Site at Former B&Q, Great Stone Road, Trafford

Inquiry Evidence
Noise - Appendices

Prepared For: Accrue (Forum) 1 LLP

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Document Reference: HA2021046/AC/9/C
e: james@holtzacoustics.uk
t: 07881 291 320

Appendix A – Details of Noise Mapping Methodology

- The noise model was configured to predict noise based on the methodology contained in ISO 9613-2 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation.

- Soundplan 4.2 noise mapping software was used. Mapping of the site and surrounding area was based on aerial photography, the elevation and layout of stands around EOT were taken from publicly available drawings included with previous planning applications.

- Buildings were set to be reflective and 2 orders of reflection were used in the calculation process.

- The majority of ground cover is hard in the area so ground absorption was set to G=0. The pitch and training nets ground surface was set to G=0.5 to account for some absorption from the grass.

- For the cricket match noise map, a distributed sound system was modelled around the perimeter of the boundary as is typical at these types of events.

- The spectators were inputted as area sources that followed the geometry of the stands and entirely covered them at a height of 1m above the stands.

- The crowd source and speaker source outputs were then adjusted to achieve 85 dBA in the centre of the stands. This is based on the worst-case level given in the LCCC's report.

- Façade noise levels were calculated and the worst-case facade point was used to undertake an internal noise calculation to demonstrate that the noise can readily meet the recommended levels in BS8233:2014 using standard specifications.

- Noise to outdoor amenity areas was modelled using the road traffic noise level determined in the previous assessment as well as the cricket match noise levels detailed above.

- Individual points were calculated for the higher-level terraces and a grid noise map calculated for the low-level courtyards.

- The concert PA system was estimated based on concert photographs from the concert surveyed. This includes two flown speaker arrays either side of the stage at 10m elevation, a central subwoofer at 2m elevation and three delay towers on the pitch at 10m elevation.

- The speakers were modelled as point sources with highly directional directivity patterns typical of line arrays which are designed to project sound onto the audience for maximum efficiency rather than waste energy projecting sound behind or above

- The subwoofer was modelled to have standard directivity for a single subwoofer rather than a cardioid or subwoofer array which offer similar efficiency to the line arrays mentioned above.

- It should be noted that the exact configuration of speakers is not vital as the model was calibrated using survey data at height, near the proposed building.

- The spectra of the speakers were set to typical rock music spectra with higher energy in the low frequency bands.

- The output level from the speakers was adjusted until the calculated level at Survey Position 2 matched the survey data. Survey Position 1 also matched the survey levels suggesting an accurate model. This calibration method takes away the unreliability of estimating the speaker system output making for a much more accurate noise map.

- The proposed building was then added to the model based on the proposed plans and elevations and the façade noise levels calculated as a 1m grid across the most exposed façades.

- It is noted that some apartments have windows that are set back from the façade edge by balconies potentially leading to a build-up of noise due to the additional surfaces around the windows.

- These apartments also have glass balustrades and the balcony floors will provide additional screening to the lower half of the windows. It is not possible to calculate either of these contributions accurately so it is estimated that any noise increase from additional surfaces is offset by noise reductions from the screening.

- The highest calculated level was 78.3 dBA. Under the 80 dB(A) level referenced in the licensing criterion.

- In addition, a grid noise map was calculated for the concert noise with and without the proposed development to show the acoustic screening benefits of the proposed buildings on the residential dwellings to the south of the site. The grids were set at an elevation of 1m and a grid spacing of 5m.

Appendix B – Calculation of Cricket Noise Ingress at Worst Affect Dwelling

The calculation methodology from BS8233:2104 Appendix G.2.2 was used. Resultant internal Noise levels were calculated as 28 dB(A) L_{eq} which leaves a safety factor of 7dB which more than allows for the reduction between laboratory values and on-site installations.

The trickle vent used in the calculation is a Greenwood 2500EA.AC1 acoustically rated trickle ventilator.

The glazing used is a 6/12/10 double glazed unit however many other configurations could achieve this target performance.

The wall is based on 150mm thick dense concrete blocks.

It should be noted that this calculation is for the worst affect dwelling from cricket noise the majority of dwelling will be subject to much lower cricket noise levels due to screening from the building mass.

