

## Westfield Liverpool ELP

### Revised Scheme Development Application Acoustic Assessment

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## 1 INTRODUCTION

Acoustic Logic Consultancy have been engaged to conduct an assessment of potential noise impacts associated with the proposed additions to the Liverpool Westfield development.

The proposal includes the construction of a rooftop entertainment and dining precinct and a commercial office tower. The proposed works are primarily on the Level 3, Level 4 and Roof levels. There are some minor works proposed on the lower levels that would not impact noise emissions.

Noise impacts associated with the proposal have been addressed for the following noise sources:

- Patrons within external dining areas,
- Indoor entertainment uses, and
- Mechanical plant noise in principle.

Noise impacts have been addressed in accordance with the following:

- NSW Liquor and Gaming – Standard acoustic conditions.
- Liverpool Council – Development Control Plan 2015.
- Environment Protection Authority – Noise Policy for Industry.

An assessment of noise impacts associated with the development has determined that the proposal can achieve the requirements of the aforementioned authorities and regulations for the proposed extended period of operation.

### **SoundPlan™ Note**

Noise levels have been predicted at the receiver locations using SoundPlan™ modelling software implementing the ISO 9613-2:1996 *“Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation”* noise propagation standard. Noise levels presented in the body of this report are the façade incidence levels and do not include façade reflection.

## 2 SITE BACKGROUND

Westfield Liverpool is located on the parcel of land bordered by Bathurst Street, Campbell Street, George Street and Elizabeth Street, Liverpool.

The site is surrounded by the following uses:

- Mixture of low set and multi-storey residential apartments to the west,
- Multi-storey residential apartment buildings to the southwest,
- Commercial zoning to the south including an existing office tower immediately adjacent on the northern side of Elizabeth Drive,
- Commercial zoning to the east,
- Mixture of residential, commercial and public domain uses to the north.

### 2.1 SITE PROPOSAL

The proposal will include the construction of an entertainment precinct and commercial tower on top of the existing structure and will typically encompass the following:

- New gold class cinemas on Level 3.
- Food and beverage tenancies with alfresco dining areas on Level 3. A large canopy over part of these external spaces is proposed.
- Entertainment and leisure tenancies on Levels 3 and 4.
- Commercial tower comprising 7 levels of commercial offices starting at Level 4 plus a roof plant room.
- Additional carparking on Level 4 at the northwest corner of the site comprising approximately 150 additional spaces. Notwithstanding, the total number of spaces would decrease from 3534 to 3342. There would also be a reconfiguration of some of the existing parking bays which would not impact noise emissions.

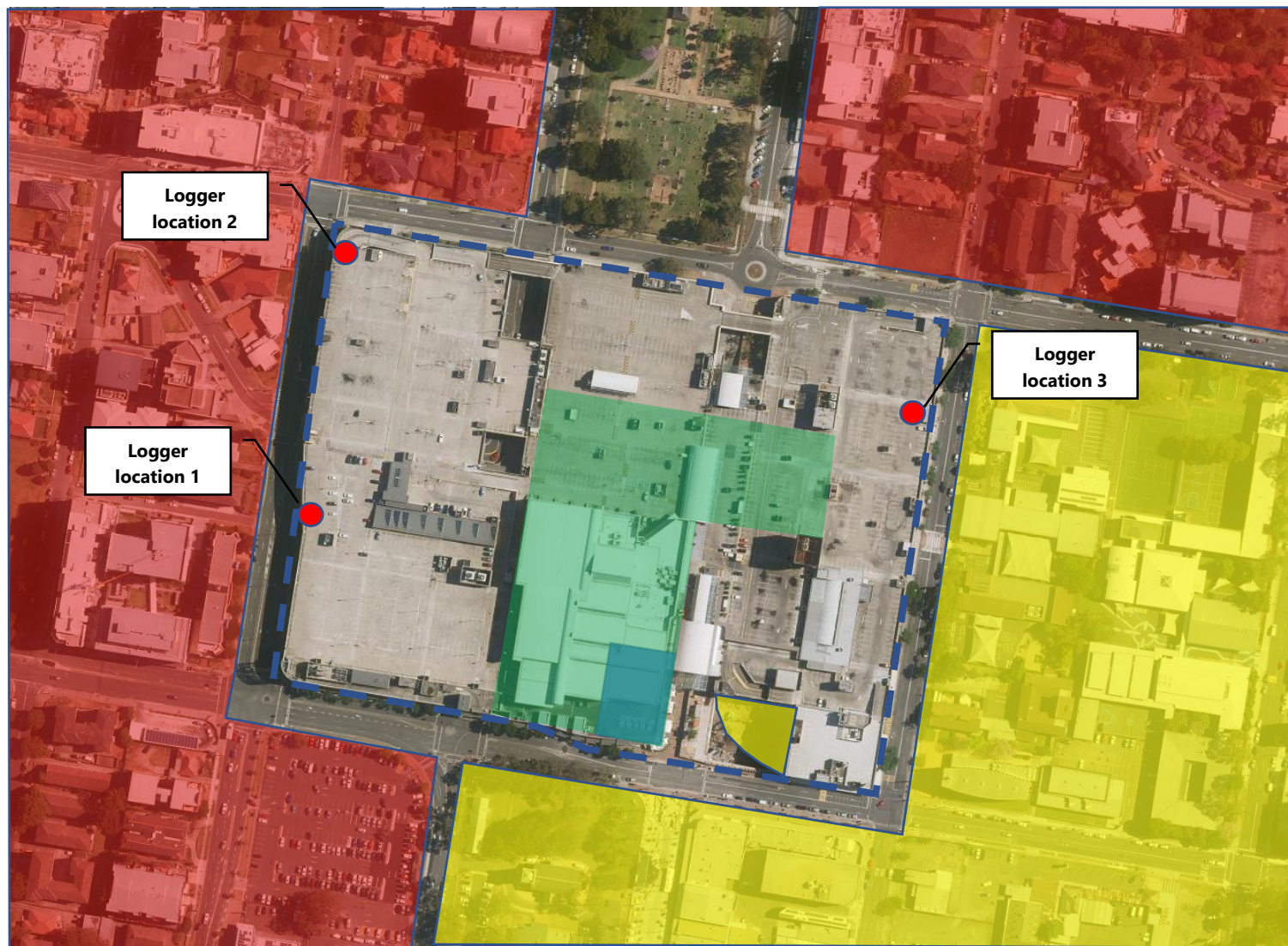
The outdoor alfresco dining area which will form the basis of this assessment is provided in Figure 2.

### 2.2 SENSITIVE RECEIVER LOCATIONS

The site is surrounded by residential uses to the south, west and north of the existing Westfield development. New multi-storey residential buildings will overlook the dining precinct and have been used as a basis for the assessment. This will include:

- Residential towers at 69-73 Elizabeth Street to the west of the site,
- Residential tower at 87-91 Campbell Street on the corner of Campbell and Bathurst street to the northwest,
- Residential tower at 19-21 Northumberland Street to the north,
- Residential tower at 18 Bathurst Street to the north,
- Residential tower at 58 Macquarie Street to the north,
- Residential tower at 35 Bigge Street to the north.

There is an existing commercial office tower on the southern site boundary.



# **LEGEND**

Proposed L3 entertainment precinct	
Proposed commercial tower	
Residential receivers and zoning	
Commercial / Retail	
Liverpool Westfield	--

**Figure 2-1: Site Survey and Monitoring Positions**





### 3 EXISTING ACOUSTIC ENVIRONMENT

The acoustic environment is categorised by moderate to high background noise levels during the day and evening and moderate levels during the night.

Acoustic monitoring was conducted at the site to establish the background noise levels which will be used as basis for this assessment.

#### 3.1 ENVIRONMENTAL NOISE DESCRIPTORS

Environmental noise constantly varies. Accordingly, it is not possible to accurately determine prevailing environmental noise conditions by measuring a single, instantaneous noise level.

To accurately determine the environmental noise a 15-20 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters.

In analysing environmental noise, three-principle measurement parameters are used, namely  $L_{10}$ ,  $L_{90}$  and  $L_{eq}$ .

The  $L_{10}$  and  $L_{90}$  measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement intervals.

The  $L_{10}$  parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the  $L_{90}$  level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The  $L_{90}$  parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the  $L_{90}$  level.

The  $L_{eq}$  parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the 15 minute period.  $L_{eq}$  is important in the assessment of environmental noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of environmental noise.

#### 3.2 BACKGROUND NOISE LEVELS

Background noise levels which will be used as a basis for this assessment are detailed in the following sections.

##### 3.2.1 Measurement Equipment

Unattended noise monitoring was conducting using Acoustic Research Laboratories Pty Ltd noise logger. The logger was programmed to store 15-minute statistical noise levels throughout the monitoring period. The equipment was calibrated at the beginning and the end of the measurement using a Rion NC-73 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode.

##### 3.2.2 Measurement Location

Monitoring was conducted in several locations around the site as indicated in Figure 1.

##### 3.2.3 Measurement Period

Noise monitoring was conducted during the following periods:



**Table 1 – Period of Noise Monitoring**

<b>Logger Position</b>	<b>Period of Monitoring</b>
1 – West	26 July to 2 August 2018
2 - Northwest	26 July to 2 August 2018
3 – East boundary	26 July to 2 August 2018

### 3.2.4 Background Noise Levels

The background noise levels established from the unattended noise monitoring are detailed in the Table below.

**Table 2 – Rating Background Noise Level (Logger 1)**

<b>Date</b>	<b>Rating Background Noise Level dB(A) L<sub>90</sub></b>			
	<b>Day</b>	<b>Evening</b>	<b>Night (10pm-12am)</b>	<b>Night</b>
26/07/2018	-	51	49	-
27/07/2018	50	50	50	45
28/07/2018	50	50	50	45
29/07/2018	51	50	43	44
30/07/2018	50	50	45	44
31/07/2018	51	51	45	44
1/08/2018	50	50	46	44
2/08/2018	-	-	-	45
<b>RBL</b>	<b>53</b>	<b>50</b>	<b>46</b>	<b>45</b>

**Table 3 – Rating Background Noise Level (Logger 2)**

<b>Date</b>	<b>Rating Background Noise Level dB(A) L<sub>90</sub></b>			
	<b>Day</b>	<b>Evening</b>	<b>Night (10pm-12am)</b>	<b>Night</b>
26/07/2018	-	52	48	-
27/07/2018	51	51	50	47
28/07/2018	51	49	50	47
29/07/2018	49	49	46	44
30/07/2018	51	50	48	41
31/07/2018	50	49	46	43
1/08/2018	51	51	49	42
2/08/2018	-	-	-	46
<b>RBL</b>	<b>51</b>	<b>50</b>	<b>48</b>	<b>44</b>

**Table 4 – Rating Background Noise Level (Logger 3)**

Date	Rating Background Noise Level dB(A) L <sub>90</sub>			
	Day	Evening	Night (10pm-12am)	Night
26/07/2018	-	51	46	-
27/07/2018	50	50	48	45
28/07/2018	50	50	49	45
29/07/2018	51	50	45	44
30/07/2018	50	50	45	44
31/07/2018	51	51	46	44
1/08/2018	50	50	46	44
2/08/2018	-	-	-	45
<b>RBL</b>	<b>50</b>	<b>50</b>	<b>46</b>	<b>44</b>

### 3.2.5 Attended Measurement

An attended measurement to determine the noise spectrum of the background measurements was taken adjacent to the multistorey residential apartment buildings located on the corner of Castlereagh and Elizabeth Street. Refer to Figure 1 for detailed location. The measured spectrum is detailed below.

