction for buildings*', therefore, the internal levels identified by WHO would appear to be appropriate for this type of development.
- 4.4 The criterion above relates to steady continuous anonymous noise sources, such as road traffic. Where the noise climate '*has a strong low-frequency content*' BS8233 states that '*lower noise limits may be appropriate*'. Therefore, it is recommended that internal ambient and maximum noise levels in rooms on the Seel Street elevation are controlled to 25dBL<sub>Aeq</sub> and 40dBL<sub>Amax</sub> at night due to music noise from Concert Square.
- 4.5 These suggested alternative design limits and any alternative glazing and ventilation strategy needs to be agreed with LCC.

#### **Noise Egress**

4.6 Following discussions with LCC, AEC have been informed that any items of plant should be assessed using BS4142: 2014 '*Methods for rating and assessing industrial and commercial sound*', and the 'rating' level should not exceed the existing background at the nearest noise sensitive residential property.

## 5.0 ASSESSMENT OF PROPOSED DEVELOPMENT

#### **External Envelope Sound Insulation Requirements**

- 5.1 The daytime and night-time ambient noise levels affecting the northern elevation of the development which overlooks Seel Street, are based on the highest measured ambient and maximum noise levels and presented in Table 1 below. It should be noted that calculations based on the noise levels measured at Location B demonstrate that the main contributor to the ambient noise levels at Location A, representative of the elevation overlooking Seel Street, is distant amplified music from Concert Square.
- 5.2 In relation to the southern elevation, the ambient and maximum noise levels are based on the night-time noise levels measured at Location C, these levels are also presented in Table 1 below. As the night-time criterion is more onerous than the daytime internal noise level limit this assessment only deals with the night-time noise levels for this elevation.
- 5.3 Based on the above, the anticipated free-field noise levels affecting the proposed development are presented below.

|                                   | Noise Level, dB |                      |                   |  |
|-----------------------------------|-----------------|----------------------|-------------------|--|
| Elevation                         | Day 0700-2300,  | Night 2300-0700      |                   |  |
|                                   | LAeq, 16h       | L <sub>Aeq, 8h</sub> | L <sub>Amax</sub> |  |
| Northern<br>(Seel Street)         | 65              | 65                   | 76                |  |
| Southern<br>(Wolstenholme Street) | -               | 56                   | 69                |  |

#### Table 2 – Typical Noise Levels due to Existing Noise Sources

#### **Glazing and Ventilation Requirements**

- 5.4 As identified above it is understood that LCC generally require that habitable rooms in residential developments within Liverpool city centre should be provided with 10/TC/6 glazing as a minimum and mechanical ventilation. Calculations based on the external noise levels, the area of the windows (assumed to be 33%) and assumed room dimensions, indicate that the internal noise level limits would be achieved in the rooms on the southern elevation using LCC stated glazing specification and mechanical ventilation.
- 5.5 In relation to the rooms on the northern elevation, the suggested alternative internal noise level limits of 25dBL<sub>Aeq, 8h</sub> and 40dBL<sub>Amax</sub> due to amplified music would be exceeded using 10/TC/6 glazing. In order to meet the suggested criteria, the glazing needs to achieve a sound insulation performance of at least 49dBR<sub>w</sub> (45dBR<sub>w</sub> + C<sub>tr</sub>), this can be achieved with a double glazing system consisting of 8.4mm glass/16mm thermal cavity/14.4mm glass. Alternatively, a secondary glazing system constructed from 10mm glass/200mm cavity/6mm glass would also be appropriate.
- 5.6 It has been assumed that there is no ventilation openings in the external façade.
- 5.7 The glazing strategy is different from LCC's standard requirement and would, therefore, need to be agreed with the Local Authority in advance.

#### Other Façade Elements

5.8 With regards to the other façade elements these should be selected in order that the on-site sound insulation performance (dBR'<sub>w</sub>) is at least 10dB higher than the performance of the glazing. Therefore, the external envelope will need to achieve at least 60dBR'<sub>w</sub> on the northern elevation and 48dBR'<sub>w</sub> on the remaining elevations. Due to the low frequency content of the external noise source, this will require further development.