Data used in the calculation of the noise level inside a room

Terms that are frequency dependent

Term	Description	Single Figure Rating	Octave Band Centre Frequency (Hz)								A-weighted
			63	125	250	500	1000	2000	4000	8000	
$L_{eq,ff}$			49	61	61	63	63	55	47	39	66
$D_{n,e}$	Trickle Vent	42	30	40	40	34	45	48	43	45	
R_{wi}	Double glazing	36	26	26	27	34	40	38	46	46	
R_{ew}	Brick wall	46	30	31	36	43	49	55	59	60	
R_{rr}	Ceiling	0	0	0	0	0	0	0	0	0	
A			32	32	32	32	32	32	32	32	

Terms that are not frequency dependent

Term	Derivation	Value
S_f	Façade area (including window)	14.00 m2
S_r	Roof area (exposed side)	0.00 m2
S_{wi}	Window area	3.70 m2
S_{ew}	Sf-Swi	10.30 m2
S_{rr}	Area of ceiling	0.00 m2
S	Sf + Srr	14.00 m2
A_0	Given in BS EN 20140-10	10.00 m2

V	100	**T60**	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

$$L_{eq,2} \approx L_{eq,ff} + 10log_{10}\left(\frac{A_0}{S}10^{\frac{-D_{n,e}}{10}} + \frac{S_{wi}}{S}10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S}10^{\frac{-R_{ew}}{10}} + \frac{S_{rr}}{S}10^{\frac{-R_{rr}}{10}}\right) + 10log_{10}\left(\frac{S}{A}\right) + 3 \quad (1)$$

$$L_{Aeq,2} = 10log_{10}\left(10^{\frac{L_{Aeq,125}}{10}} + 10^{\frac{L_{Aeq,250}}{10}} + . . +\right) \quad (2)$$