**Table 5 – Measured Background Spectrum**

Time	Octave band sound pressure level, dB								
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
10pm	58	56	51	49	51	41	29	25	<b>49</b>

## 4 NOISE EMISSION CRITERIA

Noise emissions from the proposed precinct have been addressed in accordance with the noise emission requirements of the following documents;

- Liverpool City Council Local Environment Plan (LEP) 2008 and Development Control Plan (DCP) 2018 (including amendments dated 23 August 2017)
- Liverpool City Council Social Impact Assessment Policy
- NSW Department of Environment and Heritage, Environmental Protection Agency document – Noise Policy for Industry (NPI) 2017
- NSW Department of Industry, Office of Liquor and Gaming standard conditions.

## 4.1 LIVERPOOL CITY COUNCIL DEVELOPMENT CONTROL PLAN 2008

The Liverpool City Council DCP contains the following provisions applicable to the proposed precinct.

*Part 1, Section 27 (Social Impact Assessment) refers to developments which because of their use or nature require additional assessment. As detailed in Table 20 of this document, applications for development to hotels (bars, pubs, taverns), nightclubs and registered clubs require an assessment under this clause.*

*Part 4 of the Liverpool City Council DCP 2008 details requirements for development in the Liverpool City Centre. Figure 2 from this Section (site specific extract below) details land uses within this area.*

*Residential zoning is located in the following locations:*

- *Eastern side of Bathurst Street*
- *Western side of Bathurst Street south of Elizabeth Drive between Bathurst Street and Northumberland Street.*
- *North of Campbell Street east of Macquarie Street*

*Receivers within these locations have been addressed as part of this assessment*

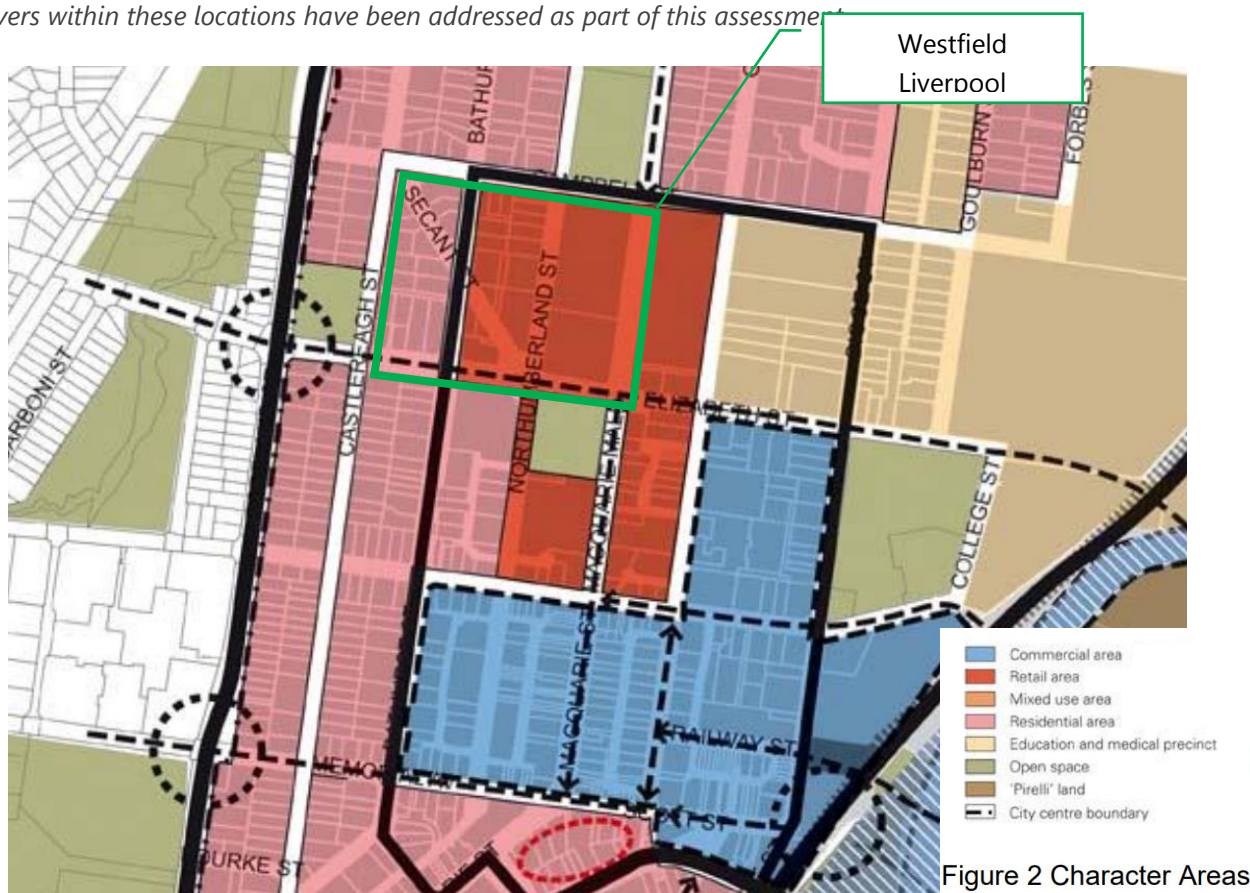


Figure 2 Character Areas

Figure 4-1 - Land Zoning in Liverpool City Centre

## 4.2 NSW DEPARTMENT OF INDUSTRY, OFFICE OF LIQUOR AND GAMING GUIDELINES

When assessing noise emissions from licensed premises, noise emissions must comply with the acoustic requirements generally imposed by the NSW L&G. These guidelines relate to noise generated by patrons. The requirements are set out below:

- *The  $L_{10}$  noise level emitted from the premises shall not exceed 5dB above the background  $L_{90}$  sound level in any Octave Band Centre Frequency (31.5kHz to 8kHz inclusive) between the hours of 7.00am to 12.00 midnight when assessed at the boundary of the nearest affected residential premises.*
- *$L_{10}$  noise level emitted from the premises shall not exceed the background  $L_{90}$  sound level in any Octave Band Centre Frequency (31.5kHz to 8kHz inclusive) after midnight when assessed at the boundary of the nearest affected residential premises.*
- *After midnight, noise emissions from the Place of Public Entertainment are to be inaudible within any habitable rooms in nearby residential properties.*

## 4.3 NSW EPA NOISE POLICY FOR INDUSTRY (NPI) 2017

The EPA NPI has two criteria which both are required to be satisfied, namely Intrusiveness and amenity. The NPI sets out acceptable noise levels for various localities. The policy indicates four categories to assess the appropriate noise level at a site. They are rural, suburban, urban and urban/industrial interface. Under the policy the nearest residential receivers would be assessed against the rural criteria.

Noise levels are to be assessed at the property boundary or nearby dwelling, or at the balcony or façade of an apartment.

### 4.3.1 Intrusiveness Criterion

The guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the  $L_{eq}$  descriptor not exceed the background noise level by more than 5dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

Background noise levels adopted are presented in Section 3.2. Noise emissions from the site should comply with the noise levels presented below when measured at nearby property boundary.

### 4.3.2 Project Amenity Criterion

The guideline is intended to limit the absolute noise level from all noise sources to a level that is consistent with the general environment.

The EPA's NPfI sets out acceptable noise levels for various localities. The recommended noise amenity area is based upon the measured background noise levels at the sensitive receiver. Based on the measured background noise levels detailed in Section 3.2, the Noise Policy for Industry suggests the adoption of the 'rural' categorisation.

The NPI requires project amenity noise levels to be calculated in the following manner;

$$L_{Aeq,15min} = \text{Recommended Amenity Noise Level} - 5 \text{ dB(A)} + 3 \text{ dB(A)}$$

The amenity levels appropriate for the receivers surrounding the project site are presented in Table 6.

**Table 6 – EPA Amenity Noise Levels**

<b>Type of Receiver</b>	<b>Time of day</b>	<b>Recommended Noise Level dB(A)<sub>Leq(period)</sub></b>	<b>Project Amenity Noise Level dB(A)<sub>Leq 15min</sub></b>
Residential – Urban	Day	60	58
	Evening	50	48
	Night	45	43
Commercial premises	When in use	65	63
Industrial premises	When in use	70	68

The NSW EPA Noise Policy for Industry (2017) defines;

- Day as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays;
- Evening as the period from 6pm to 10pm.
- Night as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays

#### **4.4 SUMMARISED NOISE EMISSION CRITERIA**

A summary of noise emission criteria is provided below.



**Table 7 – Noise Emission Objectives**

Receiver	Noise Source	Time of Day	Criteria	Octave Band Noise Criteria, dB L <sub>10</sub>									dB(A) L <sub>eq</sub>
				31.5Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
All	Entertainment	7am to 12am	BG + 5dB, L <sub>10</sub>	56	56	54	49	47	49	39	31	27	N/A
	Mechanical Plant	Day	BG + 5dB(A) Amenity Criterion L <sub>eq</sub> 15min	A-weighted noise requirement									58
		Evening		A-weighted noise requirement									48
		Night		A-weighted noise requirement									43
Surrounding Commercial	Mechanical Plant	24 hours	External, INP	A-weighted noise requirement									63

Note: Background noise levels for entertainment noise targets are based on the night time noise level up to 12am.

## 5 ASSESSMENT OF NOISE IMPACTS

Noise impacts have been addressed for the following noise sources:

- Carpark movements
- Patrons within external dining areas,
- Noise breakout from internal entertainment venues,
- Mechanical plant in principle.

### 5.1 CARPARK AND LOADING DOCKS

#### 5.1.1 General

Additional carpark spaces would be constructed on Level 4 over 3 existing carpark levels and adjacent to the existing roof carpark that covers most of the site. At most, the proposed carpark would increase noise levels by 1 dB(A) at the most impacted receivers. As a noise increase of 1 dB(A) is regarded as an inaudible change in noise level, it is concluded that the proposed carpark addition would not have any adverse noise impact.

#### 5.1.2 Proposed Kiss and Ride

A kiss and ride area is proposed on the northern side of Elizabeth Drive (just west of Macquarie Street). The area is currently used as bus zone (between Macquarie Street and Northumberland Street) some 70 metres long. The provision of the indented Kiss and Ride bay would reduce the length of the bus bay by some 20 metres (to 50 metres). Given the existing level of traffic movements on Elizabeth Drive and its location opposite commercial receivers no adverse impacts are predicted from the proposed kiss and ride area.

#### 5.1.3 Loading Docks

Docks 1 and 5 will be used to service the office tower and ELP. In addition to deliveries to the office tower and ELP by cars/vans/couriers are also likely to occur via the roof top car park as a matter of convenience. One space in the vicinity of the entry to the office tower and two spaces in the vicinity of the entry to the ELP (total 3 spaces on the roof top car park) will be allocated as loading bays.

Surveys of loading docks 1 and 5 indicate that peak demand occurs between 9:30 and 11 am in Dock 1 and in Dock 5 between 10.30am and 2.00pm.

