SHARPS REDMORE

ACOUSTIC CONSULTANTS · Established 1990

Report – Rev A

101 Camley Street

Detailed Environmental Noise Survey, Vibration Survey and External Building Fabric Assessment and Specifications

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1.0 Introduction

1.1 As background, a full environmental noise survey and acoustic report was prepared by another acoustic consultancy for a planning application for the redevelopment at 101 Camley Street, London. As part of the detailed design process and to obtain in-house data, Sharps Redmore has undertaken a new and detailed environmental noise survey in November 2016, in and around the site/existing vacant warehouse building. As the acoustic planning report did not originally incorporate a vibration assessment (this has since been Conditioned [16]), a vibration survey was concurrently undertaken with the new environmental survey.

1.2 Sharps Redmore (SR) has therefore been commissioned by Cudd Bentley to help with the noise and vibration related issues of this proposed scheme.

1.3 The proposed scheme is to comprise:

> Demolition of existing building and redevelopment for a mixed use building ranging from 6-13 storeys comprising 3,342sqm employment floorspace (Class B1), 121 residential flats, the provision of a pedestrian footbridge with disabled access over the Regent's Canal, and associated landscaping and other works relating to the public realm.

1.4 An assessment of noise break-in, and required mitigation, has been undertaken using the survey results and the local authority's Planning Condition 15. These assessments are based on typical proposed room and window sizes and ventilation requirements, and are to be confirmed when final details have been developed. It is highly unlikely, however, that the recommendations will change significantly.

1.5 The report also sets limiting noise levels for mechanical services plant based on Planning Condition 17.

1.6 A guide to the assessment methodology and criteria used within this report is included in section 2.0. Details of the noise survey to establish the existing noise climate is presented in section 3.0. Section 4.0 outlines the sound insulation requirements and specifications for the proposed building envelope. Limiting noise levels for mechanical services plant is included in section 5.0. Section 6.0 provides details and results of the vibration survey at the site.

1.7 A guide to the acoustic terminology used in this report is displayed in Appendix A.

2.0 Criteria

Local Policy

2.1 The Planning consent for this scheme was finalised in 2014/2015 with the below noise and vibration Planning Conditions (these are more than likely to be replicated for this proposed scheme):

15 *Before the use commences sound insulation shall be provided for the building in accordance with the approved Residential Planning Noise Report. The use shall thereafter not be carried out other than in accordance with the approved scheme.*

Reason: To safeguard the amenities of the adjoining premises and the area generally in accordance with the requirements of policy CS5 of the London Borough of Camden Local Development Framework Core Strategy and policies DP26 and DP28 of the London Borough of Camden Local Development Framework Development Policies.

16 *Prior to commencement of the development, details shall be submitted to and approved in writing by the local planning authority, of building vibration levels together with appropriate mitigation measures where necessary. The details shall demonstrate that vibration will meet a level that has low probability of adverse comment and the assessment method shall be as specified in BS 6472:2008. No part of the development shall be occupied until the approved details have been implemented. Approved details shall thereafter be permanently retained.*

Reason: To ensure that the amenity of occupiers of the development site are not adversely affected by ground or airborne vibration in accordance with the requirements of policy CS5 of the London Borough of Camden Local Development Framework Core Strategy and policies DP26 and DP28 of the London Borough of Camden Local Development Framework Development Policies.

17 *Prior to use of the development;*
a) details shall be submitted to and approved in writing by the local planning authority, of the external noise level emitted from plant/ machinery/ equipment and mitigation measures as appropriate. The measures shall ensure that the external noise level emitted from plant, machinery/ equipment will be lower than the lowest existing background noise level by at least 10dBA, as assessed according to BS4142:1997 at the nearest and/or most affected noise sensitive premises, with all machinery operating together at maximum capacity.
b) A post installation noise assessment shall be carried out to confirm compliance with the noise criteria and additional steps to mitigate noise shall be taken, as necessary. Approved details shall be implemented prior to occupation of the development and thereafter be permanently retained.

Reason: To ensure that the amenity of occupiers of the development site/surrounding premises is not adversely affected by noise from plant/mechanical installations/ equipment in accordance with the requirements of policy CS5 of the London Borough of Camden Local Development Framework Core Strategy and policies DP26 and DP28 of the London Borough of Camden Local Development Framework Development Policies.

Vibration

2.2 With regards to Condition 16 and vibration dose value (VDV), BS 6472-1:2008 provides guidance on the vibration in buildings with respect to human annoyance or complaints about interference with activities. VDVs relate to the levels of vibration of an event and the number of occurrences of events in a period of time. For residential buildings, BS 6472-1:2008 states, in Section 6, the following VDV ranges which might result in various probabilities of adverse comment:

Table of BS 6472-1:2008 VDV Criteria for Residential Buildings

Vibration Dose Value ranges ($m/s^{1.75}$) which might result in various probabilities of adverse comment within residential buildings			
Place and Time	Low Probability of Adverse Comment	Adverse Comment Possible	Adverse Comment Probable
Residential buildings 16 hour day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8 hour night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

2.3 BS 6472-1:2008 states that "*These values ….. may be used for both vertical and horizontal vibration*" and explains they are "*presented as ranges rather than discrete values* [due to] *the widely differing susceptibility to vibration evident among members of the population* [and] *the differing expectations of the vibration environment*".

2.4 Although future residents may have an expectation of a vibration environment near a railway line, this assessment uses the lower value of each criteria range to be robust.

2.5 In addition to BS 6472 above, BS 5228-2 2009 is the 'Code of Practice for noise and vibration control on construction and open sites: Part 2 Vibration'. This code recognises that if there is an interest in human reaction then measurements are recommended in terms of PPV (Peak Particle Velocity). PPV measurements have the added advantage that re-radiated noise from vibration source(s) can be predicted.

2.6 BS 5228-2 2009 Section B2 further discusses the human response to vibration and that '*the threshold of perception being typically in the PPV range of 0.14 mm/s to 0.3 mm/s. Vibrations above these levels can disturb, startle, cause annoyance or interfere with work activities*.'

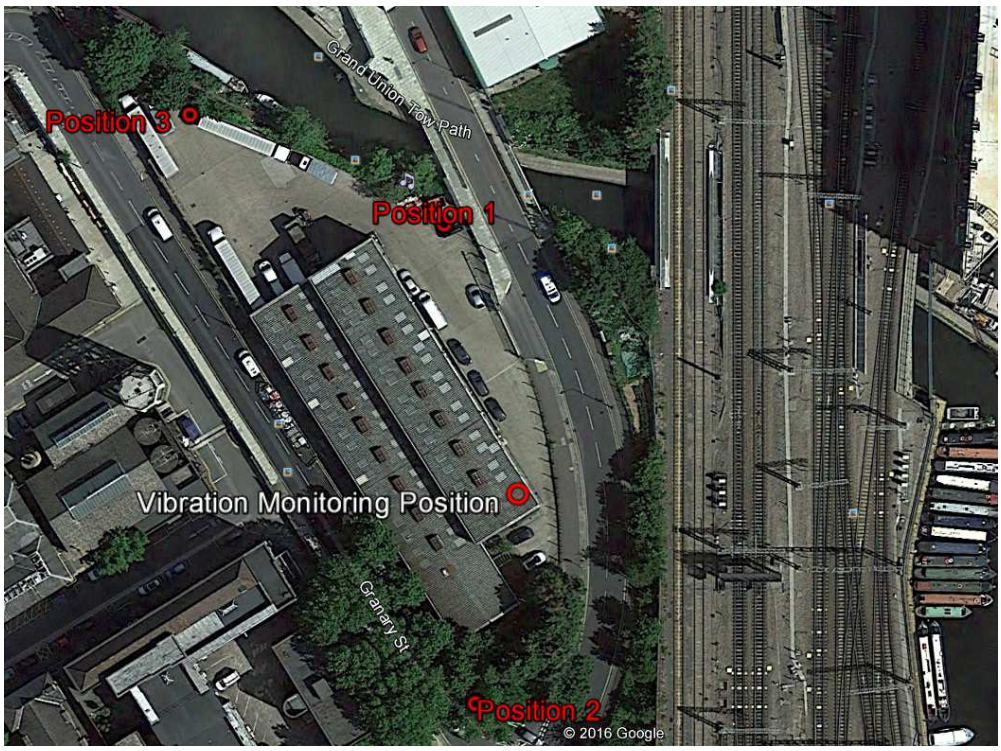
2.7 BS 5228-2 2009 provides a table relating PPV's to human perception. This table is reproduced below:

Vibration Level	Effects
0.14 mm/s	*Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.*
0.3 mm/s	*Vibration might be just perceptible in residential environments*
1.0 mm/s	*It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning has been given to residents.*
10 mm/s	*Vibration is likely to be intolerable for any more than a very brief exposure to this level.*

3.0 Environmental Noise Survey Details

3.1 A survey of existing noise levels was carried out between 17th and 21st November 2016 at three monitoring positions shown in Figure 1. The data was used to establish the worst case daytime dB $L_{Aeq(16hrs)}$ and night-time dB $L_{Aeq(8hrs)}$ ambient noise levels and typical night-time maximum dB L_{Amax} levels, in addition to being representative of the background dB L_{A90} noise levels at the nearest noise sensitive properties.

Figure 1: Monitoring positions



- Position 1 was located approximately 10 metres from the centre of the Camley Street road and 5 metres above ground level (approx. 4 metres above Camley St.) overlooking Camley Street and the railway lines. The microphone was attached to a tall pole in a free-field condition.
- Position 2 was located approximately 4 metres from the centre of the Granary Street road and approximately 2 metres above the road level overlooking Granary Street and Camley Street further afield. The microphone was attached to the chain-link fencing in a free-field condition.
- Position 3 was located equi-distant (approximately 17 metres) from the centre of Granary Street and the Grand Union Canal. The microphone was attached to a tall pole in a free-field condition and approximately 4 metres above Granary Street road level.