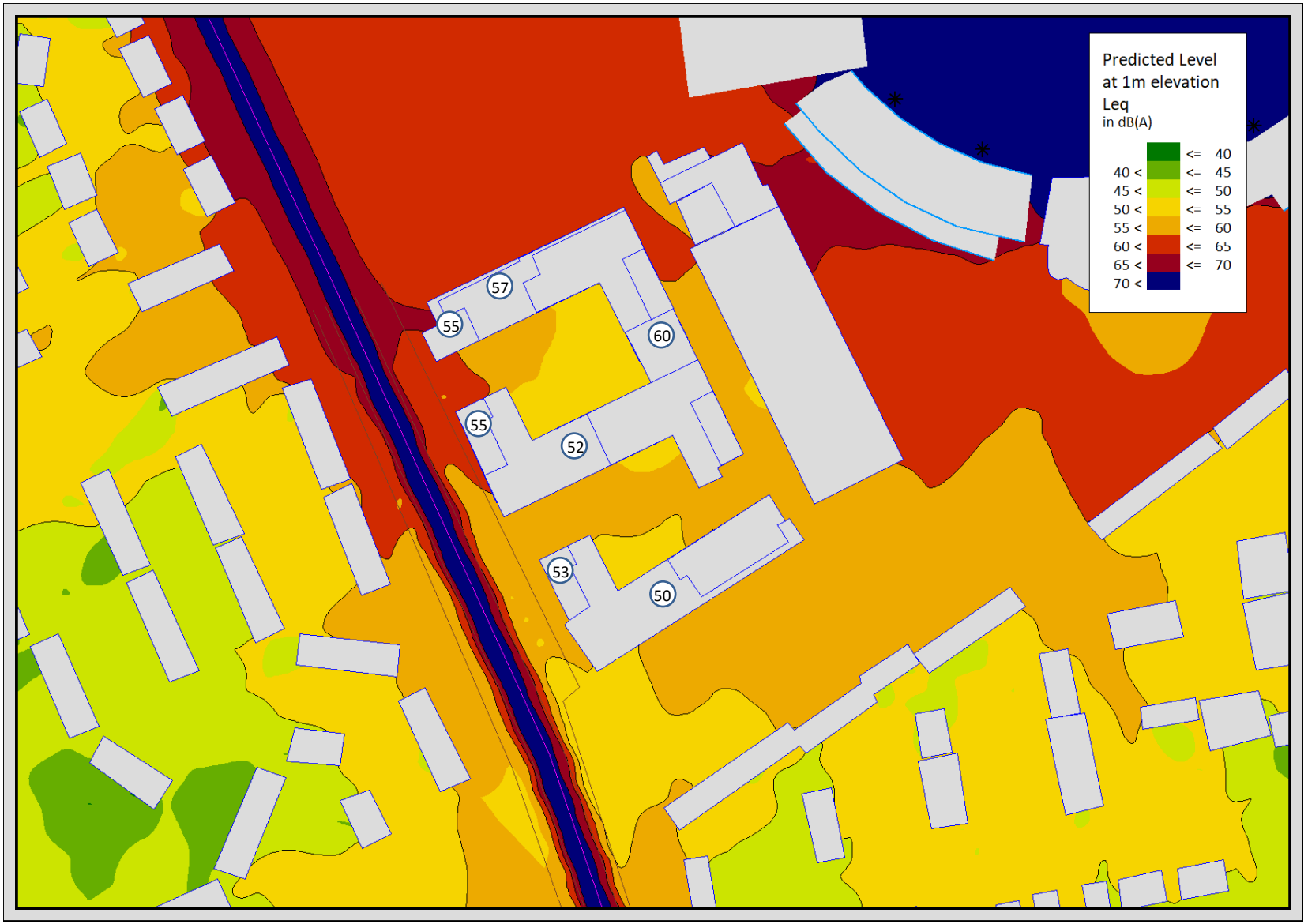
The calculation

Term from equation (1)	Reference letter of result	Octave band centre frequency (Hz)								
		63	125	250	500	1000	2000	4000	8000	
$L_{eq,ff}$	A	49	61	61	63	63	55	47	39	
$D_{n,e}$		30	40	40	34	45	48	43	45	
$\frac{A_0}{S} 10^{\frac{-D_{n,e}}{10}}$	B	0.00071	0.00007	0.00007	0.00028	0.00002	0.00001	0.00004	0.00002	
R_{wi}		26	26	27	34	40	38	46	46	
$\frac{S_{wi}}{S_f} 10^{\frac{-R_{wi}}{10}}$	C	0.00066	0.00066	0.00053	0.00011	0.00003	0.00004	0.00001	0.00001	
R_{ew}		30	31	36	43	49	55	59	60	
$\frac{S_{ew}}{S_f} 10^{\frac{-R_{ew}}{10}}$	D	0.00074	0.00058	0.00018	0.00004	0.00001	0.00000	0.00000	0.00000	
R_{rr}		0	0	0	0	0	0	0	0	
$\frac{S_{rr}}{S_f} 10^{\frac{-R_{rr}}{10}}$	E	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
10log10 (B+C+D+E)	F	-27	-29	-31	-34	-42	-43	-44	-45	
A (furnished)		32	32	32	32	32	32	32	32	
$10\log\left(\frac{S}{A}\right)$	G	-4	-4	-4	-4	-4	-4	-4	-4	
$L_{eq,2}$	A+F+G+3	21	32	29	29	20	12	3	-7	
A-weighting dB		-26	-16	-9	-3	0	1	1	-1	
$L_{eq,2}$ + A-weighting	$L_{Aeq,125}$ etc	-5	16	20	26	20	13	4	-8	28

$L_{Aeq,2}$ is obtained by combining these values using equation (2)

Appendix C – Outdoor Amenity Grid Map

At 1m elevation, Contributions from cricket match noise and road traffic noise. High level terrace point noise levels shown in dBA. Terrace calculations taken at centre of terrace at seated height of 1.2m. Allowances made for 0.5m balustrade/planter around perimeter of terraces.



Appendix D – Email Correspondence from Trafford Environmental Health Officer Peter Belfield.

From: Belfield, Peter
Sent: Fri, 1 Mar 2019 11:12:30 +0000
To: Harrison, Debra
Subject:94974/OUT/18 Former B And Q Site Great Stone Road Stretford M32 0YP (Nuisance and Air Quality)

Debra,

Please see below my final comments on 'nuisance' and 'air quality' issues relating to the above application:

Events at the Emirates Old Trafford stadium

A document entitled Trafford Place Great Stone Road Framework Management Plan (February 2019) has been submitted in response to my initial comments regarding the impact of events including concerts at the adjacent Emirates Old Trafford (EOT) stadium.

The Plan proposes a strategy to ensure that tenants are aware of the permitted activities at EOT at the outset through tenancy agreements and that information is provided to them on forthcoming events. The strategy also intends to manage tenants who may be disrupted within their apartments during events by offering a selection of activities elsewhere on the site that could be attended as an alternative.

It is noted that the likely impact on concert sound would be variable depending on the position of each apartment in relation to EOT. Indeed some residents with a direct view of the stadium may be supportive of the opportunity to enjoy the spectacle from their vantage point.

I have considered the plan in the context of event scheduling at EOT in recent years where no more than two days of planned large-scale outdoor concerts have occurred. Two additional concerts were staged at short notice in 2017 in response to an unprecedented situation borne out of the tragic events at the MEN Arena that year. Premises Licence conditions ensure that any such events are subject to a curfew at 10.30pm.

In view of the above I do not consider that outdoor events at EOT need be a constraint on the development, subject to the implementation of the Plan as a condition of any Planning Permission granted.