The vehicle movements and loading dock noise associated with the new roof top carpark would be similar to other patron movements given these will be passenger vehicles and light vans associated with courier deliveries. Therefore, there would be no audible additional impact from these movements.

The remaining loading dock demand will be taken up within the existing loading docks. Surveys indicate that Docks 1 and 5 can operate at or near maximum capacity during peak periods of use. Therefore, any increased demand as a result of the proposed ELP and office tower would be not to change significantly the maximum (peak demand) noise level emitted by the loading docks. There would be an increase in the likelihood of a peak demand period occurring, or increase the length of the peak demand period, but the emitted noise level during peak use periods would not be affected.

## 5.2 EXTERNAL DINING AREAS

The assessment of noise from the new alfresco dining areas on Level 3 has been undertaken using the following assumptions.

- The average sound power per patron (raised voice) in an outdoor area (with background level music) is 77dB(A)  $L_{10}$ , and that one in two patrons are speaking at any one time. Patron vocal effort is based on the following spectrum.

**Table 8 – Assumed Patron Noise Spectrum**

63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A-wt
61	66	69	73	74	69	60	47	77

- External music (live or amplified) is played at a low-moderate noise level (75dB(A) $L_{10}$ ) at 3m from the speakers.
- The number of patrons has been based on a preliminary evaluation of outdoor seating, play and circulation areas of approximately 900 patrons (Source: Advice from Steve Watson and Partners). This is in addition to patrons located within the building.
- Live bands may play within the central courtyard area between the retail food and beverage outlets. Predicted noise levels have been based off two large speakers with a sound power level not exceeding 105dB(A). Speakers face toward the commercial tower.
- The external dining spaces will be covered by individual canopies as well as a large high level canopy at the northern end.

It is noted that the assessment conducted on this basis is likely to be conservative given that:

- The residential receiver assessment is based on the rating background noise level at midnight. Normally, for similar restaurant and entertainment precincts patron numbers would be expected to diminish after 10pm so the maximum external seating capacity is unlikely to occur at midnight when background levels are lowest. The 10pm background noise level is significantly higher than the midnight level, meaning the assessment at midnight is likely to be conservative in practice.
- Maximum patron numbers at night are generally likely to occur on Friday and Saturday nights when background noise levels are higher than the rating background noise level used in the assessment.

## 5.3 INTERNAL ENTERTAINMENT AND LEISURE USES

The proposed leisure centres could incorporate uses similar to the following:

- Active bowling alleys such as "Strike bowling" which incorporate licensed bars and music,
- Gymnasium,
- Skyzone trampoline centres / wall climbing.

In our experience the typical worst case would be the Strike bowling type venue where there is significant music.

Noise predictions have been based on the following:

- Internal sound pressure level of 82dB(A)  $L_{10}$  as recorded by ALC at King Street Wharf.
- Roof has been assumed as being sheet metal with insulated sarking behind.

## 5.4 PREDICTED NOISE LEVELS

### 5.4.1 Residential Receivers

Predicted noise levels from the aforementioned operation is provided in the following table and illustrated in Figure 5-1 and Figure 5-2. Predicted noise levels are presented to the worst-case receiver located at 58 Macquarie Street, Liverpool.

### 5.4.2 Commercial Receivers

The potentially most impacted commercial receiver is the commercial tower immediately to the south of the site on Elizabeth Drive.

Typical peak noise emission periods for the open entertainment area would typically correspond to times when the office building would be largely unoccupied (peak use periods would be Friday and Saturday nights and weekends. Outside the peak use periods modelled noise emissions would be significantly lower with the lower occupancy levels and live music would not be present.

Notwithstanding the noise levels during peak use periods incident on the façade, without loud amplified music being played, is less than 65 dB(A) which complies with the NPfI guideline.

In the case of loud amplified music, depending on the location of the loudspeakers and level at which amplified music is played, noise levels at the office tower may marginally exceed 65 dB(A).

It is noted that the office building is a modern building with sealed, performance glazing. In this case the EPA amenity guideline is likely to provide a conservative estimate of noise impact to the internal office space and higher levels may be able to be generated without adversely impacting the occupants of that building, or other buildings.

Accordingly, sound levels from amplified music may need to be managed and limited when the commercial building is occupied. Provided the recommendations in Section 6 are adopted noise emissions to the office building would remain within the amenity levels nominated in the EPA NPfI.

## 5.5 MECHANICAL PLANT IN PRINCIPLE

The proposal may include ancillary mechanical services plant (*e.g. condensing units, exhaust fans, etc.*). As detailed plant selections and plans are not available at this stage, it is not possible to carry out a detailed examination of the ameliorative measures that may be required in order to achieve the project acoustic objectives.

It is expected that kitchen exhaust fans will be required to each food/beverage tenancy given the nature of the use. Given proximity to receivers, it is expected that minimal acoustic treatment would be required to the fans. In any case, noise emissions may be addressed using acoustic attenuators on the discharge of these fans.

## 5.6 DISCUSSION

Predicted noise levels from the operation of the site indicate that compliance with the noise emission objectives can be achieved.

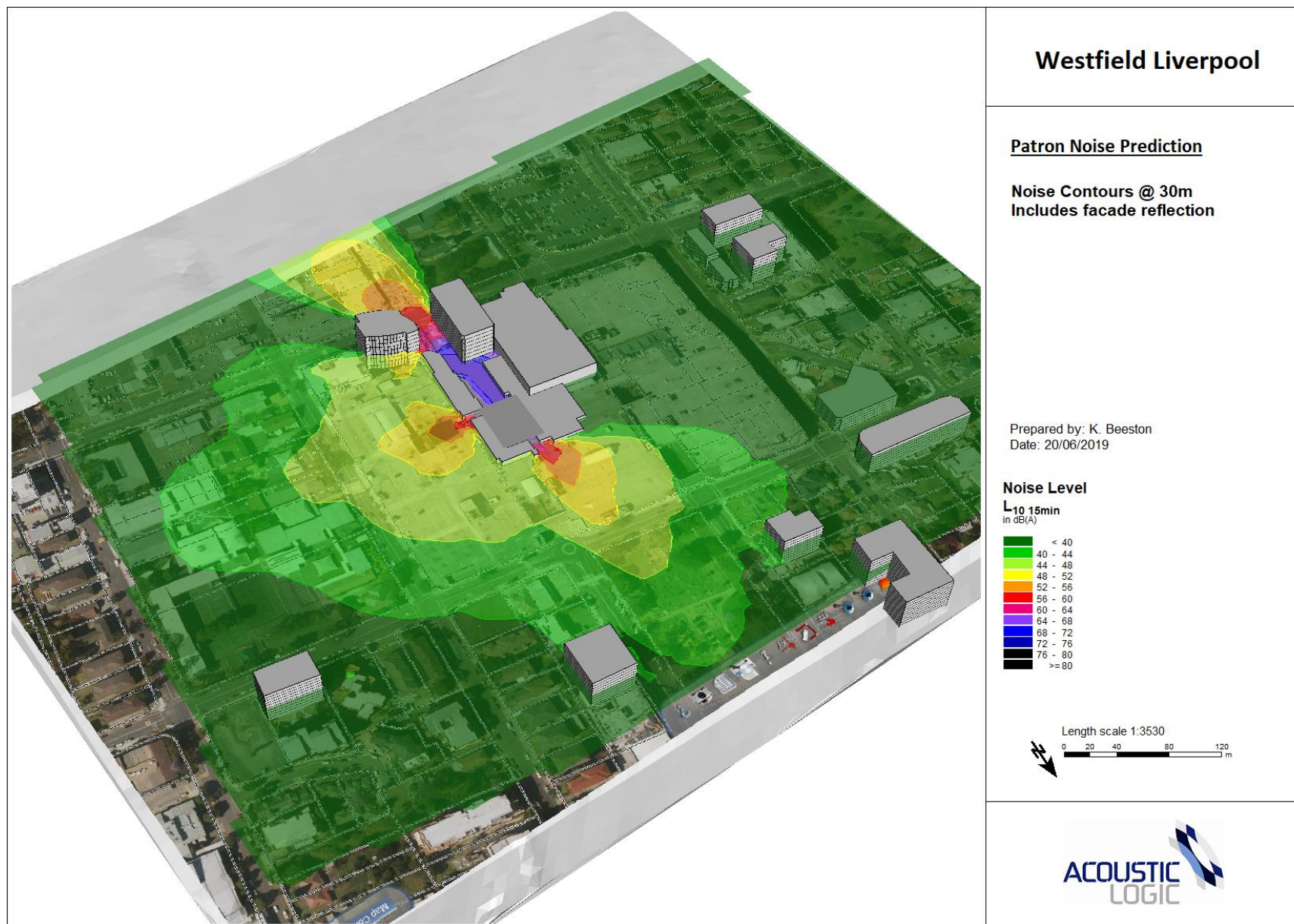
Noise from the new outdoor areas are expected to comply with the Liquor & Gaming noise requirements on the proviso that the recommendations of Section 6 are adopted.

**Table 9 – Predicted Noise Levels**

Receiver Location	Time of Day		Octave Band Noise Levels, dB L <sub>10</sub>									dB(A) L <sub>10</sub>	dB(A) L <sub>eq</sub>
			31.5Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz		
58 Macquarie Street	Up to 12 midnight	Predicted Noise Level, L <sub>10</sub>	-	48	50	41	45	41	35	22	-	45.3	
		Criteria, L <sub>10</sub>	56	56	54	49	47	49	39	31	27	N/A	
		Exceedance	-56	-8	-4	-8	-2	-8	-4	-9	-27	N/A	-