3.2 The weather during the survey period was forecasted as typically overcast with clear patches and low wind, except for the nightime between 20th-21st November where there appeared to have been some periods of high wind and rain. This period has therefore been omitted from our calculations in Section 4.0. All other weather conditions were deemed suitable for carrying out sound level measurements.

3.3 The measurements were taken using three Norsonic 140 Class 1 precision sound level meters. The sound level meters were calibrated at the start and end of the survey and showed no significant drifts, and have full traceable calibration histories. Sound level measurements were taken automatically at five minute samples over the duration of the survey.

3.4 The ambient dB $L_{Aeq(5min)}$, background dB $L_{A90(5min)}$ and maximum dB $L_{Afmax(5min)}$ measured noise levels are summarised in the figures in Appendix B. Table 3 summarises the survey results for daytime and night-time ambient dB $L_{Aeq(16hrs)}$ and $L_{Aeq(8hrs)}$, typical lowest background dB $L_{A90(5min)}$ and typical maximum dB L_{Afmax} noise levels at the site.

Table 3: Survey measurement summary (dB re 20μPa)

Position	Daytime $L_{Aeq,16hrs}$ (dB)	Night-time $L_{Aeq,8hrs}$ (dB)	Typical Background $L_{A90,5mins}$ (dB)	Typical Night-time L_{Afmax} (dB)*
1	62	59	44	78
2	60	58	42	77
3	58	55	50	71

* Typical recorded maximum levels not exceeded 10-15 times per night period.

3.5 The octave band levels in Table 4 are associated with the resultant levels above and have been used as part of the sound insulation assessment for the residential units (Section 4.0):

Table 4: Octave Band Linear Frequency Spectra

Position	Parameter	Octave Band Centre Frequency Hz								dBA
		63	125	250	500	1k	2k	4k	8k	
1	Day dB L_{eq}	74	61	59	58	58	54	50	46	**62**
	Night dB L_{eq}	63	57	55	55	56	51	44	40	**59**
	Night typical dB L_{fmax}	85	80	74	74	75	70	65	61	**78**
2	Day dB L_{eq}	68	60	58	56	56	52	49	45	**60**
	Night dB L_{eq}	64	55	53	51	52	51	49	46	**58**
	Night typical dB L_{fmax}	82	74	75	71	71	71	68	69	**77**
3	Day dB L_{eq}	65	59	57	54	53	51	47	42	**58**
	Night dB L_{eq}	61	54	52	49	50	50	47	42	**55**
	Night typical dB L_{fmax}	83	70	69	64	65	64	61	57	**71**

3.6 With the proposed new scheme, two towers will extend up to 13 storeys above ground level. Inherently, for buildings adjacent to extensive road/rail networks, as one moves up a building, each floor 'sees' more of the affecting noise sources and therefore noise levels often increase and fluctuate as they travel up a building. Consequently, a 3D noise mapping model of the site has been undertaken using a proprietary 'SoundPLAN' software. The noise levels inputted into the model were taken from the surveyed measured noise levels above and estimated vehicle/train movements. Screenshots illustrating the noise map day and night time ambient and maximum noise levels at the façades of the proposed building are shown in Appendix C.

4.0 Sound Insulation Requirements of the Building Envelope

4.1 The minimum airborne sound reduction performance of the envelope building elements are given ahead in terms of a weighted single figure R_W and octave band 'R' values for specification purposes.

4.2 Suitable products shall provide evidence of compliance in accordance with BS EN ISO 10140/2:2010 and rated in accordance with BS EN ISO 717/1:1997, or equivalent or superseded version of the standard.

4.3 The façades as a whole need to achieve a sufficient sound insulation performance against road and rail traffic.

Façade

4.4 It is not known if the wall elements of the façade are to be a lightweight 'Metsec' system or heavyweight blockwork/concrete. If lightweight external wall constructions are proposed, careful design and attention will be required and there is a likely requirement to include additional layer(s) of cement board to safeguard the sound insulation properties of the façades. Regardless, the systems must meet the minimum sound insulation requirements detailed in Table 3

Table 3: External wall specification to all rooms

Position	Octave band centre frequency Hz - R dB						
	63	125	250	500	1k	2k	4k
See Window System Type I	29	32	34	48	54	60	60
See Window System Type II	25	30	32	47	55	55	60
See Window System Type III	27	29	31	43	50	55	55
See Window System Type IV	26	31	35	44	44	50	50
See Window System Type V	23	26	28	37	45	50	50
See Window System Type VI	23	26	23	32	45	45	40

Roof

4.5 To control noise ingress to the top floor rooms from rain and to a lesser extent rail and road noise, the roof combined with the ceilings to the top floor bedrooms should provide a sound reduction of at least 50 dB R_W.

Window Systems

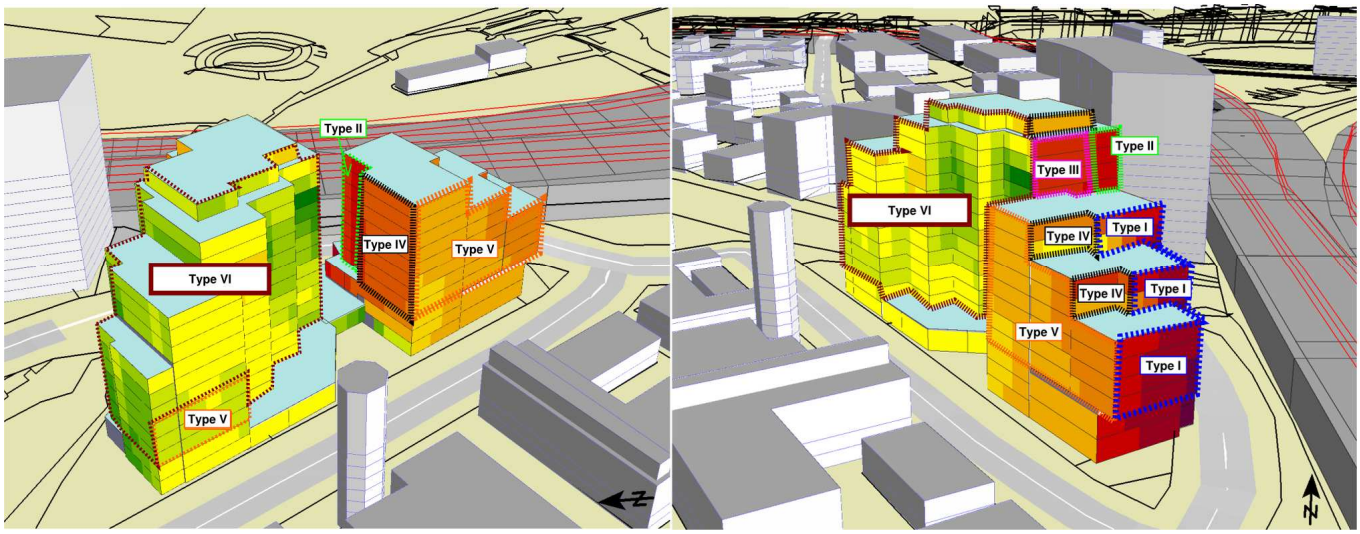
4.6 The window system must be considered as the glazing arrangement, seals and frame combined.

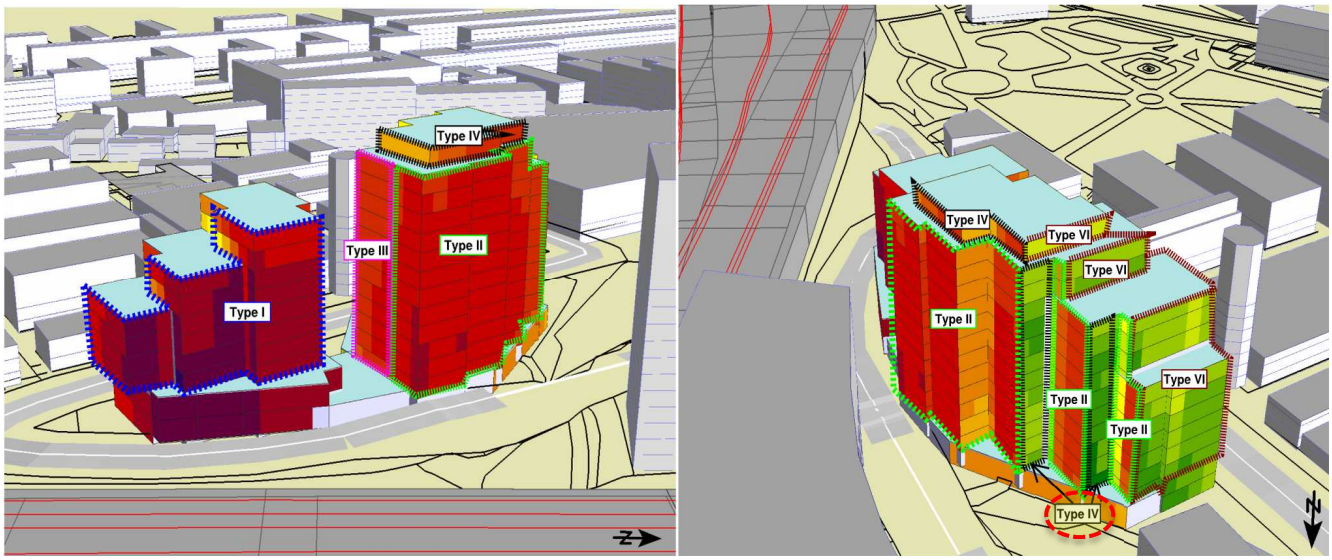
4.7 The chosen window systems should achieve the minimum sound reduction index octave bands as detailed in Table 4.