#### Plant Noise

- 5.9 Although it is not yet known what plant is to be associated with this development and where it will be located, control of plant noise at the nearest noise sensitive properties on Seel Street and Wolstenholme Square should not be onerous.
- 5.10 In order to comply with LLC requirement that the rating noise level does not exceed the background noise level at the nearest properties, a -5dB correction can be applied to the background noise level measured on Woltensholme Square. Therefore, the noise from all items of plant should be controlled to 47dBL<sub>Aeq</sub> during the night at the nearby residents.
- 5.11 This will need to be assessed further, once the plant has been specified and its final location confirmed.

### 6.0 CONCLUSION

- 6.1 Acoustic and Engineering Consultants Limited has been appointed to undertake a noise assessment for the proposed accommodation block on land adjacent to Seel Street, Liverpool.
- 6.2 Based on the measured noise levels affecting at the proposed development site, the sound insulation requirements to achieve appropriate internal noise levels based on BS8233 and WHO guidance has been determined and are presented in Section 5. The proposed glazing specification is different from the usual requirement of LCC on one elevation and, would therefore, need to be agreed with LCC.
- 6.3 Total external noise levels from all future mechanical and electrical plant serving the proposed development should be controlled to 47dBL<sub>Aeq</sub> at night outside the nearest dwellings on Seel Street and Wolstenholme Square.
- 6.4 Noise levels at the proposed development have been assessed, and may be controlled through the use of an appropriate sound insulation scheme. Therefore, appropriate planning conditions can be applied to the proposed development to ensure reasonable internal noise levels in the proposed accommodation, and to control noise from any mechanical plant. Based on this, noise should not be considered a determining factor in relation to any planning permission being sought.

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# FIGURE 1 – Proposed Site Location Identifying Monitoring Locations

### **APPENDIX A – Acoustic Terminology in Brief**

Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air. The rate at which the pressure fluctuations occur determines the pitch or *frequency* of the sound. The frequency is expressed in Hertz (*Hz*), that is, cycles per second. The human ear is sensitive to sounds from about 20 Hertz to 20,000 Hertz. Although sound can be of one discreet frequency - a 'pure tone' - most noise is made up of many different frequencies.

The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same subjective way. This is the basis of the A-weighted sound pressure level dBA, normally used to assess the effect of noise on people. The dBA weighting emphasises or reduces the importance of certain frequencies within the audible range.

#### Noise Units

In order to assess environmental noise, measurements are carried out by sampling over specific periods of time, such as fifteen minutes or one hour, the statistically determined results being used to quantify various aspects of the noise.

The figure below shows an example of sound level varying with time. Because of this time variation the same period of noise can be described by several different levels. The most common of these are described below.



Example of Sound Level Varying With Time

| L <sub>Aeq,T</sub> | The equivalent continuous (A-weighted) sound level may be considered as the "average" sound level over a given time, T. It is used for assessing noise from various sources including transportation, industrial and construction sources and can be considered as the "ambient" noise level. |  |  |  |
|--------------------|---|--|--|--|
| L <sub>A90</sub>   | The (A-weighted) sound level exceeded for 90% of a measurement period. It is the value used to describe the "background" noise.   |  |  |  |
| L <sub>Amax</sub>  | The maximum (A-weighted) sound level during a measurement period.   |  |  |  |
| Free-field Level   | This refers to the sound level measured outside, away from reflecting surfaces.   |  |  |  |
| Rw                 | Single number rating used to describe the airborne sound insulation properties of a material or building element over the frequency range of typically 100-3150Hz.  |  |  |  |
| R <sub>tra</sub>   | Single number rating used to describe the airborne sound insulation properties of a material or building element over the frequency range of typically 100-3150Hz, using a traffic noise spectrum as the source.  |  |  |  |
| D <sub>n,e,w</sub> | Weighted element-normalised level difference. Single number rating used to describe the performance of a ventilation unit.  |  |  |  |