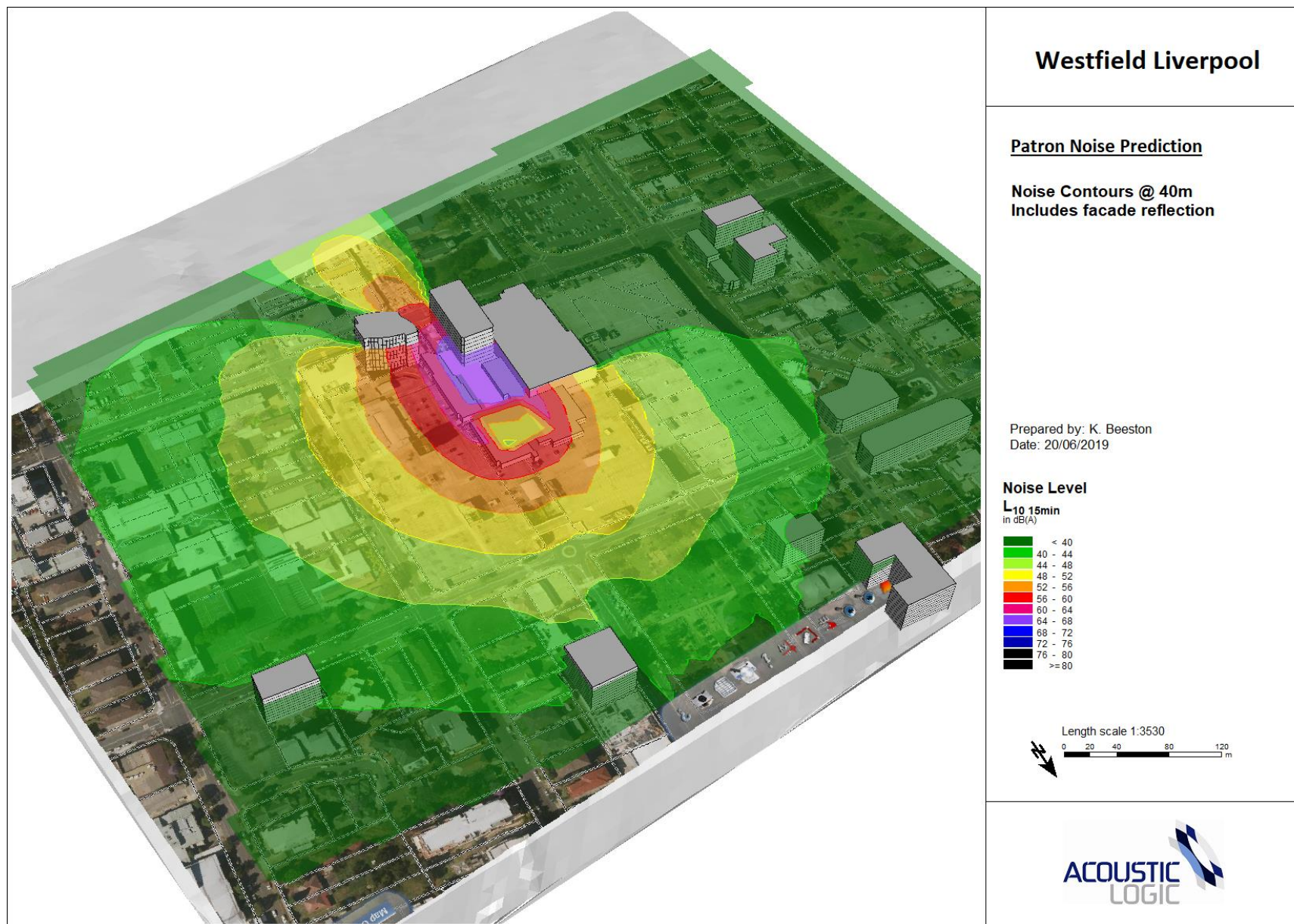
The modelling indicates that even under worst case conditions noise emissions to residential receivers will comply at all times.





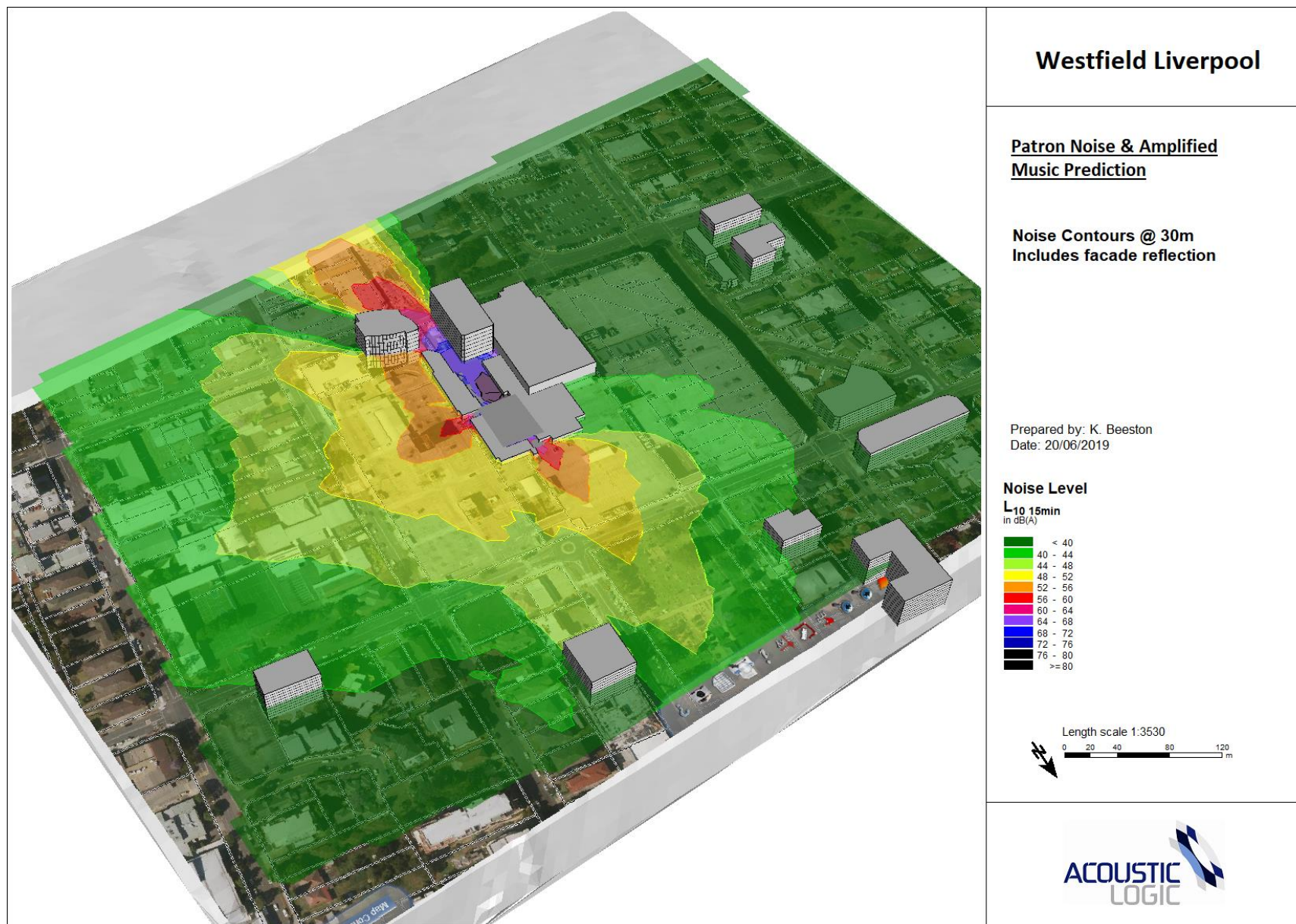
**Figure 5-1: Patron Noise Emissions – Contours at RL 30m**



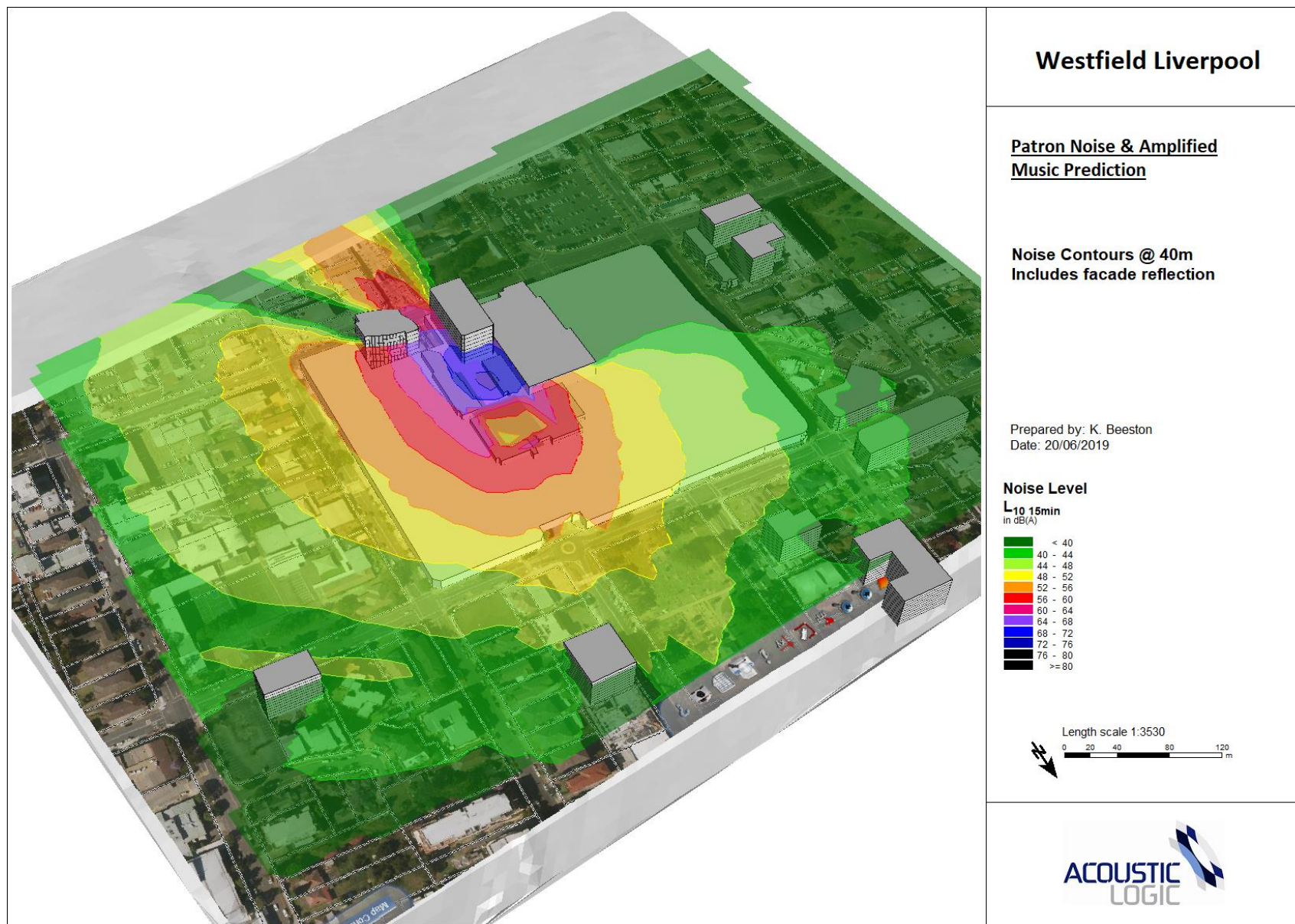


**Figure 5-2: Patron Noise Emissions – Contours at RL 40m**





**Figure 5-3: Patron & Amplified Music Noise Emissions – Contours at 30m**



**Figure 5-4: Patron & Amplified Music Noise Emissions – Contours at 40m**



## 6 CONSTRUCTION NOISE AND VIBRATION

Construction would be carried out during the day, Monday to Saturday. Impacts to residential receivers will be mitigated by the significant distance separation (they are separated by at least 100m from construction activity) and the generally high ambient noise levels associated with being in a commercial precinct.

The commercial receiver most impacted by construction noise would be the University Tower located to the south west of the proposed precinct and tower. Given this is a modern building with a sealed façade only very loud activities such as demolition using hydraulic hammers would likely adversely impact the occupants. Impacts from construction noise should be managed in accordance with the EPA Interim Construction Noise Guideline and a Construction Noise and Vibration Management Plan should be developed to regulate construction activities in response to the EPA guideline. As a minimum the management plan should:

- Identify sensitive receivers around the site and appropriate noise and vibration management levels..
- Predict noise and vibration impacts during the various phases and activities associated with the project.
- If required, identify mitigative measures which would include selection of quieter plant/methodologies, location of plant, enclosures and barriers, respite periods, management measures, monitoring, etc.
- Outline the measures to be adopted.
- Recommend community liaison measures, complaints handling procedures, etc.