Table 4: Window system specifications

System	R dB Octave band centre frequency Hz					
	125	250	500	1k	2k	4k
Type I – Blue Line	28	29	38	44	50	50
Type II – Green Line	26	27	37	45	45	45
Type III – Pink Line	25	26	33	40	45	45
Type IV – Black Line	27	30	34	34	40	40
Type V – Orange Line	22	23	27	35	40	40
Type VI – Brown Line	22	18	22	35	35	30

4.8 The extent of each System Type above across all elevations are depicted in the following four figures (also replicated in larger format in Appendix D):





4.9 In the above right hand figure ("Type IV" dotted circle in red), the colours are misleading, should be ignored and the Type IV is correctly recommended along the entire façades; this is due to an inherent trait of the noise modelling software.

4.10 The above sound insulation requirements are the overall performances for the window systems (including frame, seal and glass). The manufacturer will need to have laboratory test data to demonstrate that the window system as a whole achieves the requirements. This includes any proposed large glazed sliding doors onto balconies etc.

4.11 The window system specifications have been driven by the daytime ambient levels (L_{Aeq}) and typical maximum levels (L_{Amax}) across all elevations.

4.12 Typical elements which could meet the window system specifications given in Table 4 would be comparable to acoustic double glazing comprising:

- System Type I: 10mm (glazing) - 12mm (cavity) – 12.8mm (laminate glazing)
- System Type II: 8mm (glazing) - 12mm (cavity) – 10.8mm (laminate glazing)
- System Type III: 8mm (glazing) - 12mm (cavity) – 8.4mm (laminate glazing)
- System Type IV: 8mm (glazing) - 16mm (cavity) – 10mm (glazing)
- System Type V: 4mm (glazing) - 12mm (cavity) – 6mm (glazing)
- System Type VI: (Thermal Double Glazing): 4mm (glazing) - 10mm (cavity) – 4mm (glazing)

4.13 The specification in terms of the window system relates to acoustic requirements only. Thicker glass or larger air gaps may be required for structural and thermal reasons, which would offer improved acoustic performance.

4.14 If opaque infill glazing panels are to be used these are likely to require to be lined internally with a double 15mm acoustic plasterboard layer and 100mm acoustic insulation to the cavity to ensure that the overall required façade performance is achieved.

4.15 In the event that the client/contractor wishes to combine window systems for multiple façades (to reduce costs, or avoid onsite confusions), the more onerous system specification should be used; i.e. if Type III and IV systems where to be combined, Type III window systems should be used instead of type IV.

Ventilation

4.16 Based on the noise levels measured outside, natural ventilation by means of open windows would not achieve the required internal noise criteria during the day and night. An open window provides around a 10-15 dB reduction in external noise levels resulting in levels substantially above the proposed internal criteria. Normal ventilation will therefore, have to be provided by alternative methods; either mechanical or acoustically treated natural vent systems; although note that our assessment indicates that natural ventilation (trickle vents) will be possible for window systems V and VI only (i.e. all window systems I-IV will require mechanical ventilation for fresh air supply into habitable rooms).

4.17 Table 5 provides the minimum sound reduction specifications (D_{ne}) for natural ventilators when open across Type V and VI façades only:

Table 5: Natural Ventilators Specifications

System	D_{ne} Octave band centre frequency Hz					
	125	250	500	1000	2000	4000
Window Type V	35	35	35	35	40	45
Window Type VI	31	33	33	33	33	32

4.18 Ensure through wall/frame ventilation systems offered in relation to the specifications are capable of meeting the requirements in their OPEN condition, as some manufacturers offer data with the units CLOSED, which are of no practical use.

4.19 As per Section 4.15, if window systems V and VI were to be combined (to reduce costs, or avoid onsite confusions), the more onerous ventilator for Window Type V would have to be used.

5.0 Mechanical Services Plant

5.1 There is a proposal to include certain items of mechanical services plant as part of this development. The noise level of these items will need to be controlled to preserve the amenity of existing residential and other noise sensitive properties, in accordance with Condition 17 (as detailed in Section 2.0).

5.2 In order to meet the requirements, the noise from all plant would need to be controlled to a maximum level of 32 dB $L_{Aeq,(5mins)}$ at 1m from the nearest noise sensitive façade(s) (which is 10 dB below the lowest typical measured night time background noise levels of 42 dB $L_{A90(5min)}$; see Table 3).

5.3 As the basis of the calculations for noise emissions from the plant, an absolute worst case assessment would assume that all the sound power output from the plant would transmit from the plant and radiate hemispherically towards the nearest noise sensitive windows approximately 35 metres to the Northeast (from the centre of the Northern Block Roof). From this the sound pressure level, Lp, at 35 metres due to the total sound power level, Lw, of the plant would be calculated from:

$$Lp=Lw - 20\log(r) – 8 \text{ dB}$$

Where r is the distance from the plant to the windows. This would mean that the combined sound power level would be 39 dB greater than the required sound pressure level where the distance is 35 metres.

5.4 Therefore to achieve 32 dB L_{Aeq} outside the receptor windows at approximately 35 metres distance, the cumulative sound power level of <u>all</u> combined plant would need to be controlled to 71 dB L_{Aeq} at 1 metre outside the plant/plantroom louvres. This assumes no tonality and a distance of 35 metres. Greater distances (such as plant from the Southern Block) will more than likely require less attenuation and will be assessed during further detailed design phases.

5.5 If the plant were to be considered tonal <u>at</u> the nearest noise sensitive receptor, a further 5 dBA penalty would apply and therefore would need to be controlled to not exceed 66 dB L_{Aeq} at 1 metre from the plant/plantroom louvres.

6.0 Vibration Survey Details and Results

6.1 VDV vibration levels from adjacent rail traffic were measured during the same period and at the location indicated in Figure 1 (page 7); internally at first floor level. The measurements were taken over 1-minute periods throughout the 5-day survey. Measurements were taken using a Rion VM-54 Digital Recorder with attached 3-axes accelerometer unit; which was placed directly on the existing warehouse's 1st floor (with the linoleum tile pulled up). The meter has full calibration histories.

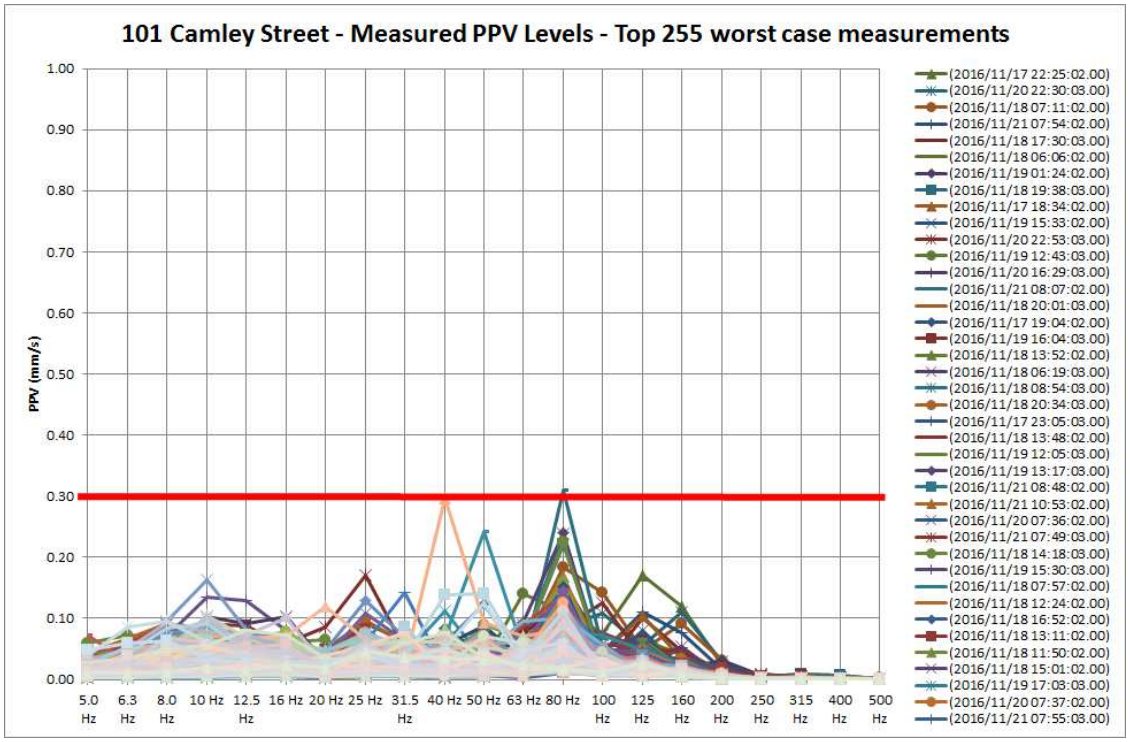
6.2 For VDV levels, the results of the worst-case 16-hour day and 8-hour night periods are provided in the following table for each axes:

Worst-Case Vibration Dose Value ($m/s^{1.75}$)			
Axes	X	Y	Z
16 hour day	0.02	0.02	0.06
8 hour night	0.02	0.02	0.06

6.3 The above clearly demonstrates that VDV vibrations at this site fall comfortably below the criteria of 0.2 $m/s^{1.75}$ for the daytime and 0.1 $m/s^{1.75}$ for the night-time and vibration is therefore not considered to be an issue.

6.4 With regards to PPVs as previously discussed in Sections 2.5-2.7, PPV measurements were taken using a Norsonic 140, Class 1 precision sound level meter with a vibration MMF-KS48 accelerometer adaptor. The accelerometer was magnetically mounted within a proprietary stainless steel tri-axial mounting block in the vertical (Z-axis). The block was placed directly next to the VDV tri-axial accelerometer unit detailed in 6.1.