Environmental Noise impact on the site

The Holtz Acoustic Design Statement (20th June 2018, Rev 2) has monitored noise and vibration levels affecting the site, from local traffic and the nearby Metrolink line respectively, in accordance with relevant national planning standards and guidelines. An assessment of the results has confirmed that any impacts on the new occupiers of the development should not be significant, subject to the use of double glazing and acoustically rated trickle vents.

A validation report should be requested on completion of the development to confirm that the double glazing and trickle vents have been installed in accordance with the acoustic specifications detailed in section 4.2 of the aforementioned Holtz Acoustic Design Statement.

The report confirms that external amenity spaces will not be affected by excessive levels of environmental noise.

Plant noise

The Holtz Acoustic Design Statement has set appropriate plant noise limits based on the noise survey results. No further assessment of plant noise has been undertaken since the full plant schedule is not yet available.

As such a further detailed assessment should be submitted for approval to demonstrate that the combined fixed plant noise level (when rated in accordance with BS 4142: 2014) will not exceed 58dB (LAr) between 0700-2300h and 44 dB (LAr) between 2300-0700h at the nearest new or existing residential receptors.

The report shall also detail any mitigation measures required to ensure the above limits can be met. Any approved mitigation scheme should be implemented and retained in good order for the duration of the development.

Commercial servicing

Servicing, deliveries and waste and recycling collections for any commercial uses of the development should only take place between the hours of 7am and 7pm on Mondays to Saturdays in view of the likelihood of undue disturbance affecting adjacent residents, should these activities occur at other times.

Lighting

A Lighting Impact Assessment shall be submitted in respect of exterior lighting installations in order to demonstrate compliance with the Obtrusive Light Limitations of The Institution of Lighting Professionals Guidance Notes for the Reduction of Obtrusive Light GN01:2011, including details of any necessary mitigation measures.

Air Quality

The REC Air Quality Assessment dated January 2018 is acceptable and follows the methodologies of appropriate national standards and guidelines to reach a conclusion that the development will not have an adverse impact on local receptors due to pollutants from additional traffic movements, nor will future occupiers be exposed to unsatisfactory air pollution conditions once the development is operational.

The provision of electric vehicle (EV) charge points should be required for every new house (minimum 7kWh) with dedicated parking or 1 charge point (minimum 7khH) per 10 car parking spaces for unallocated car parking. For commercial developments there should be the provision for 1 charge point (minimum 7kWh) per 1000m2 of commercial floorspace.

Construction and Demolition Phase:

Prior to the commencement of the development, a Construction and Demolition Environmental Management Plan (CEMP) shall be submitted to and approved in writing by the Local Planning Authority to include details of the measures proposed during construction to manage and mitigate the main environmental effects. The development shall be implemented in accordance with the approved CEMP, which shall address, but not be limited to the following matters:

a. Suitable hours of construction and demolition activity

b. the parking of vehicles of site operatives and visitors (all within the site),

c. loading and unloading of plant and materials (all within the site), times of access/egress

d. storage of plant and materials used in constructing the development

e. the erection and maintenance of security hoardings

f. wheel washing facilities

g. measures to control the emission of dust and dirt during construction and procedures to be adopted in response to complaints of fugitive dust emissions

h. a scheme for recycling/disposing of waste resulting from demolition and construction works (prohibiting fires on site)

i. measures to prevent disturbance to adjacent dwellings from noise and vibration, including any piling activity

j. information on how asbestos material is to be identified and treated or disposed of in a manner that would not cause undue risk to adjacent receptors

k. information to be made available for members of the public

Acceptable site working hours are published on our website – see link below.

http://www.trafford.gov.uk/residents/environment/pollution/noise-pollution/noise-from-construction-sites.aspx

Regards,

Peter Belfield

Environmental Health Officer

Pollution & Housing Team, Regulatory Services, Trafford Council, Trafford Town Hall, Talbot Road, Stretford, Trafford M32 0TH.

Tel: 0161 912 4579 **Email:** peter.belfield@trafford.gov.uk

Appendix E – Concert Noise Survey and Modelling Details

- A survey of the concert noise was undertaken on the evening of Saturday the 25th of September.

- The concert measured was 'The Courteeners' which reportedly had sold out at a 50,000 capacity. The survey was started during the main set and concluded just before the set finished.

- The set was a mixture of acoustic and rock songs. The most important measurements were taken towards the end of the set where there was just bass heavy rock music. The set concluded at the 2230hrs curfew time.

- I was unable to measure the last 10 minutes of the concert as numerous people had already left the venue early and were shouting near the microphone, so had to abandon the survey. Fireworks were set off at the end of the concert which also would have skewed readings.

- Monitoring was undertaken at two positions as show on the aerial view below.