## 7 RECOMMENDATIONS

The following acoustic treatments and management conditions are recommended to ensure compliance with the noise emission criteria and to manage noise emissions from the proposed additions.

- With the exception of live music, all other music played within the external area should not exceed 70dB(A) at 3m from any speaker.
- The underside of the proposed high level canopy over the external spaces be lined with an absorptive surface having an NRC not less than 0.9.
- That the operation of any live entertainment or noise producing activities (other than normal patron activity and background music) be governed by a Plan of Management that stipulates the times of operation, location of events and the corresponding maximum permissible noise levels so as to prevent adverse noise impacts at the residential and commercial receivers.
- Should there be any tenancies that would generate higher internal noise levels than assumed in this assessment a noise impact assessment should be submitted with the development application indicating the predicted noise emissions and any additional recommendations needed to prevent adverse impacts.

No additional architectural measures are required for noise emissions to comply with noise requirements.



## 8 CONCLUSION

This report presents the assessment of noise emissions associated with the proposed entertainment precinct to be located on top of the existing Westfield Liverpool.

This assessment has addressed noise music and patron noise associated with the proposed food and beverage tenancies. Consideration has been given to indoor entertainment and leisure tenancies and potential impacts from mechanical plant.

Our analysis of noise emissions from vehicle movements within the carpark and loading docks generated by the proposal indicates that there would be no perceptible increase noise emissions produced by vehicle movements and loading dock activities.

ALC confirms that noise emissions from the operation of the development as detailed in this report can comply with the relevant noise emission criteria on the proviso that the recommendations and management conditions detailed in this report are adopted.

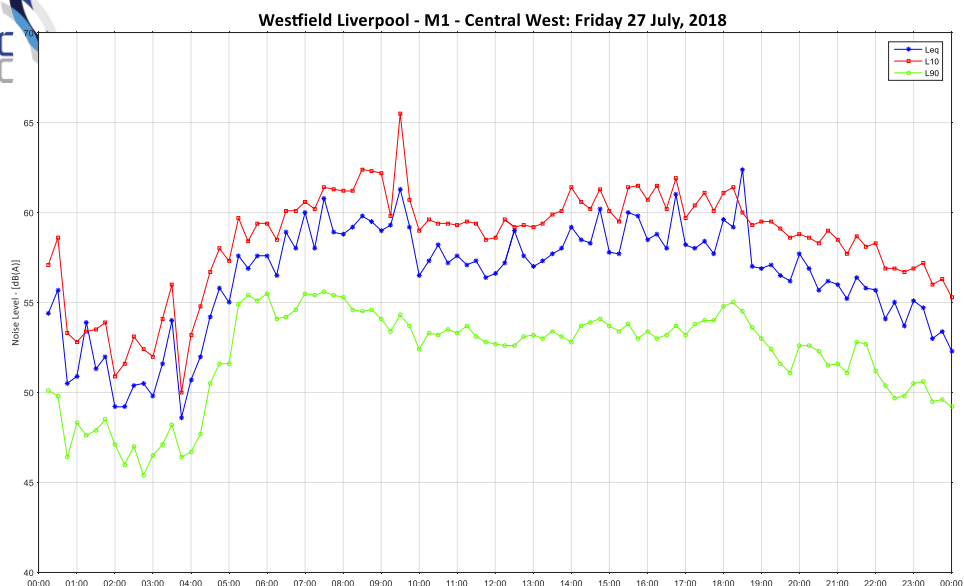
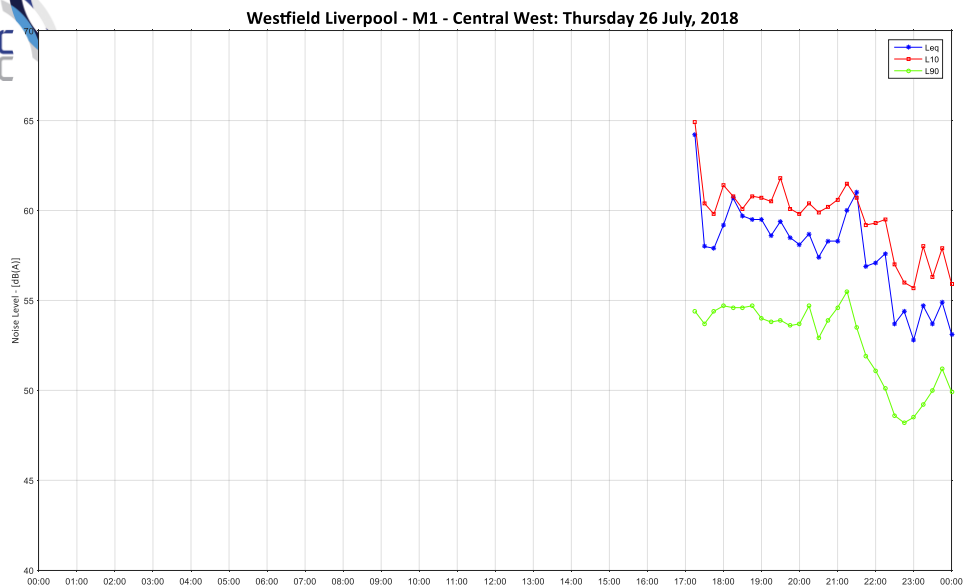
Yours faithfully,



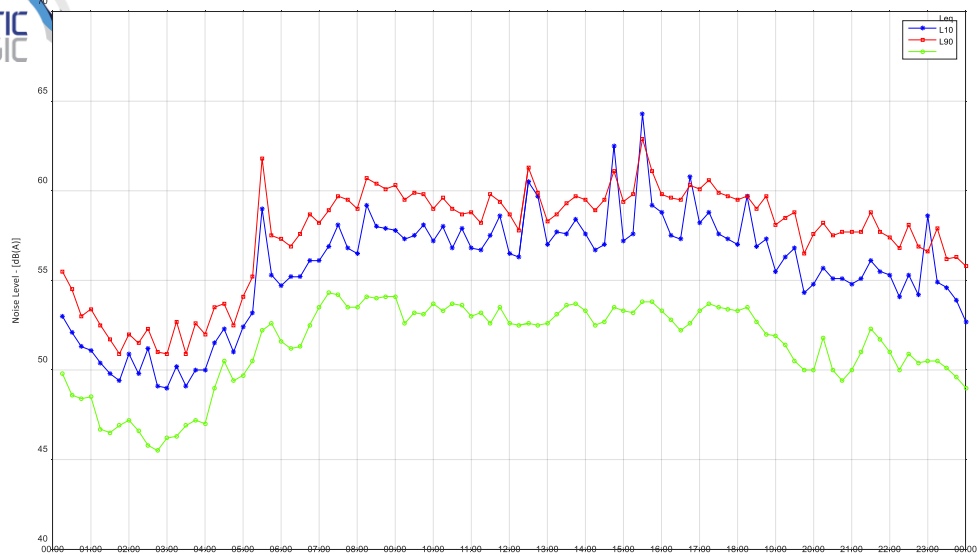
Acoustic Logic Consultancy Pty Ltd  
Victor Fattoretto

## APPENDIX ONE – UNATTENDED NOISE MONITORING

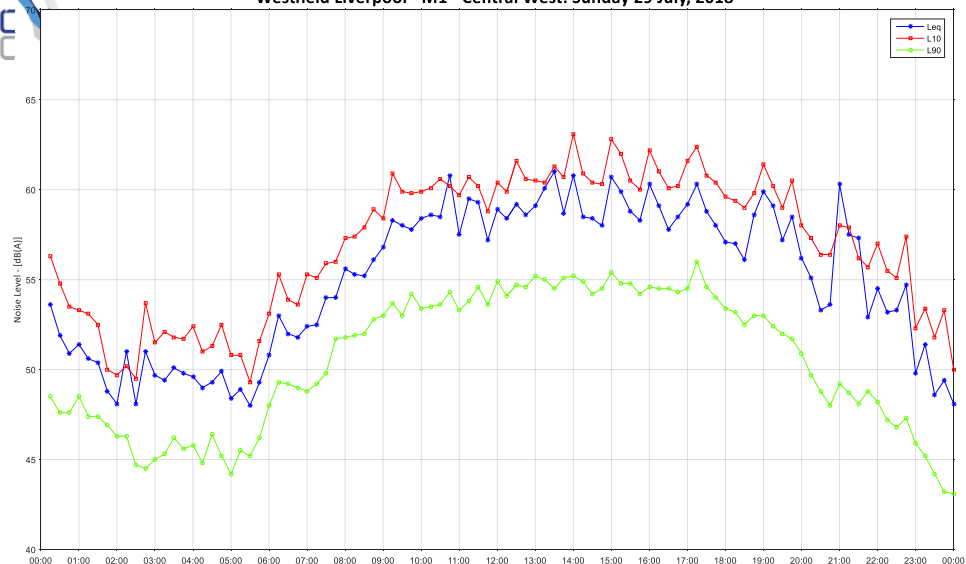
## NOISE MONITORING POSITION 1



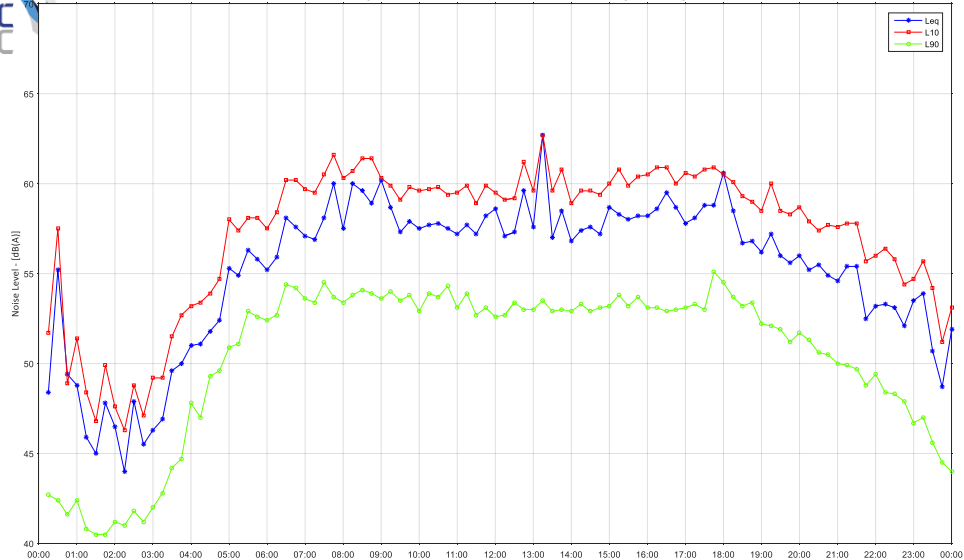
Westfield Liverpool - M1 - Central West: Saturday 28 July, 2018