#### **APPENDIX B – Measurement Procedure**

- Dates & Times of Survey 2100h Saturday 21 November 2015 to 0300h Sunday 22 November 2015.
- Personnel Present David Terry (AEC)
- Equipment Used B&K 2260 Real Time Analyser (AEC Kit 2)
- Weather Conditions Overcast, mostly dry, some light rain at 2300h and again at 0300h when survey was stopped. Wind speed and direction negligible.
- Measurement Procedure Ambient, background and maximum noise levels were measured at 3 locations, identified as Locations A to C on Figure 1 and described below.
  - A At proposed façade of the development, approximately 5 metres from 1 the nearest carriageway of Seel Street.
  - B Centre of Fleet Street and on the corner of Concert Square. Approximately 10 metres from the outdoor loudspeakers of the Mubo nightclub.
  - C Centre of Wolstenholme Square.

All locations were selected to measure baseline noise levels, which were measured in terms of  $L_{Aeq}$ ,  $L_{A10}$ ,  $L_{A90}$  and  $L_{Amax}$  (fast response) typically over 5 to 15 minute periods. Although some shorter sample measurements of vehicle pass-bys and amplified music were also taken.

All the measurements were taken at a height of 1.5m above ground and all were free field measurements.

The sound level analyser, which conforms to BS EN 61672-12003 '*Electro* acoustics – sound level meters - Part1Specifications' for Class 1 Type Z meters, was in calibration and check calibrated before and after the measurement periods using a Brüel & Kjær type 4231 (94dB) calibrator. There was no significant drift of calibration. Calibration certificates are available on request.

Measured Data A summary of the results are presented in Table B1.

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| Location | Period, h  | Noise Level, dB  |                  |                  | 3                    | Commente   |
|----------|------------|------------------|------------------|------------------|----------------------|--|
| Location |            | L <sub>Aeq</sub> | L <sub>A10</sub> | L <sub>A90</sub> | L <sub>Amax, F</sub> | Comments   |
|          | 2115-2116h | 61.5             | 63.2             | 59.2             | 69.1                 | Just amplified music noise.  |
|          | 2116-2126h | 62.0             | 64.1             | 59.2             | 74.6                 | Amplified music. 10 cars/taxis.  |
|          | 2157-2207h | 65.4             | 67.6             | 59.4             | 84.1                 | Amplified music; cars passing approx<br>70dBLAmax; groups of people shouting<br>aprrox 84.1dBLAmax; vehicle engines<br>idling. |
| Δ        | 2252-2300h | 63.3             | 65.8             | 58.7             | 79.6                 | Taxi = 79.6 max. amplified music and people. Still very busy.  |
| ~        |            |                  |                  |                  |                      |  |
|          | 0210-0212h | 65.1             | 67.9             | 60.9             | 75.5                 | Mostly just amplified music. Still just as busy as previous.   |
|          | 0213-0222h | 61.8             | 64.0             | 58.7             | 75.7                 | Amplified music and people noise. Taxi<br>passby = 75.7dBLAmax. Good<br>representative measurement.                            |
|          | 0222-0227h | 62.5             | 64.7             | 59.4             | 73.9                 | as above   |
|          | 0245-0250h | 61.0             | 62.8             | 57.4             | 75.2                 | as above   |
|          | 0256-0258h | 59.2             | 60.8             | 57.4             | 65.7                 | Just amplified music noise. Starting to get slightly quiter (Mubo closing?).   |
|          |            |                  |                  |                  |                      |  |
|          | 2112-2114h | 82.4             | 85.5             | 74.5             | 90.3                 | Music Noise & Crowds   |
| В        | 0228-0229h | 86.1             | 88.9             | 82.5             | 96.3                 | Walkabout Loudspeakers around 6m<br>Mubo still loud with amplified music,<br>>100 people in square.                            |
|          |            |                  |                  |                  |                      |  |
| С        | 0233-0241h | 55.6             | 58               | 51.6             | 68.8                 | Ambient. Two taxis paused out. Cream nightclub closed.   |

# TABLE B1 – Measured Noise Levels