



# **CHINA TOWN DEVELOPMENT LTD**

## **NOISE ASSESSMENT**

### **TRIBECA GREAT GEORGE STREET, LIVERPOOL**

23 July 2015

**AEC REPORT: P3191/R1/PJK**

A handwritten signature in black ink, appearing to be 'P. Knowles', with a long, sweeping flourish extending to the right.

Prepared by:  
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## DOCUMENT STATUS

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## 1.0 INTRODUCTION

- 1.1 Acoustic & Engineering Consultants Limited (AEC) has been appointed by China Town Development Ltd, to assess the existing ambient and background noise levels at a proposed mixed-use commercial and residential accommodation development at the Tribeca development on Great George Street, Liverpool.
- 1.2 The exact site layout has not yet been confirmed, however, this report details the ambient noise levels measured on site, and discusses the implications on the external building fabric to achieve acceptable internal noise levels and meet appropriate planning guidance. This report is required to accompany a planning application for the development.
- 1.3 Acoustic terminology is described in brief in Appendix A.

## 2.0 BACKGROUND AND SITE DESCRIPTION

- 2.1 A scheme to build up to nine new blocks on vacant land adjacent to Great George Street, Liverpool has been prepared by China Town Development Ltd, as identified on Figure 1. Please note AEC have assigned the numbers to the blocks for reference purposes in this report only.
- 2.2 St James Street runs along the southwest boundary of Blocks 1 and 2. Beyond St James Street are industrial units including a garage and a carpet warehouse.
- 2.3 Great George Street makes up the eastern boundary of the development site. Adjacent to the site on the opposite side of Great George Street are existing residential blocks.
- 2.4 To the west of Blocks 4 to 9 are local residential streets, including Duncan Street, Upper Pitt Street and Cookson Street. To the north is Hardy Street and further residential properties.
- 2.5 To the south of the site is the junction of Great George Street and St James Street.

## 3.0 NOISE MEASUREMENTS

- 3.1 Daytime noise levels were measured by AEC on Friday 10 July 2015 between 1000 and 1330h and night-time noise levels were measured on Tuesday 21 and Wednesday 22 July 2015 between 2300 and 0110h.
- 3.2 Measurements were undertaken at 4 locations identified as A to D on Figure 1. Full details of the noise surveys are presented in Appendix B with measured noise data presented in Tables B1 and B2, with a brief description provided below.
- 3.3 Locations A and C were chosen to represent the facades of the blocks overlooking Great George Street. Location A was towards the centre of the proposed development site and Location C was closer to the junction of Great George Street and St James Street. During the daytime period the measured noise levels of around 64dBL<sub>Aeq, 15 minute</sub> and 68dBL<sub>A10, 15 minute</sub> was similar at both locations.
- 3.4 Similarly at night, there was little variation between the noise levels measured at both locations of 61dBL<sub>Aeq, 10 minute</sub> and 74 to 78dBL<sub>Amax</sub>.
- 3.5 Due to building works on Duncan Street, it was not possible to measure on either Duncan Street or Upper Pitt Street, therefore, the daytime and night-time measurements obtained at Location B have been considered representative of the blocks facing away from Great George Street. The ambient noise level at this location during the day was 55dBL<sub>Aeq, 15 minutes</sub> and 51dBL<sub>Aeq, 10 minutes</sub> at night. The

main noise source during both periods was due to road traffic noise on Great George Street, however, there was occasional car pass-bys on Cookson Street and the night-time maximum noise level from this source was around 67dBL<sub>Amax</sub>.

- 3.6 Location D was selected to represent the blocks overlooking St James Street and the industrial units. It should be noted that the units were inaudible during the day due to road traffic on St James Street and none of the units appeared to be operating at night.
- 3.7 The daytime noise levels at this location were 64dBL<sub>Aeq, 15minute</sub> and 68dBL<sub>A10, 15minutes</sub>. At night the amount of traffic reduced and the night-time ambient noise level was around 57dBL<sub>Aeq, 10minutes</sub> with maximum noise levels no greater than 77dBL<sub>Amax</sub>.
- 3.8 The lowest background noise levels measured around the development site were 49dBL<sub>A90, 15minutes</sub> during the daytime period and 40dBL<sub>A90, 10minutes</sub> at night.