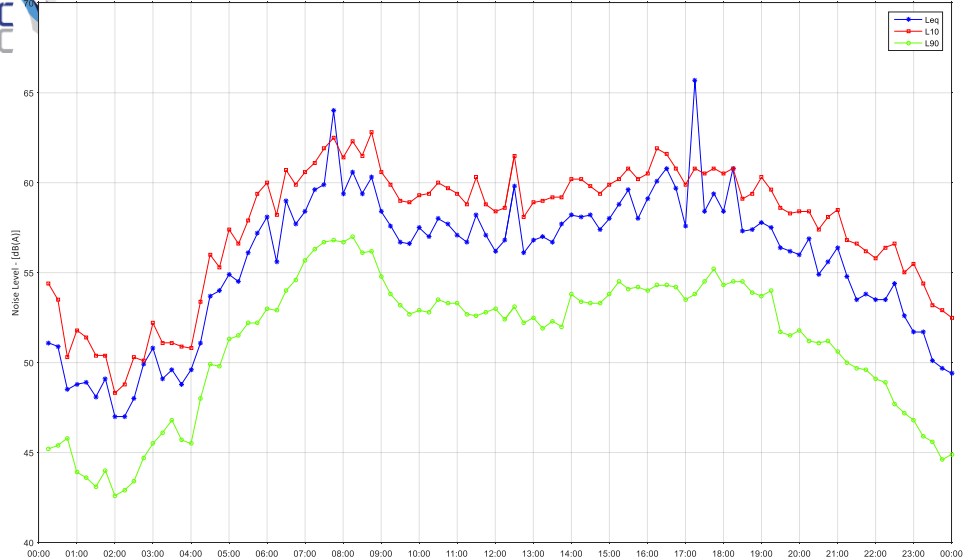
Westfield Liverpool - M1 - Central West: Sunday 29 July, 2018



Westfield Liverpool - M1 - Central West: Monday 30 July, 2018

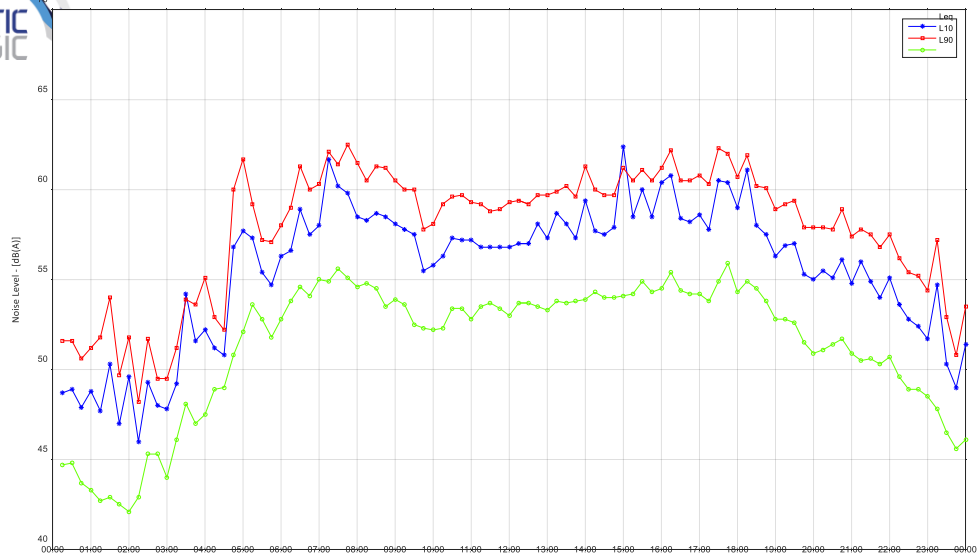


Westfield Liverpool - M1 - Central West: Tuesday 31 July, 2018

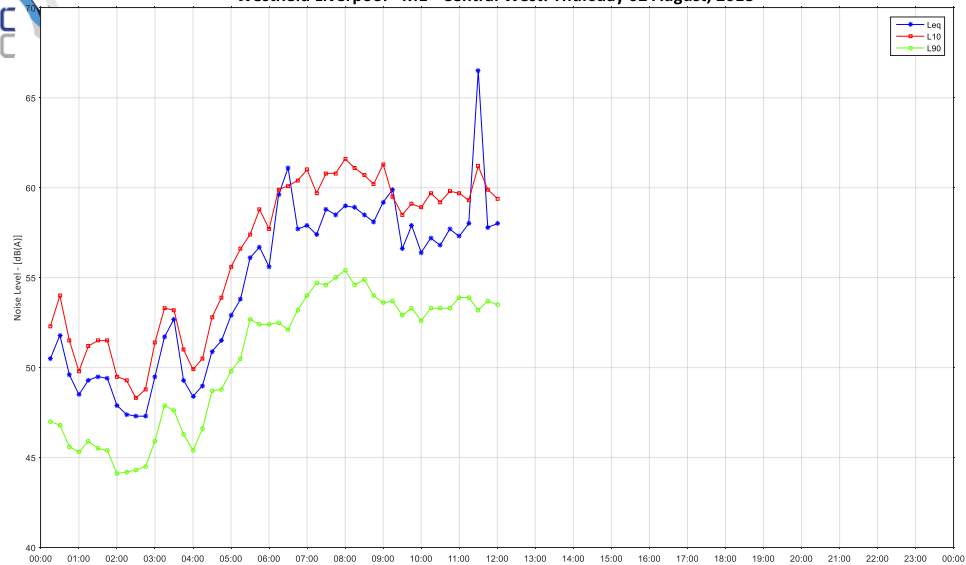




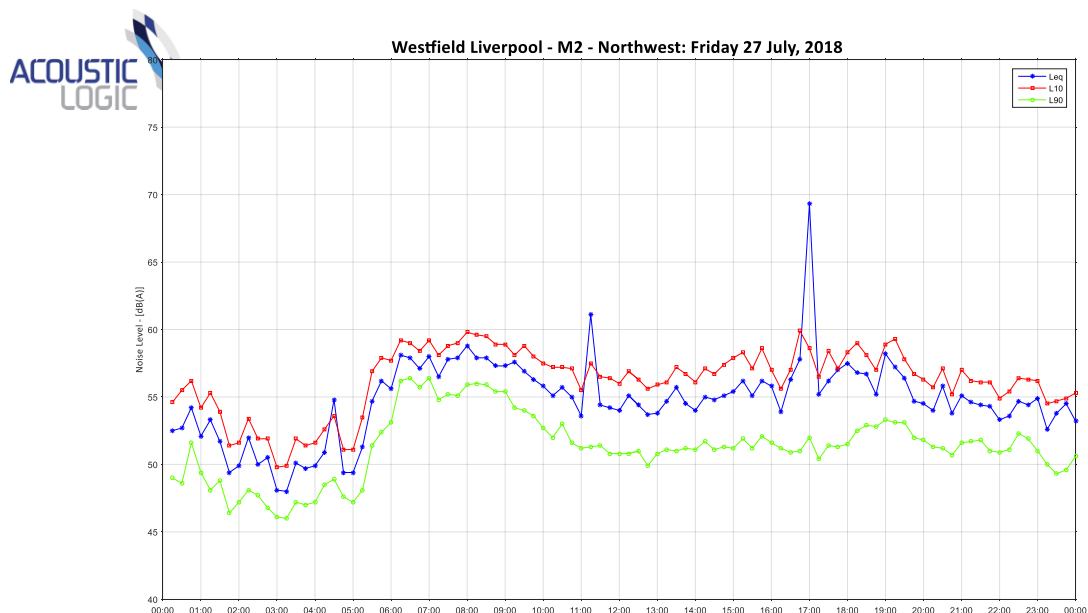
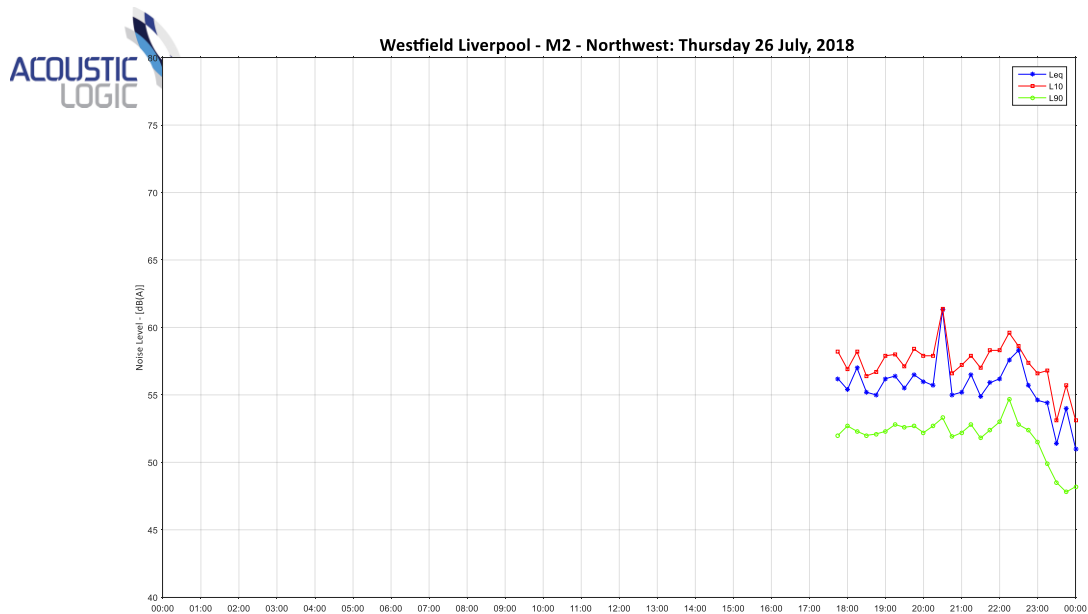
Westfield Liverpool - M1 - Central West: Wednesday 01 August, 2018



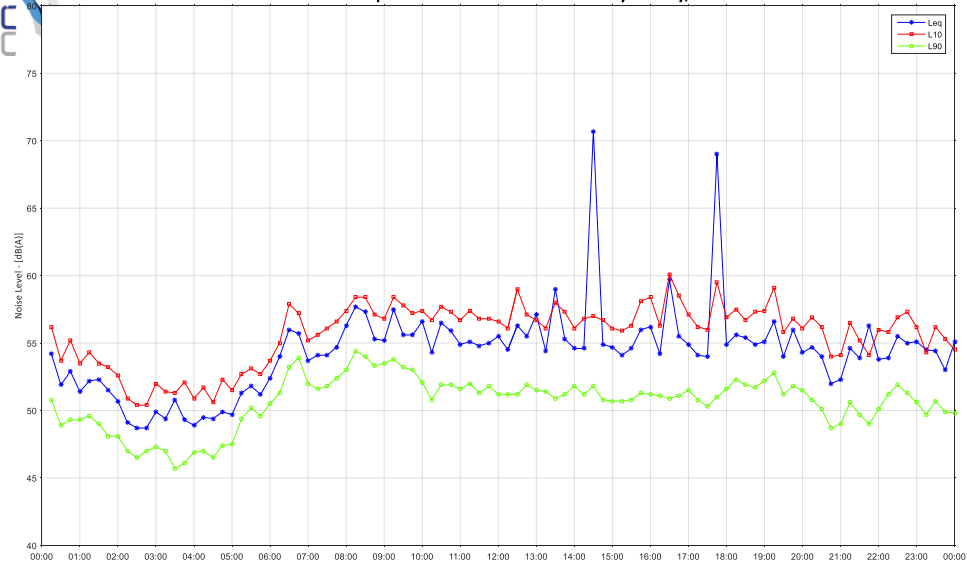
Westfield Liverpool - M1 - Central West: Thursday 02 August, 2018