- Measurements were taken with a microphone on a 6m vertical pole to reduce the screening effects from the flat roof of the existing site.

- It should be noted that the main speaker systems were pointing away from the proposed site, it is understood that this configuration and stage position are the standard setup for concerts at EOT.

- Modern speaker systems are designed to point sound down and towards the audience, this makes them more efficient and easier to power as no energy is wasted propagating sound behind, where no one will hear it. The long 'strings' of speakers often seen at concerts are a special configuration called a 'line array' which direct sound forwards and down onto the audience.

- PA systems also includes low frequency speakers (subwoofers), these typically radiate in all directions but in recent years subwoofer arrays are being introduced which also radiate more sound forwards rather than backwards. It is not known whether subwoofer arrays are used at EOT.

- Noise modelling/mapping software allows one to model the propagation of noise from numerous noise sources via complex terrain and building geometry.

- The resultant noise levels at receiver facades are then calculated. 3D façade noise maps and grid maps provide a visual representation of the noise propagation.

- A noise map was also included in LCCC's 'Review of Noise Issues' report but did not include detail on the parameters used to configure it.

- A large level of uncertainty in noise mapping can be present when estimating the level from noise sources. It is unclear how source levels were determined in their model nor how the directivity of the PA system was configured.

- The model presented in this report however used survey data taken from a recent concert at EOT to 'calibrate' the noise map and provide a more accurate noise source level, a summary of the results is shown in Table 1 below.

Table 1. Summary of survey results

Position Reference	Location Description	$L_{Aeq,T}$ (dB)	Measurement Notes
1	Near south east façade, partially screened by cricket school.	71 $L_{Aeq,33min}$	Average L_{Aeq} over entire survey period, a mixture of acoustic songs and bass heavy rock songs
2	Near site entrance, direct line of sight to stage and PA	74 $L_{Aeq,8min}$	Only 8 minutes of survey data available. But a suitable proxy for a 15 minute measurement. Taken towards the end of the concert during bass heavy rock songs. Fireworks set off at end of concert

- A noise map of the existing site as it stood during the survey was constructed and the above receiver levels inputted at their respective positions (6m elevation) in the model. The sound system was then inputted into the model as estimated from concert photos. The sound level of the system was then set to match the measured levels at the receiver points.

- This methodology takes away the uncertainties from estimating the output and propagation pattern of the sound system as it relies on survey data for calibration. This data was sourced relatively close to the proposed facades.

- The proposed building geometry was then inputted into the model and the resultant levels at the facades calculated. A summary of the calculated levels is shown in Table 2 below and a 'heat map' of the façade shown in Appendix C.

- Measurements were taken using a Class 1 sound level meter which was set to integrate over 1 minute periods and measure in single octave bands.

- The positions were chosen to be as close to the proposed façade as possible but there were access issues stopping the survey proceeding very close to the proposed façade.

- Position 1 included the effect of screening from the cricket school.

- Position 2 had a direct line of sight to the stage and PA system.

A summary of the results from the survey are shown in the tables overleaf.