6.5 The results of the top 255 worst-case 1-minute measurements throughout the entire survey period are depicted in the below graph:



6.6 The above graph demonstrates that PPV levels were all (except for the worst two measurements; from a total of 5535 1-minute measurements) comfortably at and below "*Vibration might be just perceptible in residential environments*", further reinforcing that train induced groundborne vibrations are not considered to be an issue at this site.

7.0 Conclusions

7.1 A new environmental noise survey has been conducted and the noise climate at the site has been established.

7.2 The environmental noise survey proposes internal noise level criteria in line with accepted national guidance/British Standards' requirements and the Planning Conditions of the scheme, together with design specifications to reduce internal noise levels.

7.3 Specifications have been provided for the airborne sound reduction performance of the proposed building's various envelope elements necessary to achieve the required internal levels.

7.4 Maximum noise limits from combined mechanical services plant have been specified so as the plant noise criteria in accordance with Camden's Planning Condition 17, falls 10 dB below the minimum measured background noise levels, at the nearest noise affected sensitive receiver.

7.5 A vibration survey has been conducted; the vibration climate at the site from the adjacent train line has been measured.

7.6 Vibration levels have been assessed in accordance with British Standard BS 6472-1:2008 VDV criteria and BS 5228-2 2009 PPV criteria. It is concluded that levels of vibration are not considered to be an issue at this site.

APPENDIX A

ACOUSTIC TERMINOLOGY

Acoustic Terminology

A1 Noise, defined as unwanted sound, is measured in units of decibels, dB. The range of audible sounds is from 0 dB to 140 dB. Two equal sources of sound, if added together will result in an increase in level of 3 dB, i.e. 50 dB + 50 dB = 53 dB. Increases in continuous sound are perceived in the following manner:

1 dB increase - barely perceptible

3 dB increase - just noticeable

10 dB increase - perceived as twice as loud

A2 Frequency (or pitch) of sound is measured in units of Hertz. 1 Hertz (Hz) = 1 cycle/second. The range of frequencies audible to the human ear is around 20Hz to 18000Hz (or 18kHz). The capability of a person to hear higher frequencies will reduce with age. The ear is more sensitive to medium frequency than high or low frequencies.

A3 To take account of the varying sensitivity of people to different frequencies a weighting scale has been universally adopted called "A-weighting". The measuring equipment has the ability automatically to weight (or filter) a sound to this A scale so that the sound level it measures best correlates to the subjective response of a person. The unit of measurement thus becomes dBA (decibel, A-weighted).

A4 The second important characteristic of sound is amplitude or level. Two units are used to express level, a) sound power level - L_w and b) sound pressure level - L_p. Sound power level is an inherent property of a source whilst sound pressure level is dependent on surroundings/distance/directivity, etc. The sound level that is measured on a meter is the sound pressure level, L_p.

A5 External sound levels are rarely steady but rise or fall in response to the activity in the area - cars, voices, planes, birdsong, etc. A person's subjective response to different noises has been found to vary dependent on the type and temporal distribution of a particular type of noise. A set of statistical indices have been developed for the subjective response to these different noise sources.

A6 The main noise indices in use in the UK are:

L_{A90}: The sound level (in dBA) exceeded for 90% of the time. This level gives an indication of the sound level during the quieter periods of time in any given sample. It is used to describe the "background sound level" of an area.

L_{Aeq}: The equivalent continuous sound level in dBA. This unit may be described as "the notional steady noise level that would provide, over a period, the same energy as the intermittent noise". In other words, the energy average level. This unit is now used to measure a wide variety of different types of noise of an industrial or commercial nature, as well as aircraft and trains.

L_{A10}: The sound level (in dBA) exceeded for 10% of the time. This level gives an indication of the sound level during the noisier periods of time in any given sample. It has been used over many years to measure and assess road traffic noise.

L_{AMAX}: The maximum level of sound measured in any given period. This unit is used to measure and assess transient noises, i.e. gun shots, individual vehicles, etc.

A7 The sound energy of a transient event may be described by a term SEL - Sound Exposure Level. This is the L_{Aeq} level normalised to one second. That is the constant level in dBA which lasting for one second has the same amount of acoustic energy as a given A weighted noise event lasting for a period of time. The use of this unit allows the prediction of the L_{Aeq} level over any period and for any number of events using the equation;

$$L_{AeqT} = SEL + 10 \log n - 10 \log T \text{ dB}.$$

Where

n = Number of events in time period T.

T = Total sample period in seconds.

A8 In the open, known as free field, sound attenuates at a rate of 6 dB per each doubling of distance. This is known as geometric spreading or sometimes referred to as the Inverse Square Law. As noise is measured on a Logarithmic scale, this attenuation in distance = 20 Log (ratio of distances), e.g. for a noise level of 60 dB at ten metres, the corresponding level at 160 metres is:

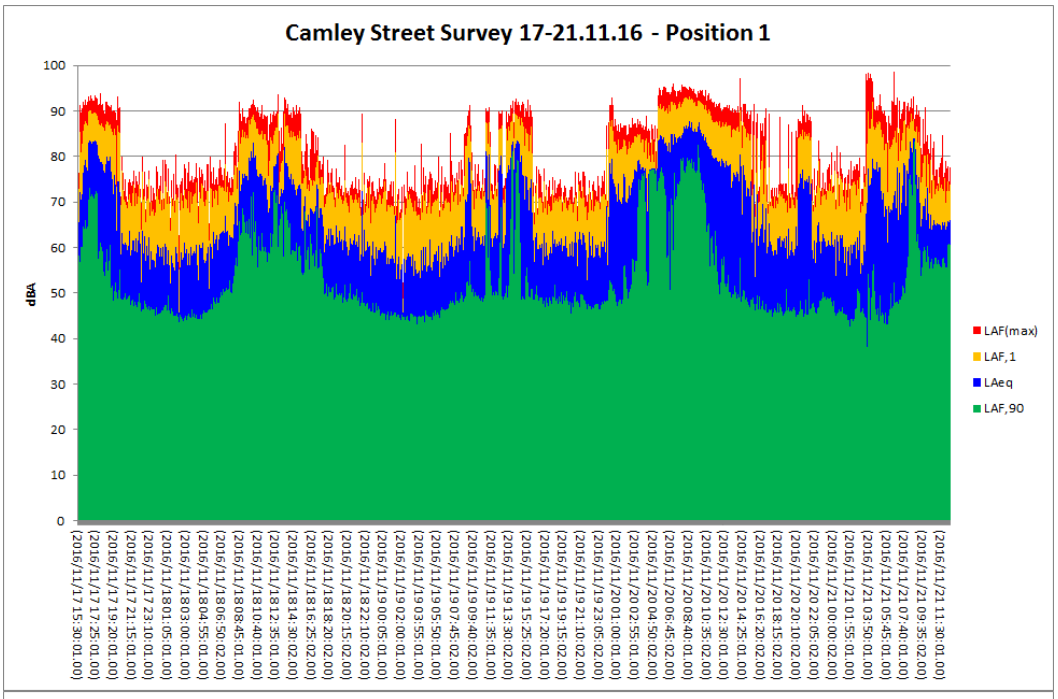
$$60 - 20 \text{ Log } {}^{160}/_{10} = 60 - 24 = 36 \text{ dB}.$$