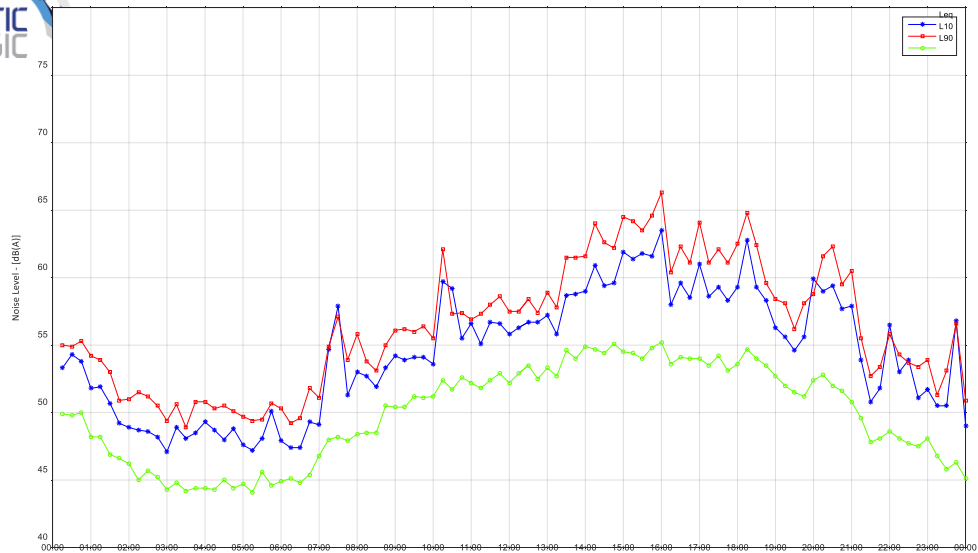
## NOISE MONITORING POSITION 2



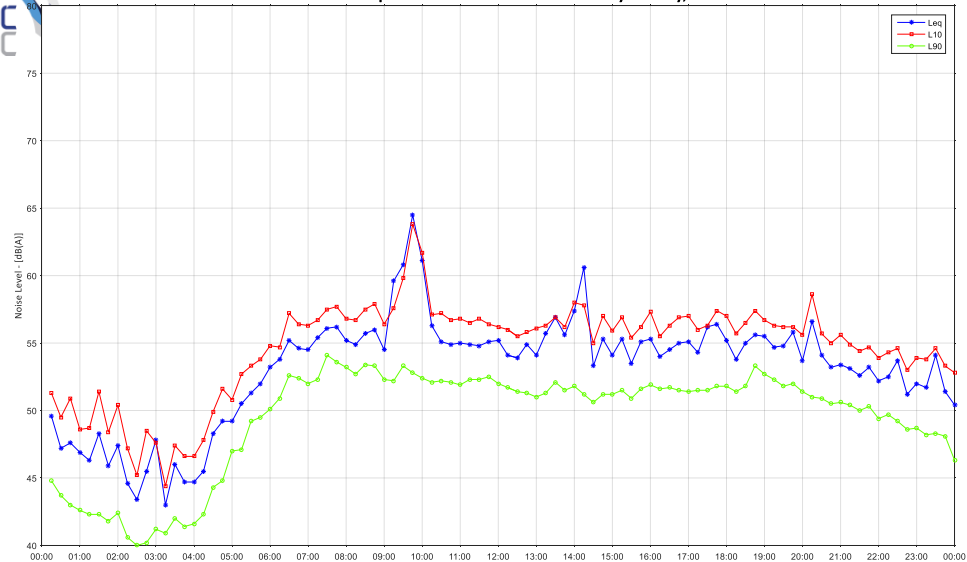
Westfield Liverpool - M2 - Northwest: Saturday 28 July, 2018



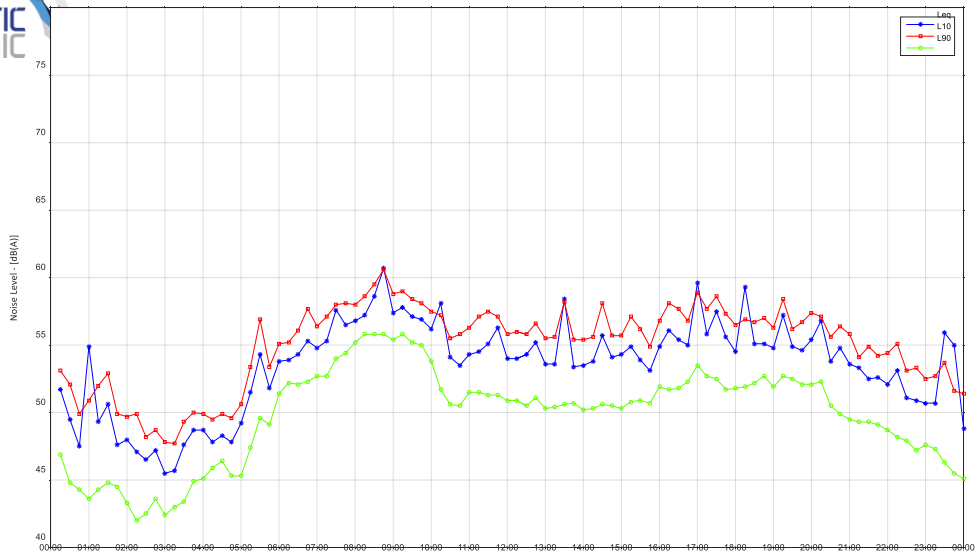
Westfield Liverpool - M2 - Northwest: Sunday 29 July, 2018



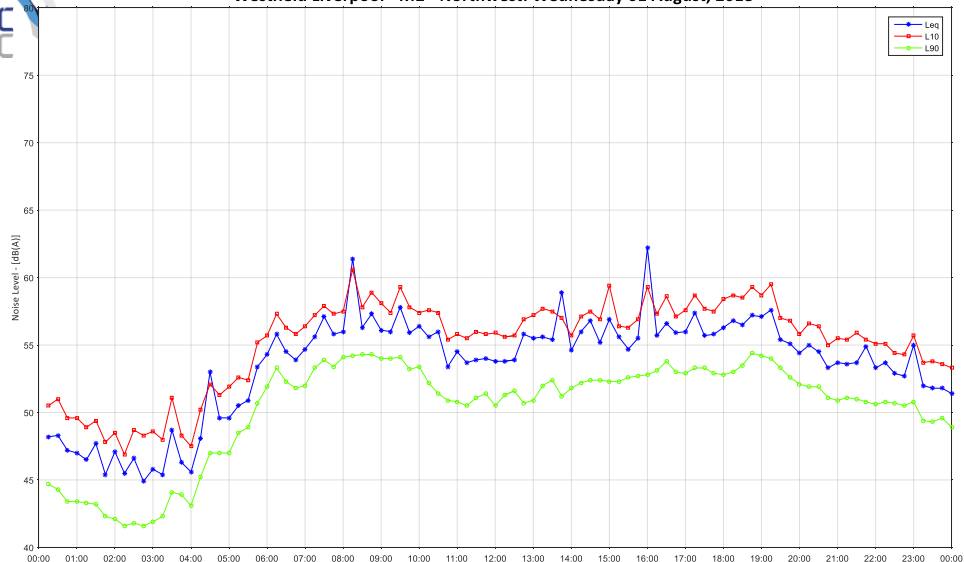
Westfield Liverpool - M2 - Northwest: Monday 30 July, 2018



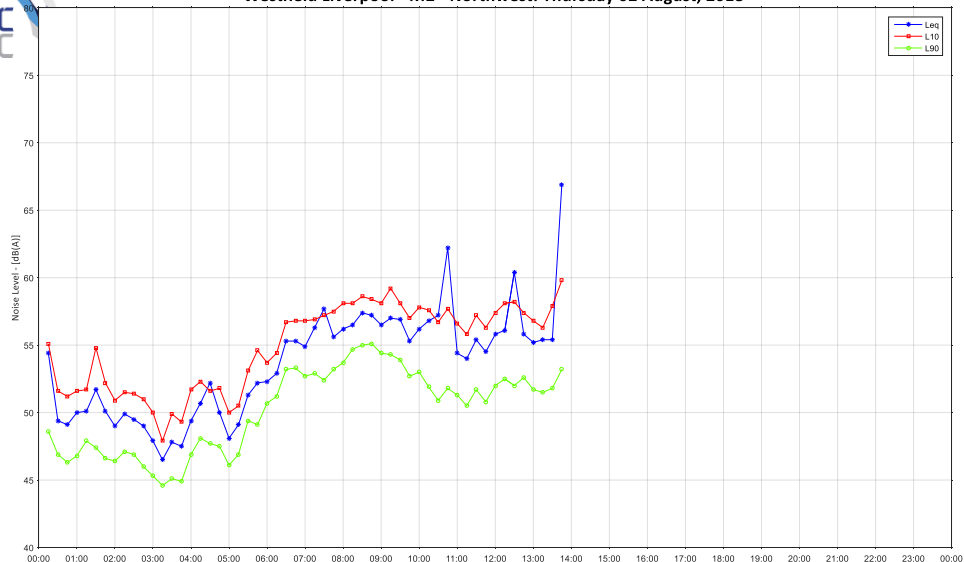
Westfield Liverpool - M2 - Northwest: Tuesday 31 July, 2018



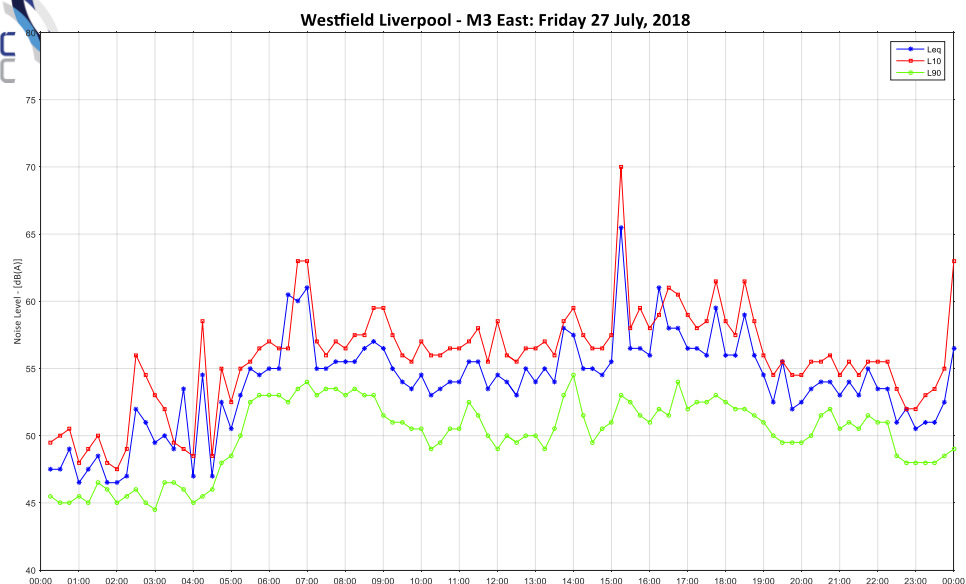
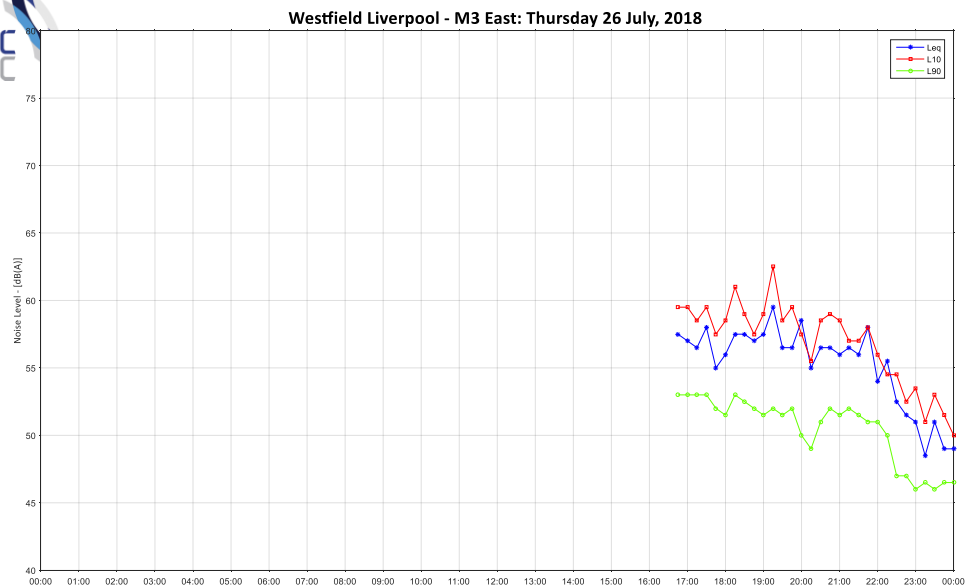
Westfield Liverpool - M2 - Northwest: Wednesday 01 August, 2018