## 4.0 BASIS OF ASSESSMENT

### Internal Noise Level Limits

- 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 no greater than those identified in the World Health Organisation (WHO) document '*Guidelines for Community Noise*'. These are to achieve acceptable internal noise levels to avoid annoyance and sleep disturbance. Inside dwellings, the noise level should not exceed 30dBL<sub>Aeq, 8 hour</sub> and 45dBL<sub>Amax</sub> at night and between 35dBL<sub>Aeq, 16 hour</sub> during the day.
- 4.3 These levels are similar to 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 Where these internal levels can be achieved with a less onerous glazing and ventilation strategy the suggested alternative systems would need to be agreed with LCC.

### Noise Egress

- 4.5 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.
- 4.6 The noise levels from ground floor activities would not only need to be controlled externally, but there would also be a need to control noise to the apartments above. Controlling noise levels in the apartments above to below NR25<sub>Lmax</sub> would be expected to be acceptable.

## 5.0 ASSESSMENT OF PROPOSED DEVELOPMENT

### Road Traffic Noise

- 5.1 Due to the constant nature of the road traffic on Great George Street it is possible to calculate the daytime ambient noise level,  $dBL_{Aeq, 16h}$  using the shortened measurement procedure in CRTN which is based on the measured  $L_{A10, 3h}$  of 68dB. To convert  $L_{A10, 3h}$  to a daytime average,  $L_{A10, 18h}$ , 1dB is subtracted. To convert this to an ambient noise level, a further 2dB is subtracted, giving an overall level of  $65dBL_{Aeq, 16h}$ , which correlated well but is marginally higher than the average measured ambient noise level,  $64dBL_{Aeq, 15minutes}$ , and hence the CRTN figure, has been used in our assessment calculations.
- 5.2 The above calculation can also be undertaken on the noise levels measured at Location D, representative of St James Street, where the daytime ambient noise level has been also been determined to be  $65dBL_{Aeq, 16h}$ .
- 5.3 At night, although noise levels may reduce after 0100h until about 0500h, the average noise level, of  $62dBL_{Aeq, 10minutes}$ , measured over the two hour period between 2300 and 0100h have been taken to be representative of the 8 hour period for the facades facing Great George Street. In addition, the night-time maximum noise level has been based on the highest maximum noise level of  $78dBL_{Amax}$  measured in the same period.
- 5.4 In relation to the southwestern facades of Blocks 1 and 2 overlooking St James Street, Location D, the night-time ambient noise level was  $57dBL_{Aeq, 10 minutes}$  and maximum noise levels did not exceed  $77dBL_{Amax}$ .
- 5.5 In regards to the facades of the blocks which will be screened either fully or partially from the main roads, the daytime ambient noise level would be expected to be around  $55dBL_{Aeq, 15minutes}$ , with night-time ambient of  $51dBL_{Aeq, 10minutes}$  and maximum noise levels of no greater than  $67dBL_{Amax}$ .
- 5.6 As identified above it is understood that LCC generally require that any habitable rooms in new residential developments within Liverpool city centre should be provided with 10/12/6 glazing and mechanical ventilation. However, calculations taking account of the measured external noise levels, the area of the windows (assumed to be around 40%) and assumed room dimensions, indicate that the required glazing and ventilation strategy could be reduced on all facades during the daytime and the facades not overlooking either Great George Street or St James Street at night.
- 5.7 The suggested revised glazing and ventilation strategy for all facades in the daytime and those not facing Great George Street or St James Street at is presented in Table 1 below.

**Table 1 – Outline Requirements to Achieve Sound level Reductions in Table 4**

Block	Elevation	Period	Glazing	Ventilation
1 & 2	South-Western	Day	4mm Glazing/thermal cavity/ 4mm Glazing (31dBR <sub>w</sub> , 25dBR <sub>Tra</sub> )	36dBD <sub>n,e,w</sub>
	North-Eastern	Day & Night	4/TC/4 (31dBR <sub>w</sub> , 25dBR <sub>Tra</sub> )	Standard Trickle
3, 4 & 5	Eastern	Day	4/TC/4 (31dBR <sub>w</sub> , 25dBR <sub>Tra</sub> )	36dBD <sub>n,e,w</sub>
	Western	Night	4/TC/4 (31dBR <sub>w</sub> , 25dBR <sub>Tra</sub> )	Standard Trickle
6, 7, 8 & 9	Northern	Day & Night	4/TC/4 (31dBR <sub>w</sub> , 25dBR <sub>Tra</sub> )	Standard Trickle

- 5.8 As these performances are different from LCC's standard requirement, this would need to be agreed with the Local Authority.