Position 1

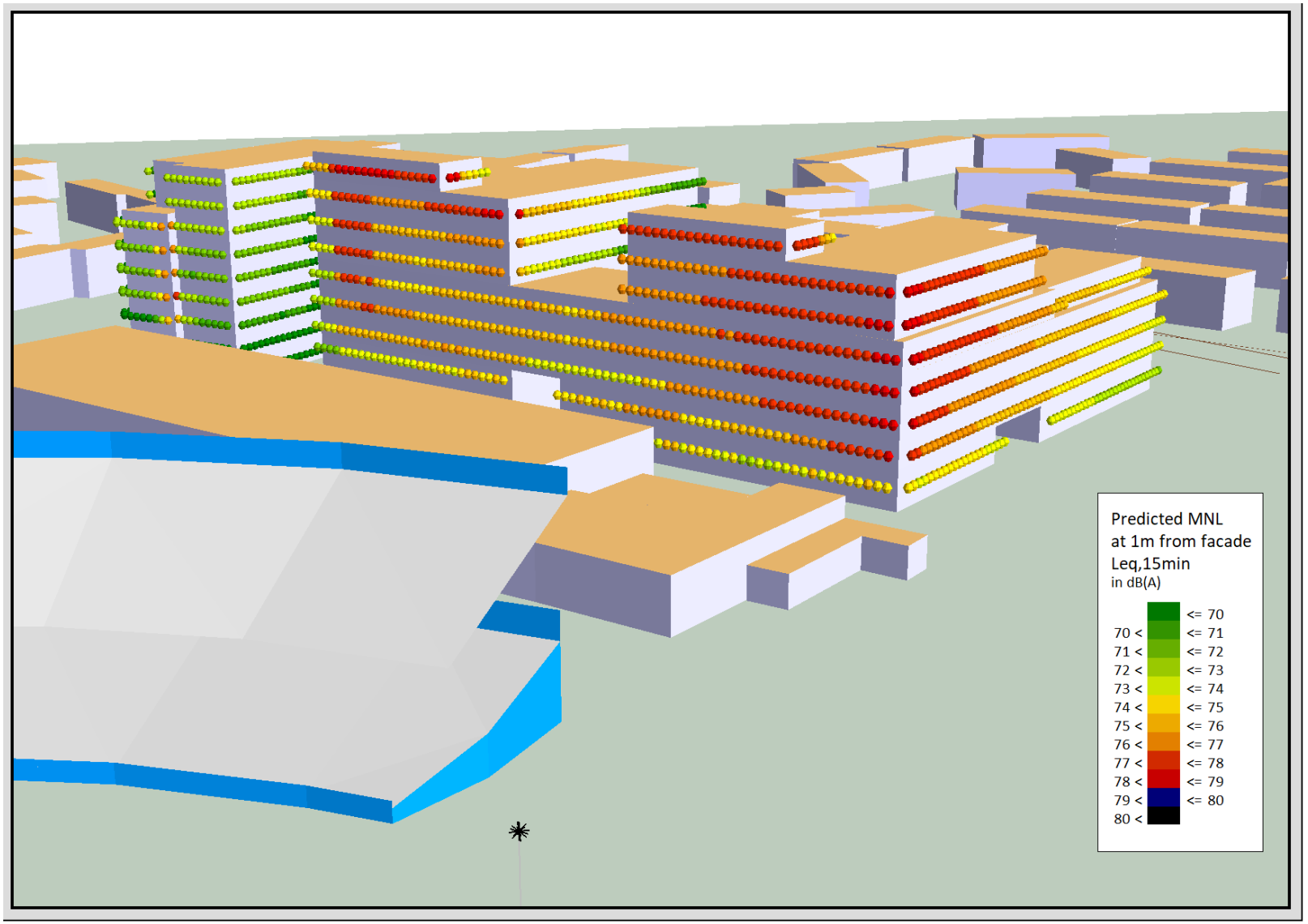
Time	$L_{Aeq,1min}$	L_{eq} (dB)							
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
21:38:21	74	86	85	77	68	66	63	59	47
21:39:21	75	87	85	79	69	66	65	61	46
21:40:21	68	81	79	72	62	59	55	48	32
21:41:21	72	83	80	76	67	63	60	53	43
21:42:21	72	85	81	76	68	64	62	52	42
21:43:21	73	84	82	78	68	66	64	56	44
21:44:21	75	85	83	80	68	66	65	58	46
21:45:21	71	78	79	76	64	63	60	53	38
21:46:21	58	57	54	52	57	54	48	39	23
21:47:21	66	57	66	71	62	60	58	47	41
21:48:21	65	58	64	69	62	59	56	47	37
21:49:21	65	57	62	68	62	61	57	47	37
21:50:21	65	60	63	66	62	60	56	47	38
21:51:21	69	59	65	73	65	63	59	49	41
21:52:21	68	59	63	71	65	64	59	49	42
$L_{Aeq,15min}$	71								
21:53:21	67	58	64	69	64	63	57	49	40
21:54:21	66	58	65	69	62	60	58	48	41
21:55:21	68	58	67	71	64	60	60	50	45
21:56:21	68	59	66	71	65	61	60	50	44
21:57:21	61	58	60	59	57	59	52	45	34
21:58:21	62	58	55	52	57	61	50	41	29
21:59:21	61	58	59	57	58	57	53	46	33
22:00:21	69	78	78	73	65	62	58	48	37
22:01:21	72	83	80	77	67	64	62	52	42
22:02:21	72	81	81	76	66	64	61	52	41
22:03:21	71	81	80	75	66	64	62	54	42
22:04:21	67	75	75	70	61	61	57	50	37
22:05:21	71	83	80	74	65	65	60	53	42
22:06:21	74	85	84	77	70	66	63	56	46
22:07:21	74	84	84	77	70	65	64	56	45
$L_{Aeq,15min}$	70								
22:08:21	74	84	84	76	70	66	65	57	46
$L_{Aeq,31min}$	71								