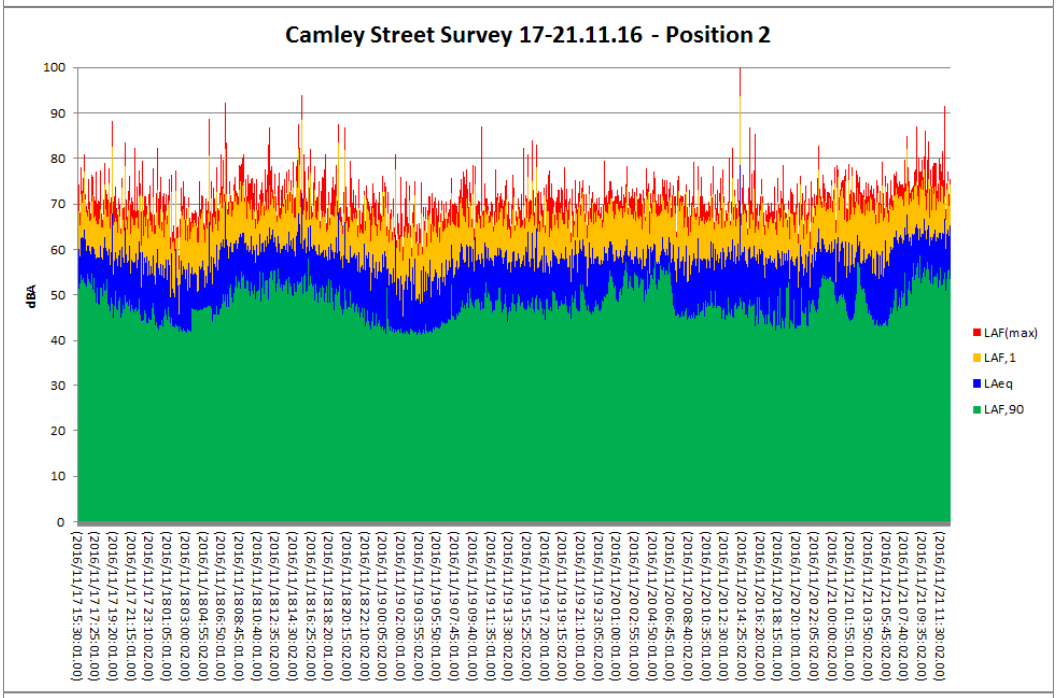
VIBRATION

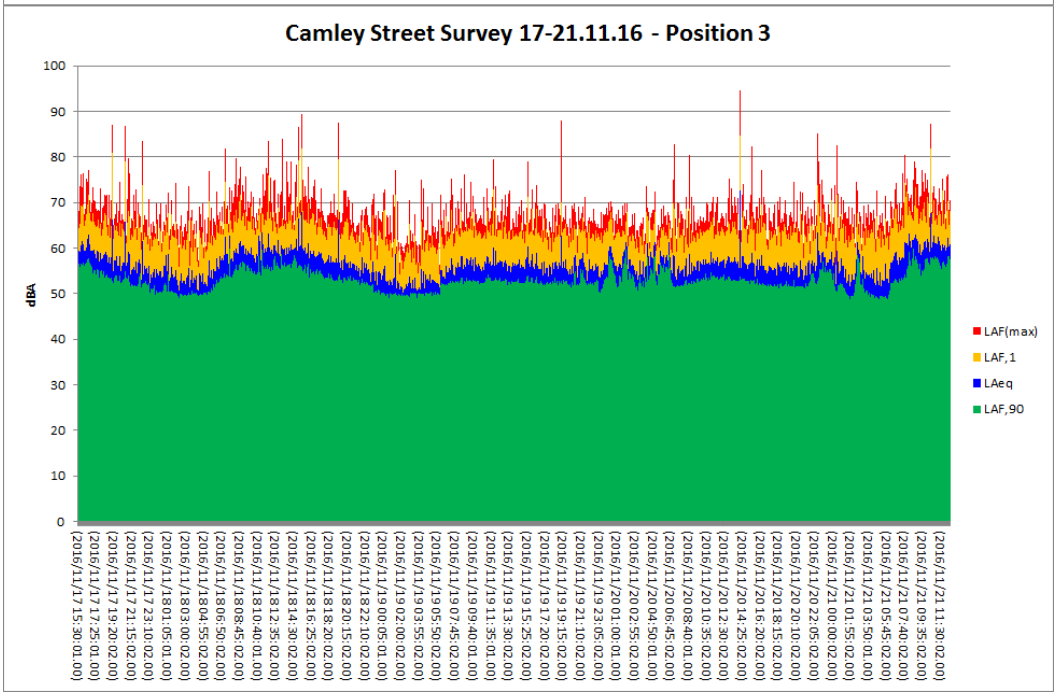
A9 Vibration Velocity and Acceleration: Vibration in terms of velocity or acceleration is usually used to assess the effect of vibration on people or structures. Vibration amplitude can be expressed as an absolute value (e.g. in the case of velocity 1 mm/s or in the case of acceleration 1 mm/s2) or as a ratio on a logarithmic scale in decibels.

APPENDIX B

Environmental Noise Survey Results

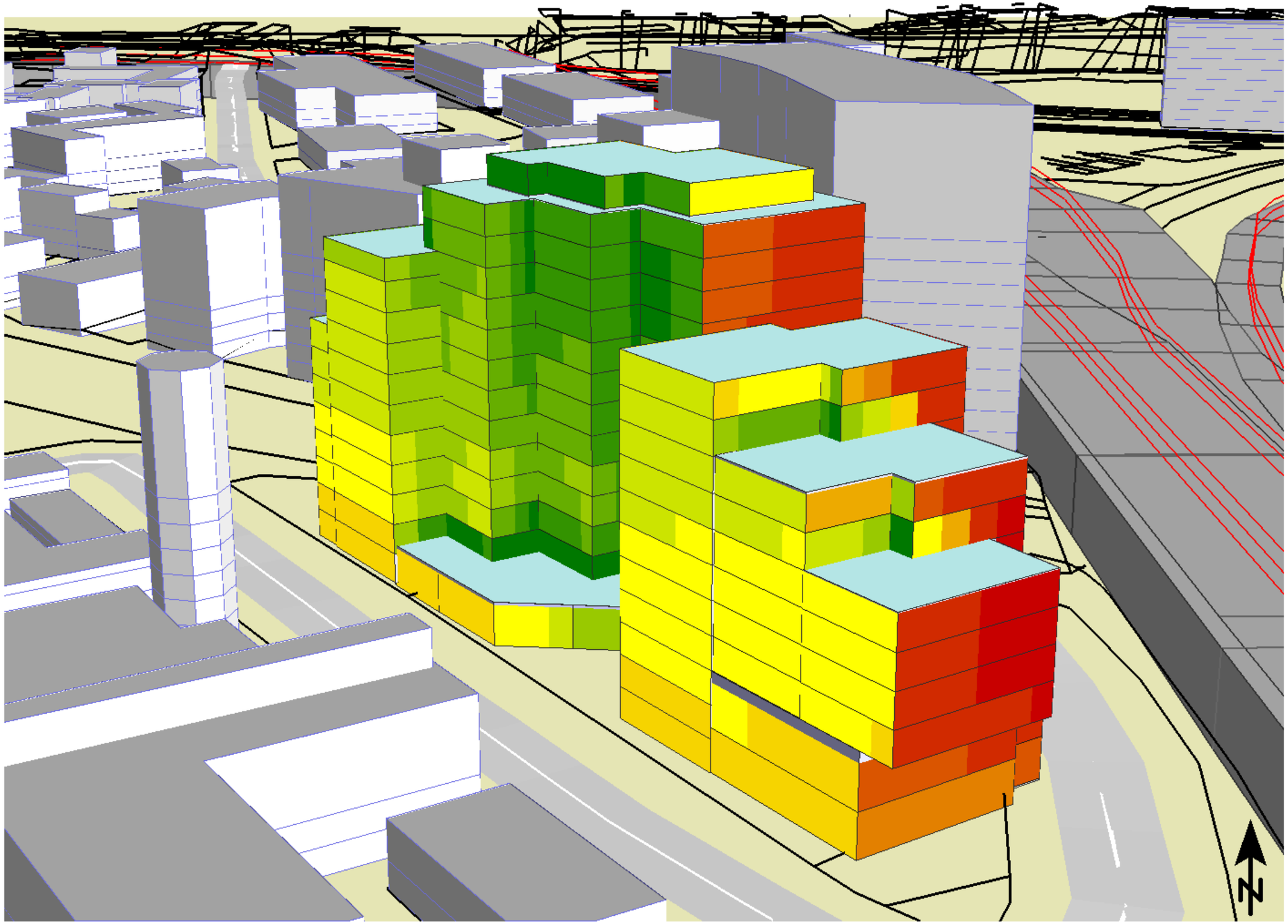

Camley Street Survey 17-21.11.16 - Position 1
dBA
LAF(max)
LAF,1
LAeq
LAF,90


Camley Street Survey 17-21.11.16 - Position 2
dBA
LAF(max)
LAF,1
LAeq
LAF,90


Camley Street Survey 17-21.11.16 - Position 3
dBA
LAF(max)
LAF,1
LAeq
LAF,90

APPENDIX C

SoundPlan Noise Mapping Screenshots



Noise level
LAeq(T)
(dB)

		<=	47
47	<	<=	49
49	<	<=	51
51	<	<=	53
53	<	<=	55
55	<	<=	57
57	<	<=	59
59	<	<=	61
61	<	<=	63
63	<	<=	65
65	<	<=	67
67	<	<=	69
69	<	<=	71
71	<	<=	73
73	<	<=	75
75	<		

Camley Street

Daytime noise levels
LAeq(16hour)