- 5.9 Windows can be openable providing that they are effectively acoustically sealed when closed and it is important that any frames and seals do not downgrade the sound insulation performance of the glazing.

#### **Noise Breakout from Ground Floor Use**

- 5.10 It is understood that the number and usage of the various retail units in the different blocks has not yet been determined, however, it would appear appropriate to set limits to include in the tenancy agreements. These could include that the noise level in the adjacent habitable rooms should not exceed  $NR25dB_{LAmax}$ , however, this would need to be agreed with the Local Authority.

#### **Plant Noise**

- 5.11 Although it is not yet known the amount, types or locations of any building services plant which may be installed on this development, the 'rating' noise level from all plant should be designed to meet LCC requirements. Therefore, based on the measured background noise levels of  $40dB_{LA90}$  during the night and  $49dB_{LA90}$  during the day, external noise levels from all plant serving the proposed development should be controlled to  $34dB_{LAeq}$  during the night and  $43dB_{LAeq}$  during the day at the nearest noise sensitive property which could be either an existing residential property or part of the new development.
- 5.12 This will require further development once the layout of the site and location of the plant has been finalised.

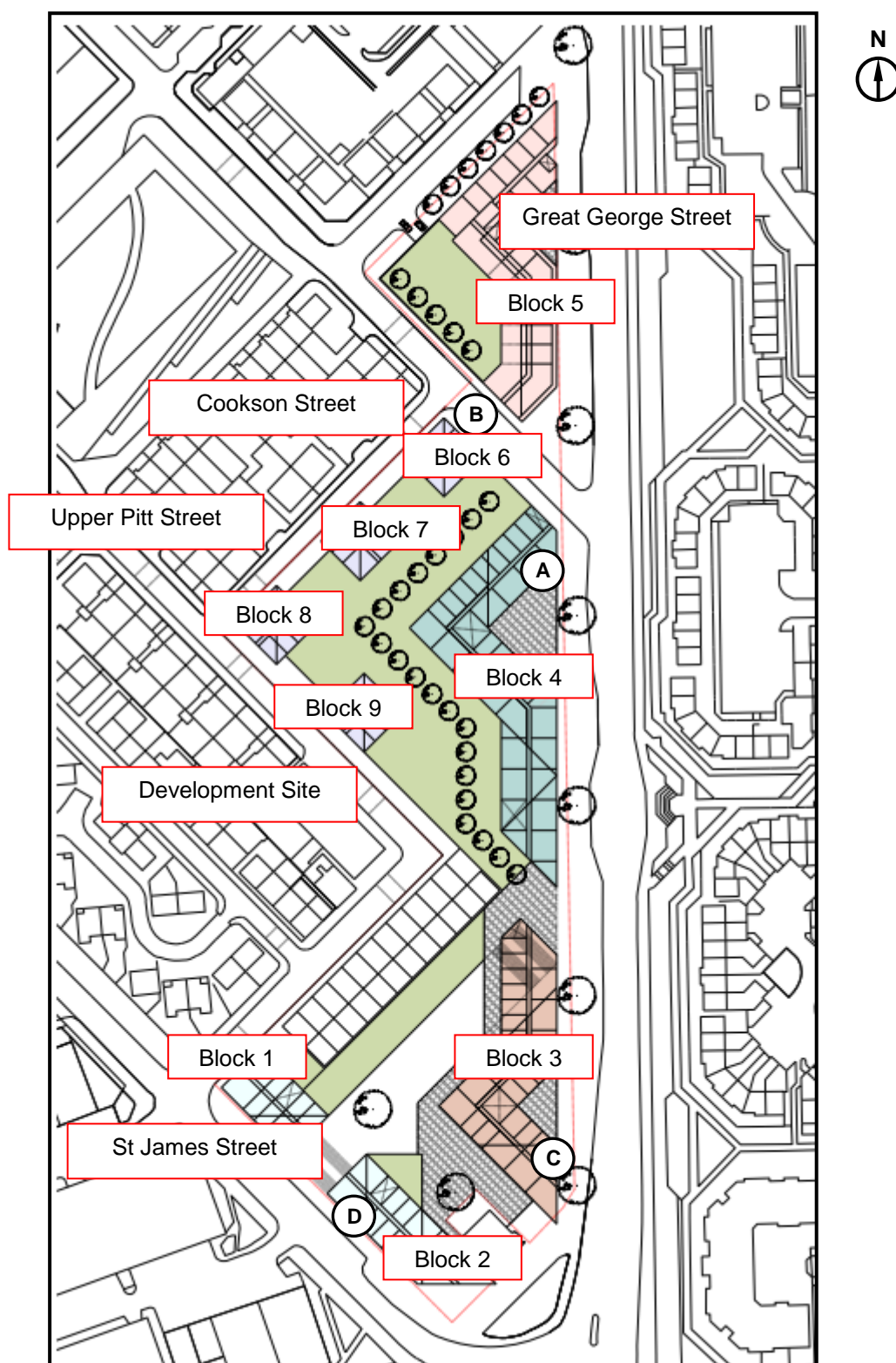