Position 2

Time	$L_{Aeq,1min}$	L_{eq} (dB)							
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
22:12:11	75	90	82	80	68	69	66	61	43
22:13:11	73	91	82	79	65	63	60	53	40
22:14:11	74	93	83	80	66	65	61	55	43
22:15:11	75	94	82	81	66	66	65	58	44
22:16:11	74	93	81	80	66	66	63	57	45
22:17:11	60	60	56	55	58	56	52	45	35
22:19:24	77	93	81	76	69	69	72	69	64
22:20:54	73	93	82	79	65	63	59	51	38
$L_{Aeq,8min}$	74								

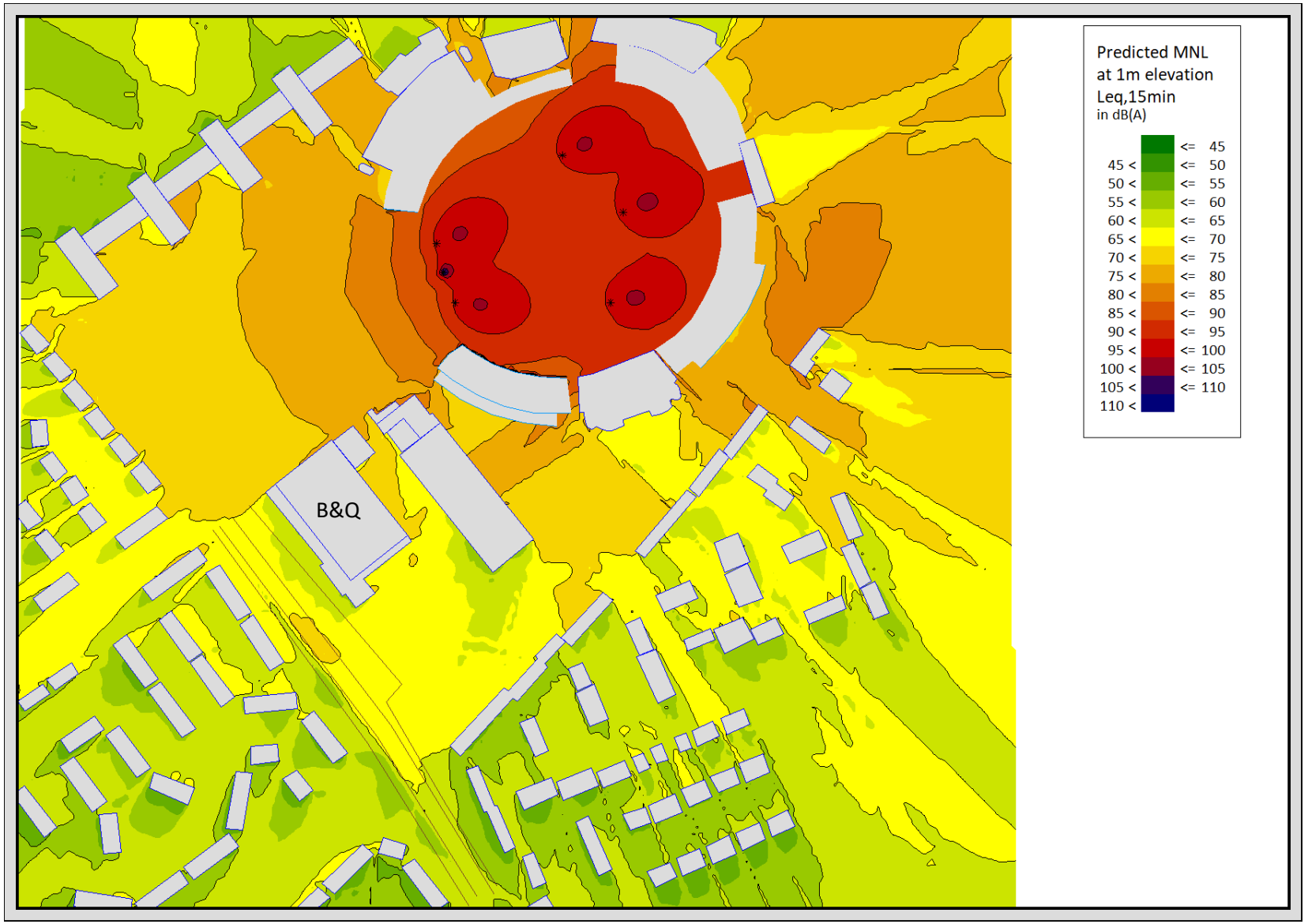
Appendix F – Façade Noise Map Showing Predicted MNLs at 1m from Facade

At no point is the 80 dBA licensing criterion exceeded.