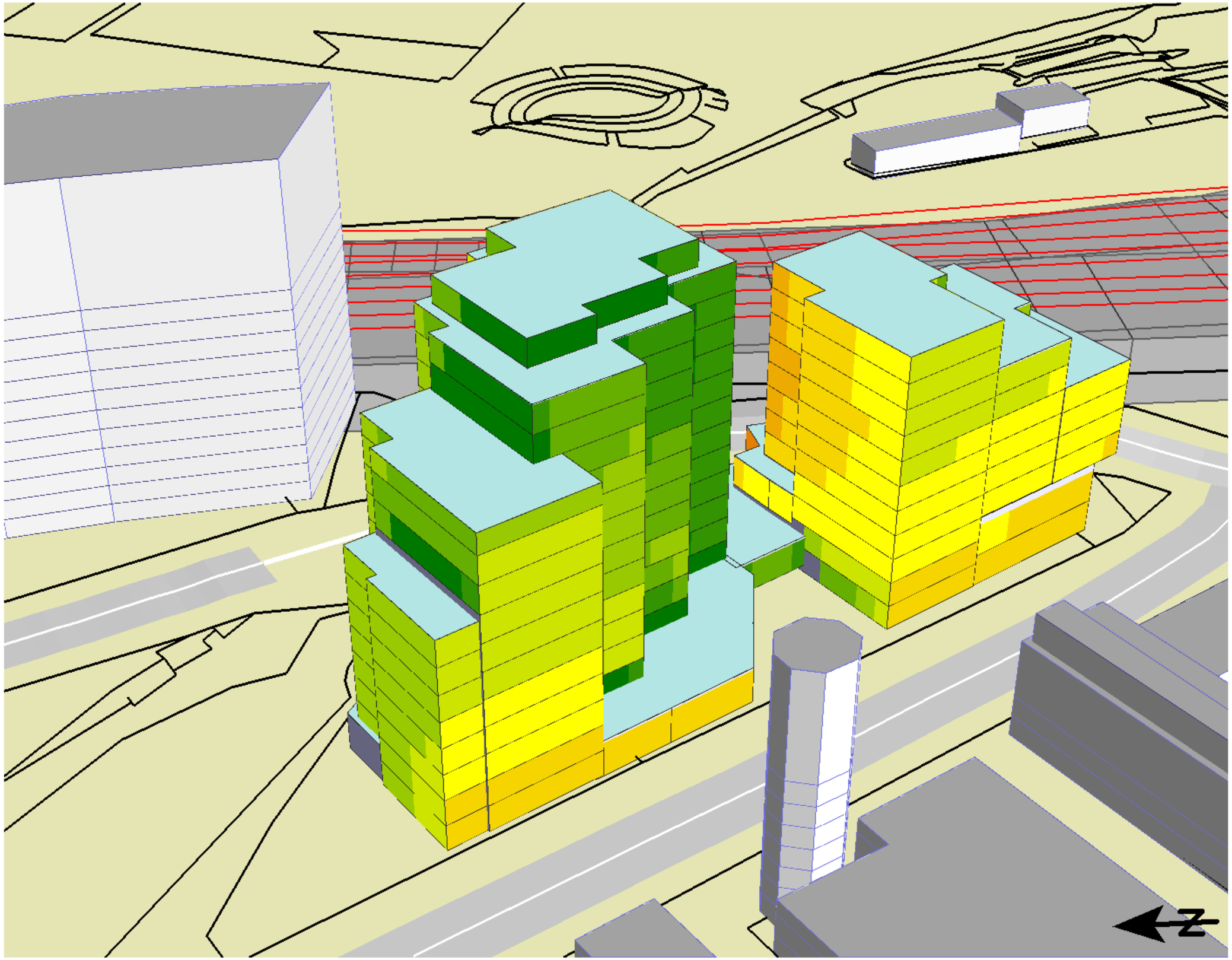
Date: 19.01.2017

Consultant: DJA

Scale 1:5322

0 25 50 100 150 200 m

SHARPS REDMORE
ACOUSTIC CONSULTANTS



Camley Street

Daytime noise levels
LAeq(16hour)

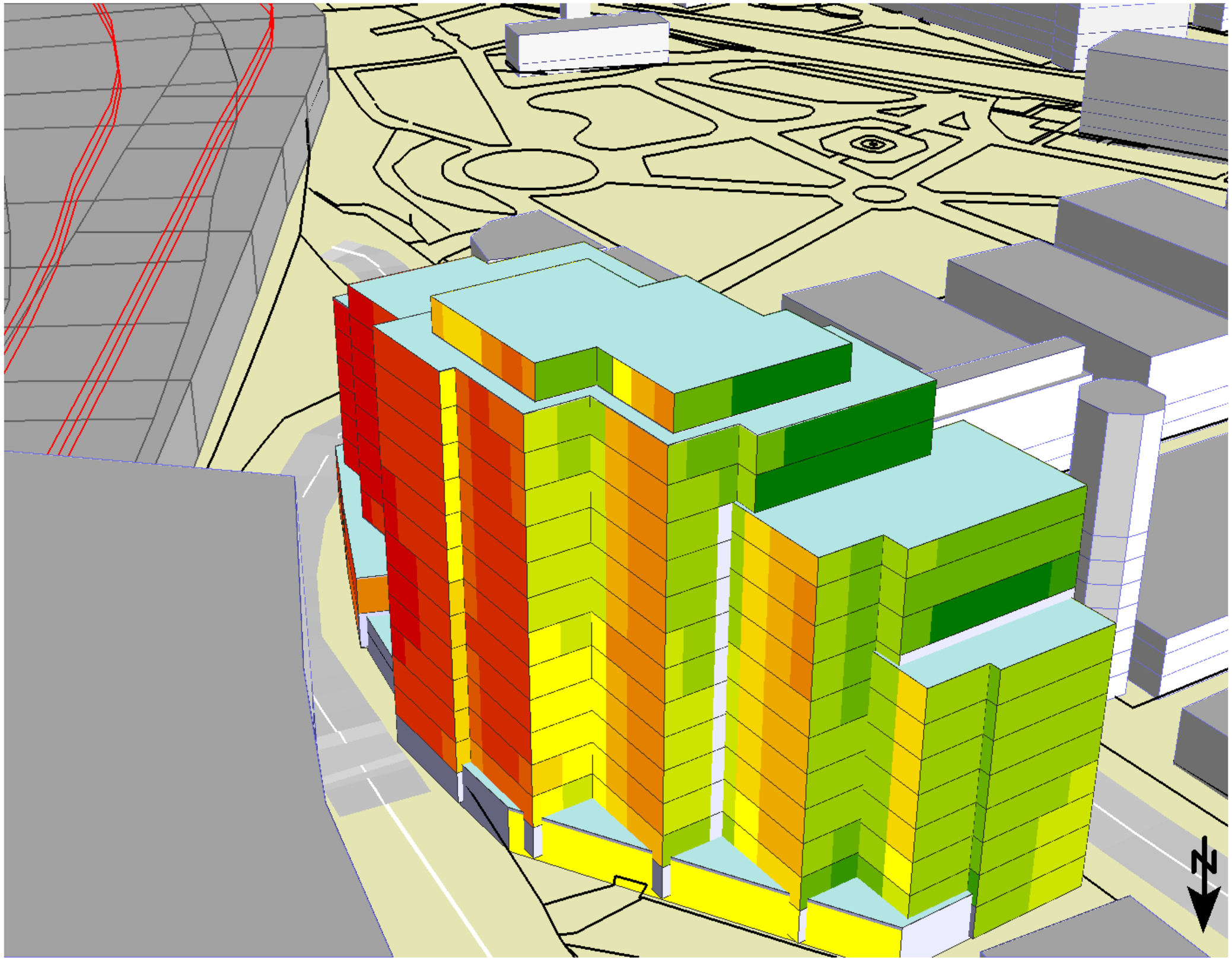
Date: 19.01.2017

Consultant: DJA

Scale 1:5322

0 25 50 100 150 200 m

SHARPS REDMORE
ACOUSTIC CONSULTANTS



Noise level
LAeq(T)
(dB)

		<=	47
47	<	<=	49
49	<	<=	51
51	<	<=	53
53	<	<=	55
55	<	<=	57
57	<	<=	59
59	<	<=	61
61	<	<=	63
63	<	<=	65
65	<	<=	67
67	<	<=	69
69	<	<=	71
71	<	<=	73
73	<	<=	75
75	<		

Camley Street

Daytime noise levels
LAeq(16hour)

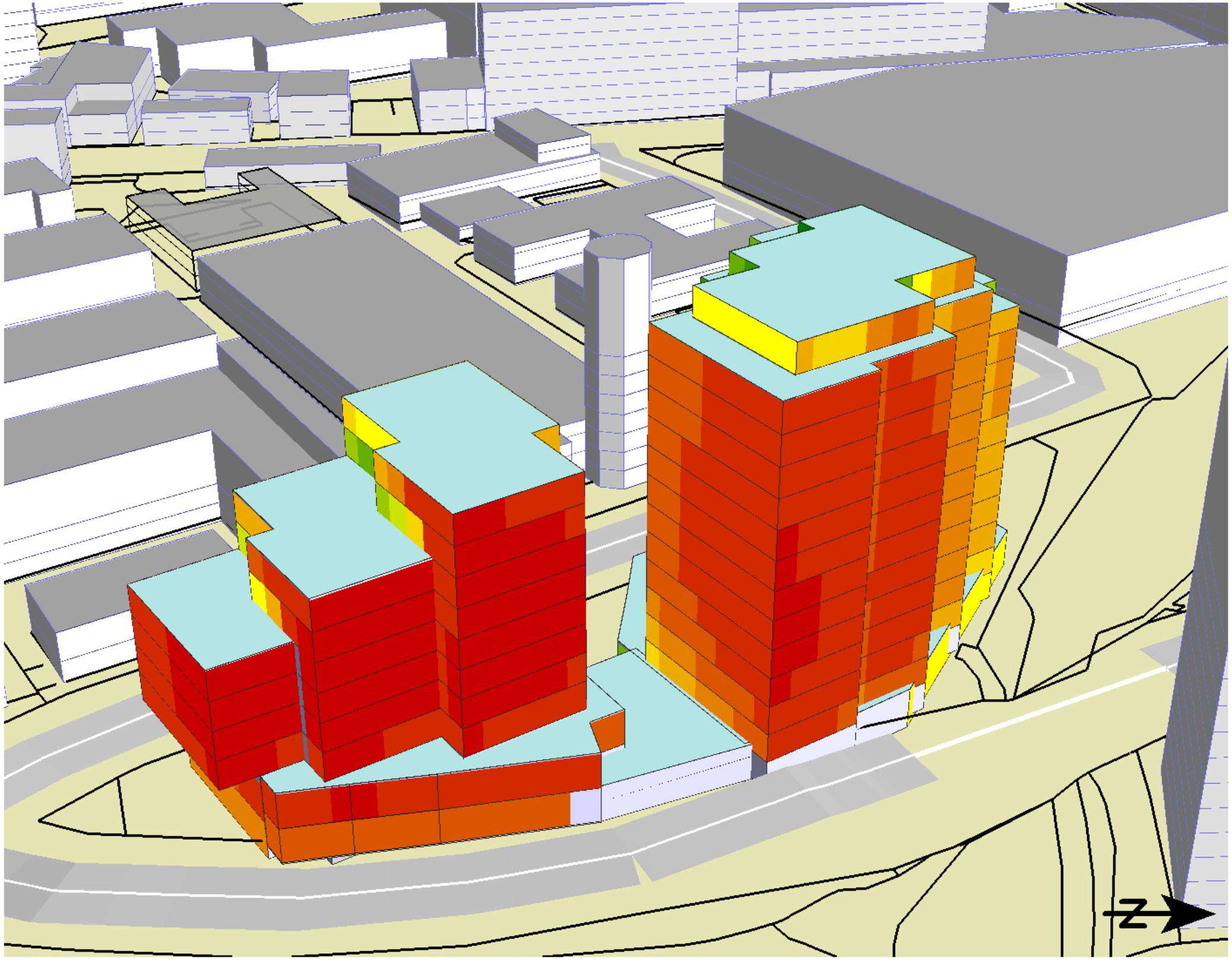
Date: 19.01.2017

Consultant: DJA

Scale 1:5322

0 25 50 100 150 200 m

SHARPS REDMORE
ACOUSTIC CONSULTANTS



Noise level
LAeq(T)
(dB)