## **6.0 CONCLUSION**

- 6.1 Acoustic and Engineering Consultants Limited has been appointed to undertake a noise assessment for the proposed mixed-use development at Tribeca, Great George Street, Liverpool.
- 6.2 Based on the noise levels at the proposed development site, the sound insulation requirements to achieve appropriate internal noise levels based on WHO guidance has been determined and is presented in Section 4. The proposed specification is less onerous than the usual requirement of LCC for all habitable rooms on all elevations with the exception of bedrooms which overlook Great George Street and St James Street which would require to meet LCC's requirement of a glazing build-up of 10/12/6 and mechanical ventilation.
- 6.3 Total external noise levels from all future mechanical and electrical plant serving the proposed development should be controlled to  $34dB_{LAeq}$  at night, and  $43dB_{LAeq}$  during the day outside the nearest residential properties.
- 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.



Paul Knowles

**FIGURE 1 – Proposed Site Layout Identifying Monitoring Locations**



## APPENDIX A – Acoustic Terminology in Brief

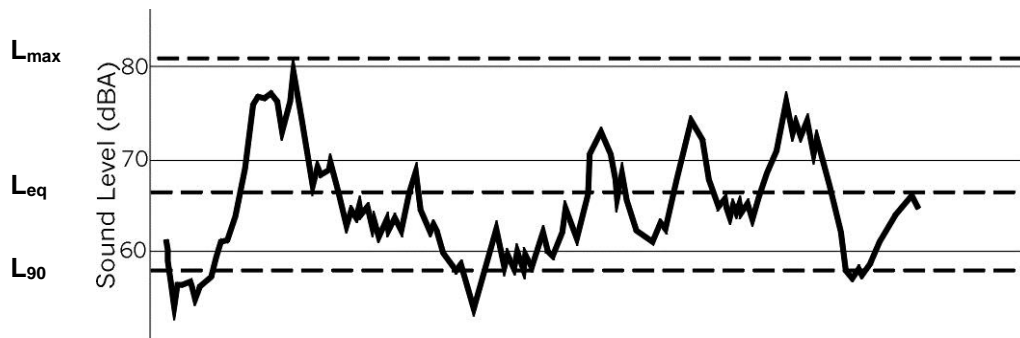
Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air. The rate at which the pressure fluctuations occur determines the pitch or *frequency* of the sound. The frequency is expressed in Hertz (*Hz*), that is, cycles per second. The human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