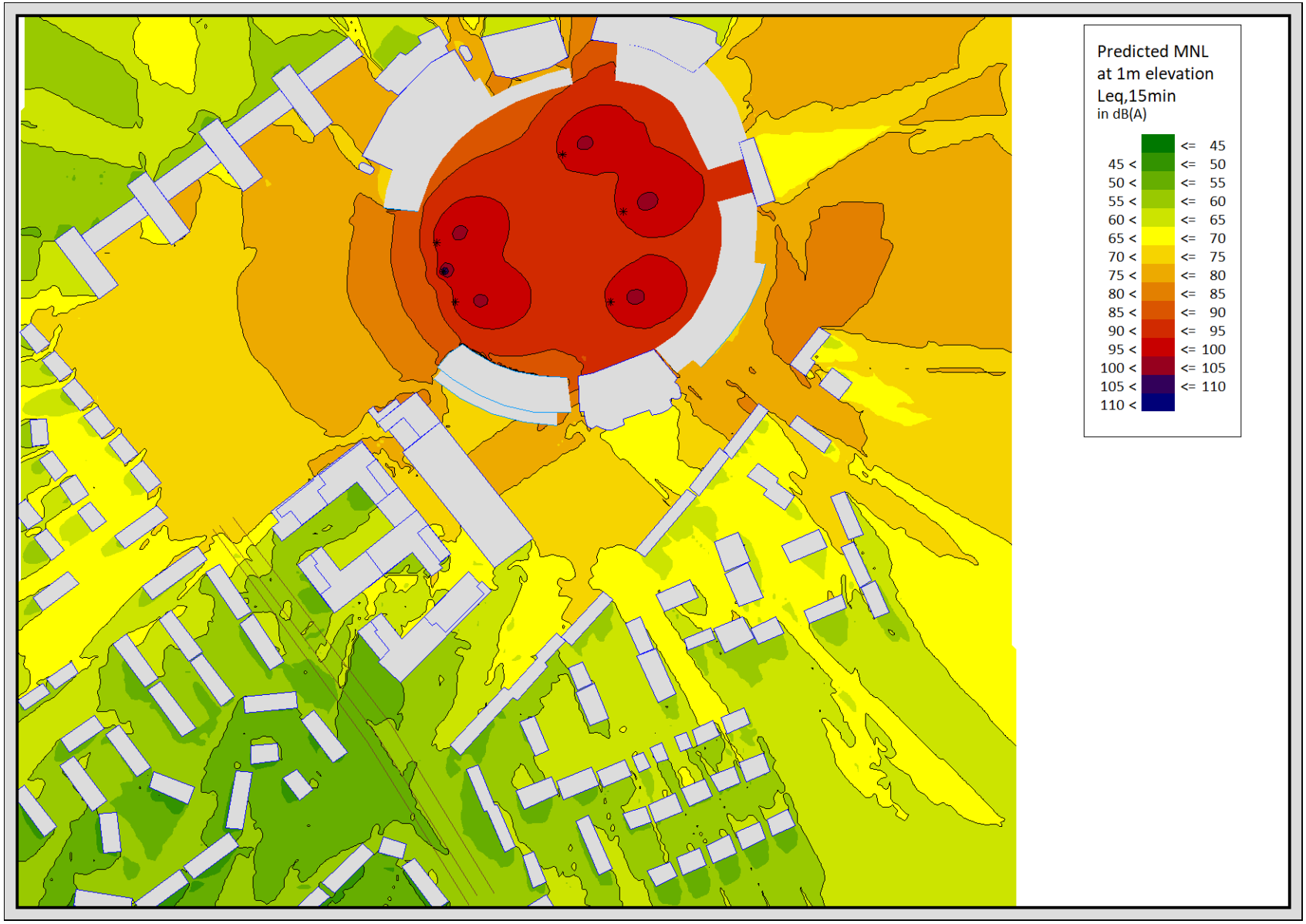
Appendix G – MNL Grid Map - Existing

Shows predicted noise levels at existing receptors.



Appendix H – MNL Grid Map - Proposed

Shows reduced noise levels at some existing receptors due to screening from proposed building mass.



Appendix I – Glazing Upgrade Calculation

Sound reduction index of typical double-glazing specification 4/20/4.

Sound Reduction Index (R_w)							
63Hz	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
16	17	15	34	43	48	44	46

Sound reduction index of acoustic double-glazing specification 6.4lam/12/8.

Sound Reduction Index (R_w)							
63Hz	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
21	23	23	36	43	46	57	49

Typical concert noise frequency spectrum (unweighted)

	Octave Band Level (dB)							
A weighted	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
75	92	81	79	66	66	65	61	55

A-weighted reduction using standard glazing (simple subtraction assuming all other factors are constant). **16 dB**

A-weighted reduction using acoustic double glazing **25 dB.**

Potential overall reduction in internal noise level with acoustic glazing is **7dB(A)**