		<=	47
47	<	<=	49
49	<	<=	51
51	<	<=	53
53	<	<=	55
55	<	<=	57
57	<	<=	59
59	<	<=	61
61	<	<=	63
63	<	<=	65
65	<	<=	67
67	<	<=	69
69	<	<=	71
71	<	<=	73
73	<	<=	75
75	<		

Camley Street

Daytime noise levels
LAeq(16hour)

Date: 19.01.2017

Consultant: DJA

Scale 1:5322

0 25 50 100 150 200 m

SHARPS REDMORE
ACOUSTIC CONSULTANTS

Noise level
LAeq(T)
(dB)

		<=	47
47	<	<=	49
49	<	<=	51
51	<	<=	53
53	<	<=	55
55	<	<=	57
57	<	<=	59
59	<	<=	61
61	<	<=	63
63	<	<=	65
65	<	<=	67
67	<	<=	69
69	<	<=	71
71	<	<=	73
73	<	<=	75
75	<		

Camley Street

Daytime noise levels
LAeq(16hour)

Date: 19.01.2017

Consultant: DJA

Scale 1:5322

0 25 50 100 150 200 m

SHARPS REDMORE
ACOUSTIC CONSULTANTS

Noise level
LAmax
(dB)

		<=	57
57	<	<=	59
59	<	<=	61
61	<	<=	63
63	<	<=	65
65	<	<=	67
67	<	<=	69
69	<	<=	71
71	<	<=	73
73	<	<=	75
75	<	<=	77
77	<	<=	79
79	<	<=	81
81	<	<=	83
83	<	<=	85
85	<		

Camley Street

Night-time noise levels
LAmax

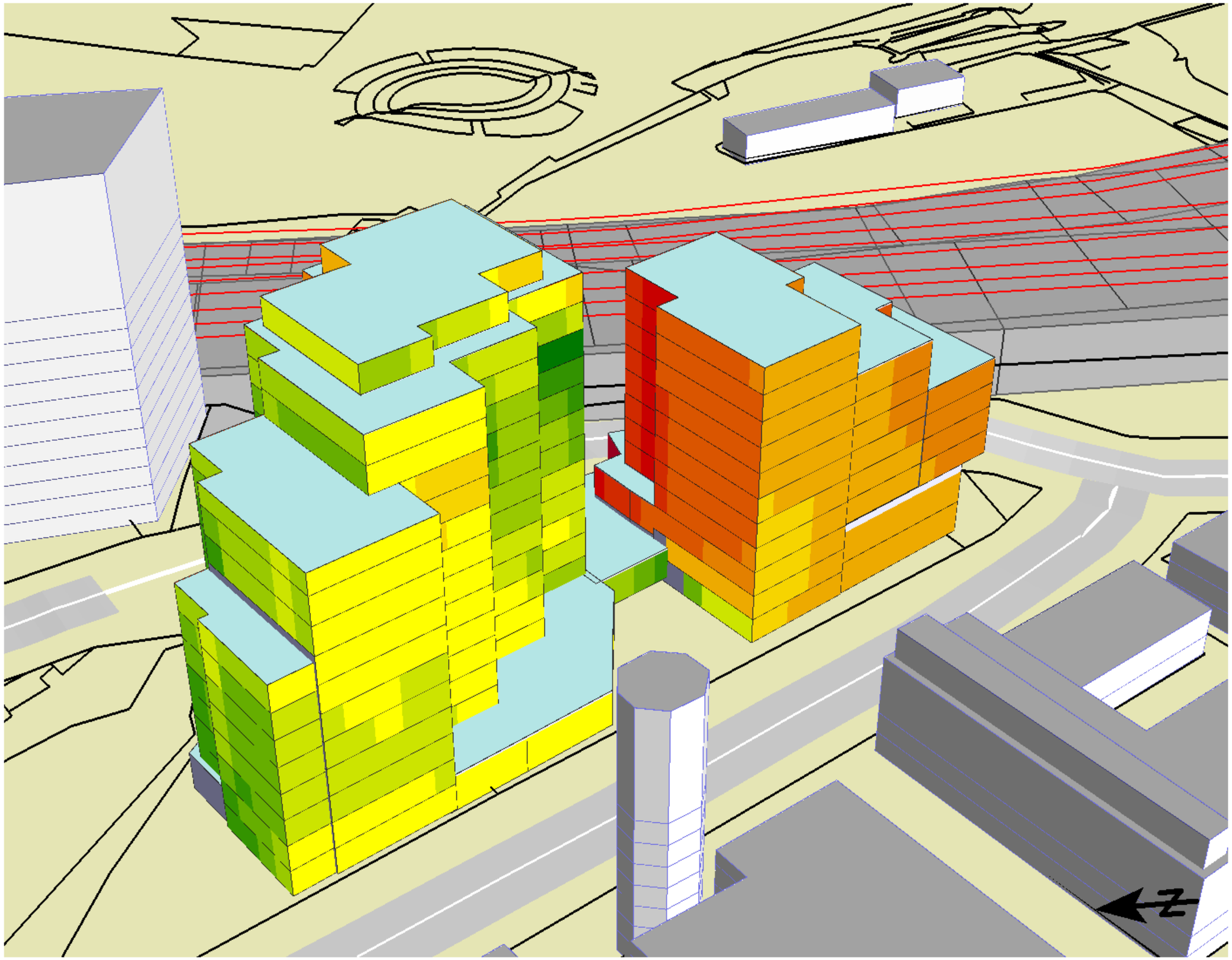
Date: 19.01.2017

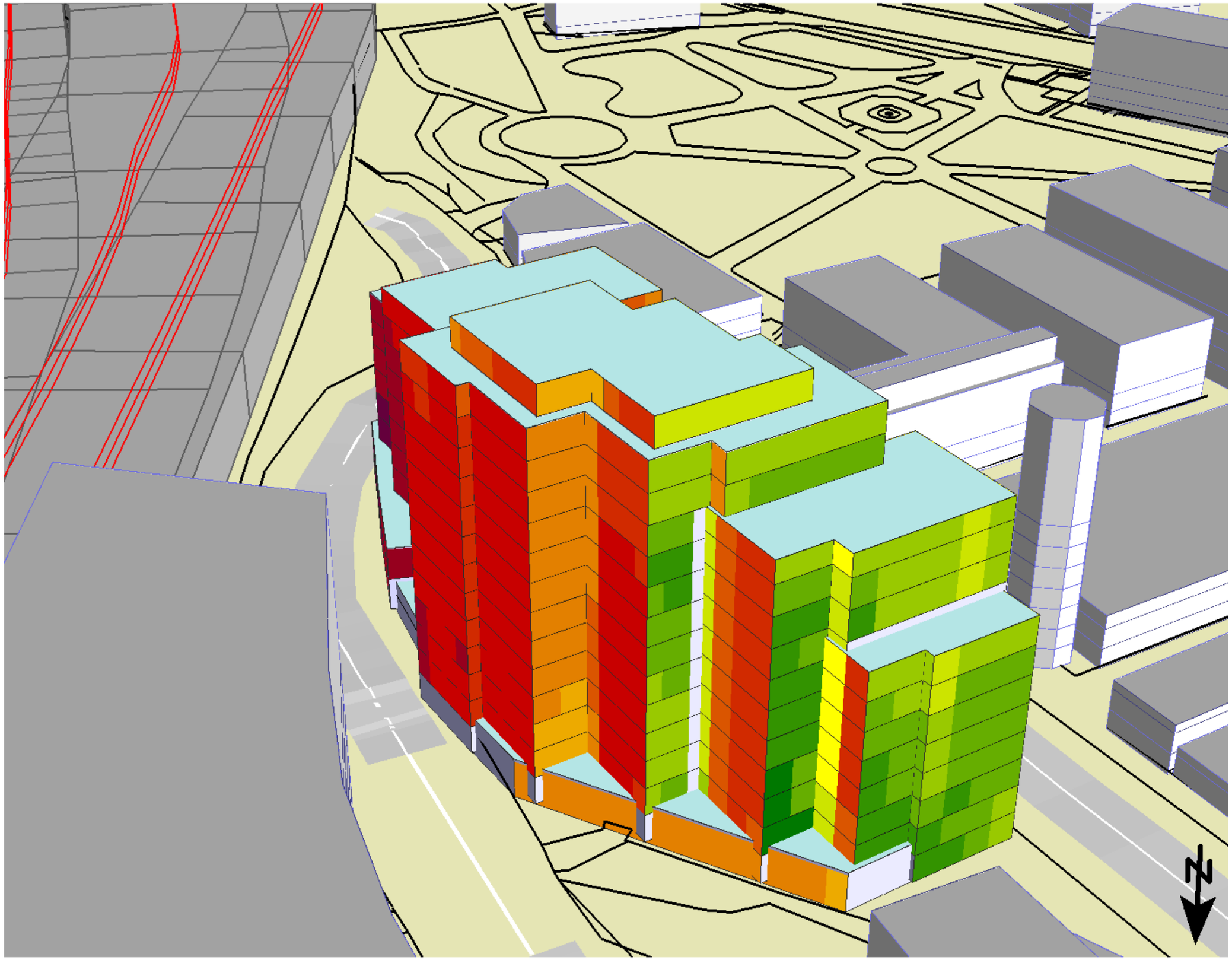
Consultant: DJA

Scale 1:5322

0 25 50 100 150 200 m

SHARPS REDMORE
ACOUSTIC CONSULTANTS


Noise level
LAmax
(dB)
57 < <= 57
59 < <= 59
61 < <= 63
63 < <= 65
65 < <= 67
67 < <= 69
69 < <= 71
71 < <= 73
73 < <= 75
75 < <= 77
77 < <= 79
79 < <= 81
81 < <= 83
83 < <= 85
85 <
N
Camley Street
Night-time noise levels
LAmax
Date: 19.01.2017
Consultant: DJA
Scale 1:5322
0 25 50 100 150 200
m
SHARPS REDMORE
ACOUSTIC CONSULTANTS