<b><math>L_{Aeq,T}</math></b>	The equivalent continuous (A-weighted) sound level may be considered as the "average" sound level over a given time, <i>T</i> . It is used for assessing noise from various sources including transportation, industrial and construction sources and can be considered as the "ambient" noise level.
<b><math>L_{A90}</math></b>	The (A-weighted) sound level exceeded for 90% of a measurement period. It is the value used to describe the "background" noise.
<b><math>L_{Amax}</math></b>	The maximum (A-weighted) sound level during a measurement period.
<b>Free-field Level</b>	This refers to the sound level measured outside, away from reflecting surfaces.
<b><math>R_w</math></b>	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.
<b><math>R_{tra}</math></b>	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.
<b><math>D_{n,e,w}</math></b>	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	Daytime: Friday 10 July 2015, 1000 to 1400h Night-Time: Tuesday/Wednesday 21/22 July 2015, 2300 to 0100h
Personnel Present	Paul Knowles (AEC)
Equipment Used	B&K 2260 Real Time Analyser (AEC Kit 1)
Weather Conditions	Daytime: Dry, 22°C, clear skies, calm Night-Time: Dry, 15°C, clear skies, 2m/s westerly breeze
Measurement Procedure	<p>Ambient, background and maximum noise levels were measured at 5 locations, identified as Locations A to E on Figure 1 and described below.</p> <p>A - On the edge of the path, 12m from the edge of the carriageway of Great George Street.</p> <p>B - 5m from the edge of the carriageway of Cookson Street.</p> <p>C - On the edge of the path, 12m from the edge of the carriageway of Great George Street.</p> <p>D - On the edge of the path, 12m from the edge of the carriageway of Great George Street.</p> <p>E - 5m from the edge of the carriageway of St James Street.</p> <p>All locations were selected to measure baseline noise levels, which were measured in terms of <math>L_{Aeq}</math>, <math>L_{A10}</math>, <math>L_{A90}</math> and <math>L_{Amax}</math> (fast response) typically over 5 to 15 minute periods.</p> <p>All the measurements were taken at a height of 1.5m above ground and all were free field measurements.</p> <p>The sound level analyser, which conforms to BS EN 61672-12003 '<i>Electro acoustics – sound level meters - Part 1 Specifications</i>' for Class 1 Type Z meters, was in calibration and check calibrated before and after the measurement periods using a Brüel &amp; Kjær type 4231 (94dB) calibrator. There was no significant drift of calibration. Calibration certificates are available on request.</p>
Measured Data	A summary of the results are presented in Tables B1 and B2.

**TABLE B1 – Measured Daytime Noise Levels**

Location	Period, h	Noise Level, dB				Comments
		L <sub>Aeq</sub>	L <sub>A10</sub>	L <sub>A90</sub>	L <sub>Amax, F</sub>	
A	1001-1016	64.3	68.0	51.3	73.6	Road traffic on Great George Street
	1123-1138	64.0	67.8	51.1	74.8	
	1231-1246	63.6	67.2	49.0	73.3	
B	1018-1033	54.6	57.3	49.3	63.3	Road traffic on Great George Street and Cookson Street
	1144-1159	55.9	58.6	49.8	72.9	
	1247-1302	55.1	57.8	50.2	70.0	
C	1037-11047	64.8	68.6	51.9	76.2	Road traffic on Great George Street
D	1052-1102	62.5	66.4	53.6	74.5	Road traffic on Great George Street
	1306-1316	63.8	67.9	53.4	75.2	
E	1104-1114	64.9	69.3	56.3	78.6	Road traffic on Saint James Street
	1231-1246	63.6	67.2	49.0	73.3	
	1318-1333	63.8	68.2	55.1	74.1	

**TABLE B2 – Measured Night-Time Noise Levels**

Location	Period, h	Noise Level, dB			Comments
		L <sub>Aeq</sub>	L <sub>A90</sub>	L <sub>Amax, F</sub>	
A	2305-2315	61.0	43.9	78.5	Road traffic on Great George Street
	2356-0006	62.7	42.2	75.1	
B	2317-2327	51.0	42.5	67.2	Road traffic on Great George Street and Cookson Street
	0008-0018	51.7	40.5	67.1	
D	2330-2340	61.8	46.6	75.9	Road traffic on Great George Street
	0022-0032	60.8	44.3	74.1	
	0057-0107	60.5	39.7	77.2	
E	2343-2353	58.8	44.0	76.6	Road traffic on Saint James Street
	0034-0044	54.6	40.2	72.6	
	0044-0054	57.3	42.9	73.6	