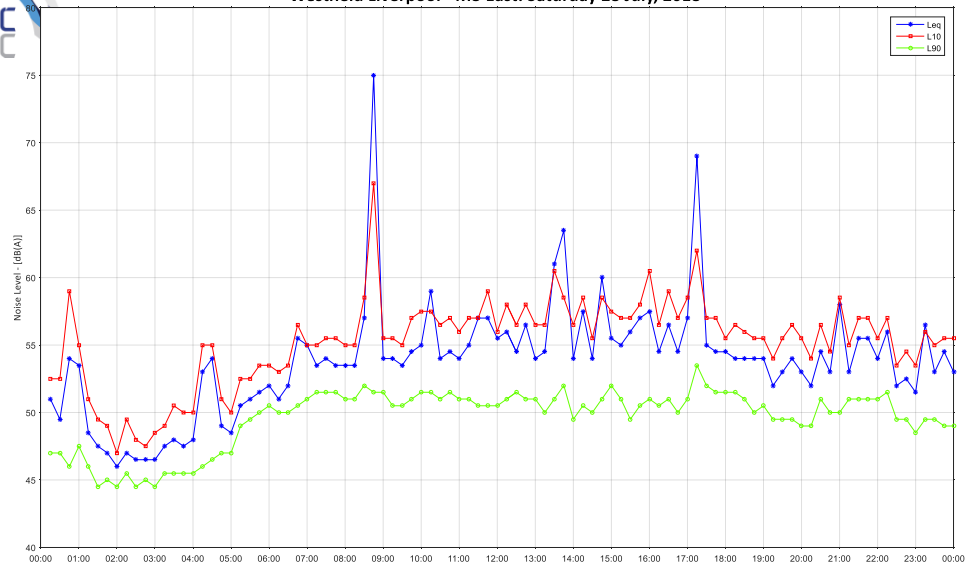
Westfield Liverpool - M2 - Northwest: Thursday 02 August, 2018



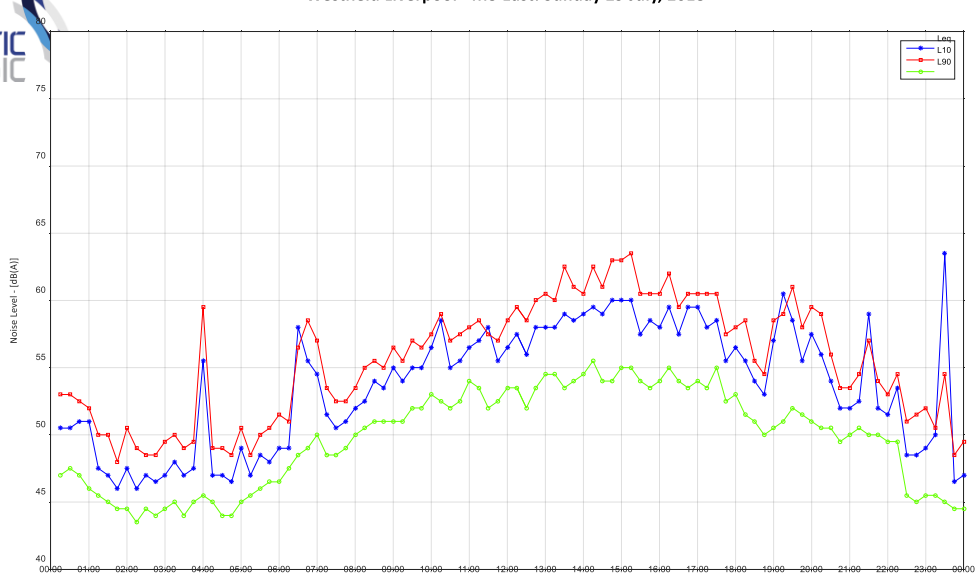
## NOISE MONITORING POSITION 3



Westfield Liverpool - M3 East: Saturday 28 July, 2018

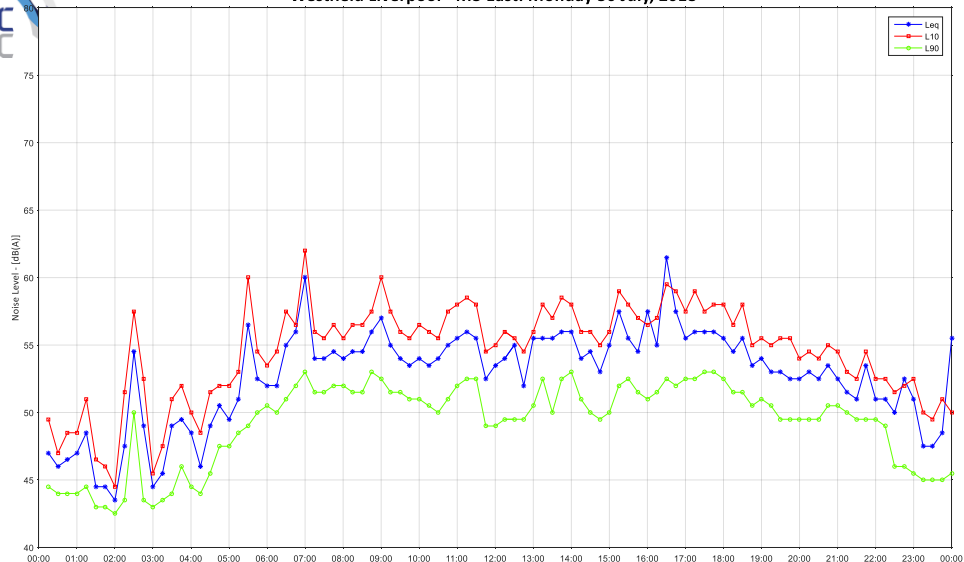


Westfield Liverpool - M3 East: Sunday 29 July, 2018

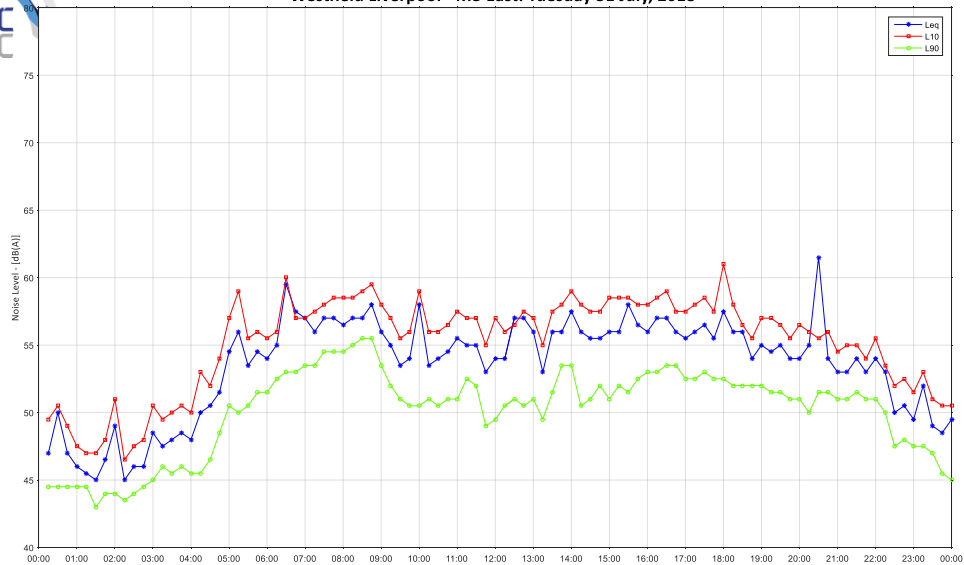




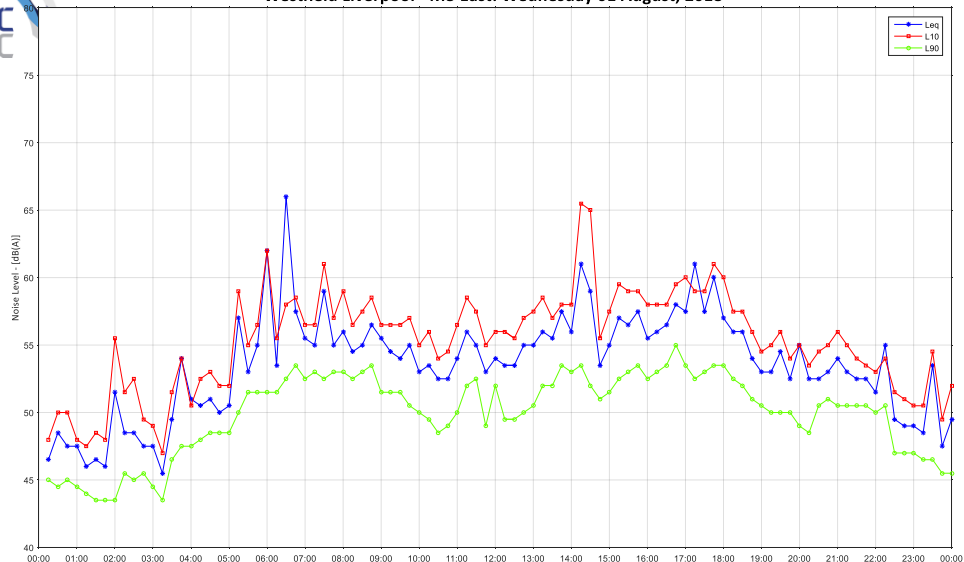
Westfield Liverpool - M3 East: Monday 30 July, 2018



Westfield Liverpool - M3 East: Tuesday 31 July, 2018



Westfield Liverpool - M3 East: Wednesday 01 August, 2018



Westfield Liverpool - M3 East: Thursday 02 August, 2018