Noise level
LAmax
(dB)

		<=	57
57	<	<=	59
59	<	<=	61
61	<	<=	63
63	<	<=	65
65	<	<=	67
67	<	<=	69
69	<	<=	71
71	<	<=	73
73	<	<=	75
75	<	<=	77
77	<	<=	79
79	<	<=	81
81	<	<=	83
83	<	<=	85
85	<		

Camley Street

Night-time noise levels
LAmax

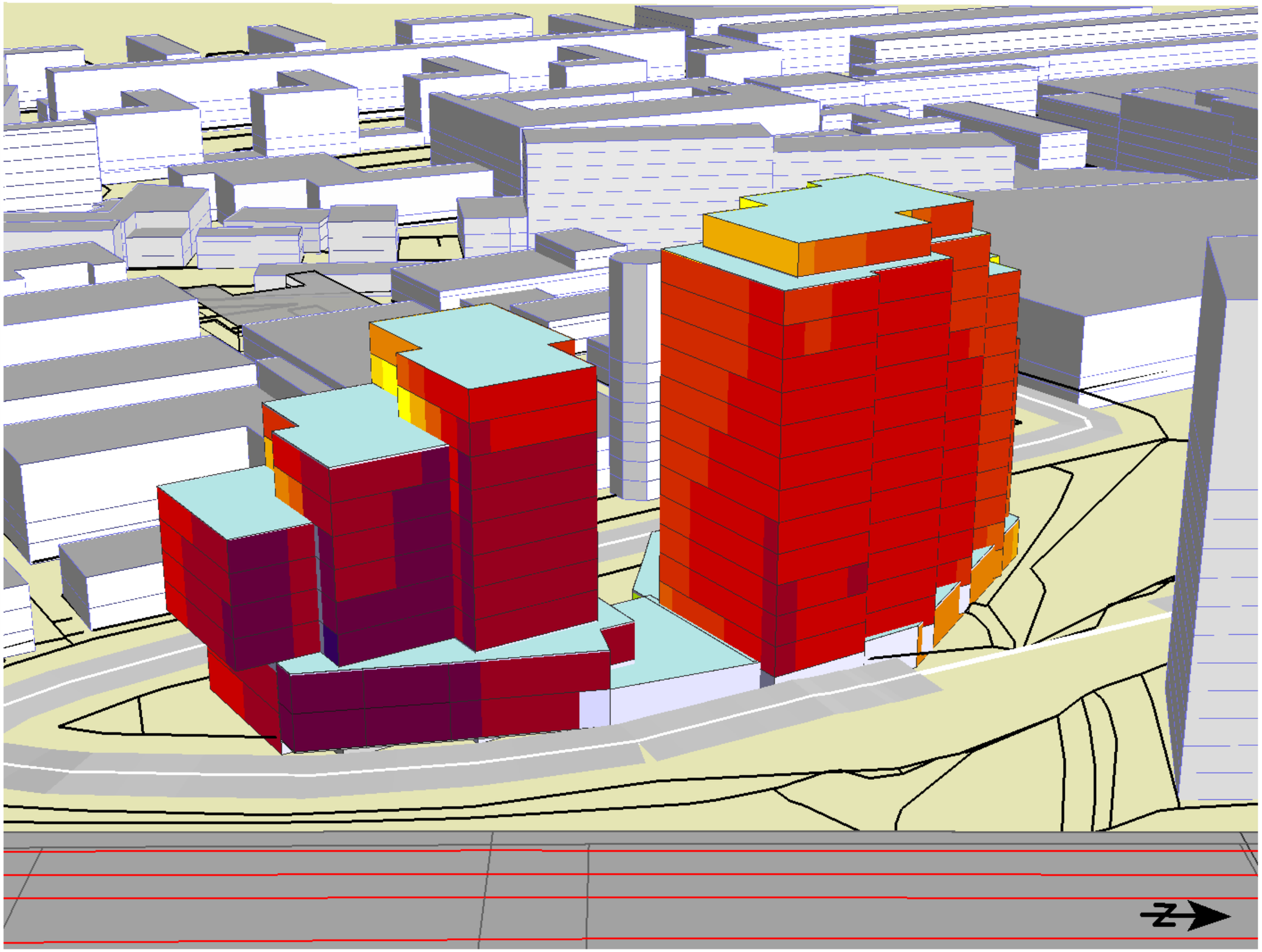
Date: 19.01.2017

Consultant: DJA

Scale 1:5322

0 25 50 100 150 200 m

SHARPS REDMORE
ACOUSTIC CONSULTANTS



Noise level
LAmax
(dB)

		<=	57
57	<	<=	59
59	<	<=	61
61	<	<=	63
63	<	<=	65
65	<	<=	67
67	<	<=	69
69	<	<=	71
71	<	<=	73
73	<	<=	75
75	<	<=	77
77	<	<=	79
79	<	<=	81
81	<	<=	83
83	<	<=	85
85	<		

Camley Street

Night-time noise levels
LAmax

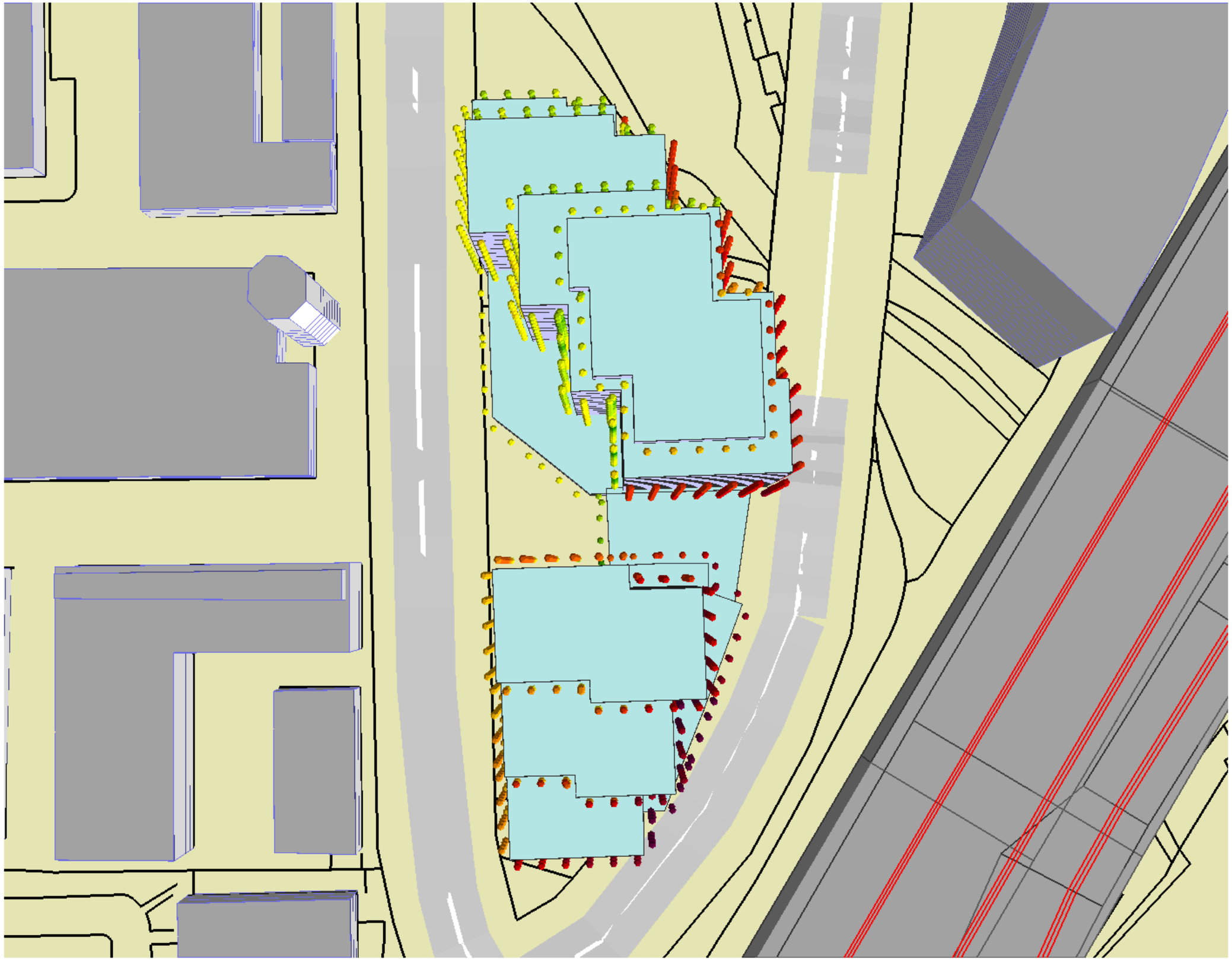
Date: 19.01.2017

Consultant: DJA

Scale 1:5322

0 25 50 100 150 200 m

SHARPS REDMORE
ACOUSTIC CONSULTANTS



Noise level
LAmax
(dB)

		<=	57
57	<	<=	59
59	<	<=	61
61	<	<=	63
63	<	<=	65
65	<	<=	67
67	<	<=	69
69	<	<=	71
71	<	<=	73
73	<	<=	75
75	<	<=	77
77	<	<=	79
79	<	<=	81
81	<	<=	83
83	<	<=	85
85	<		

Camley Street

Daytime noise levels
LAmax

Date: 19.01.2017

Consultant: DJA

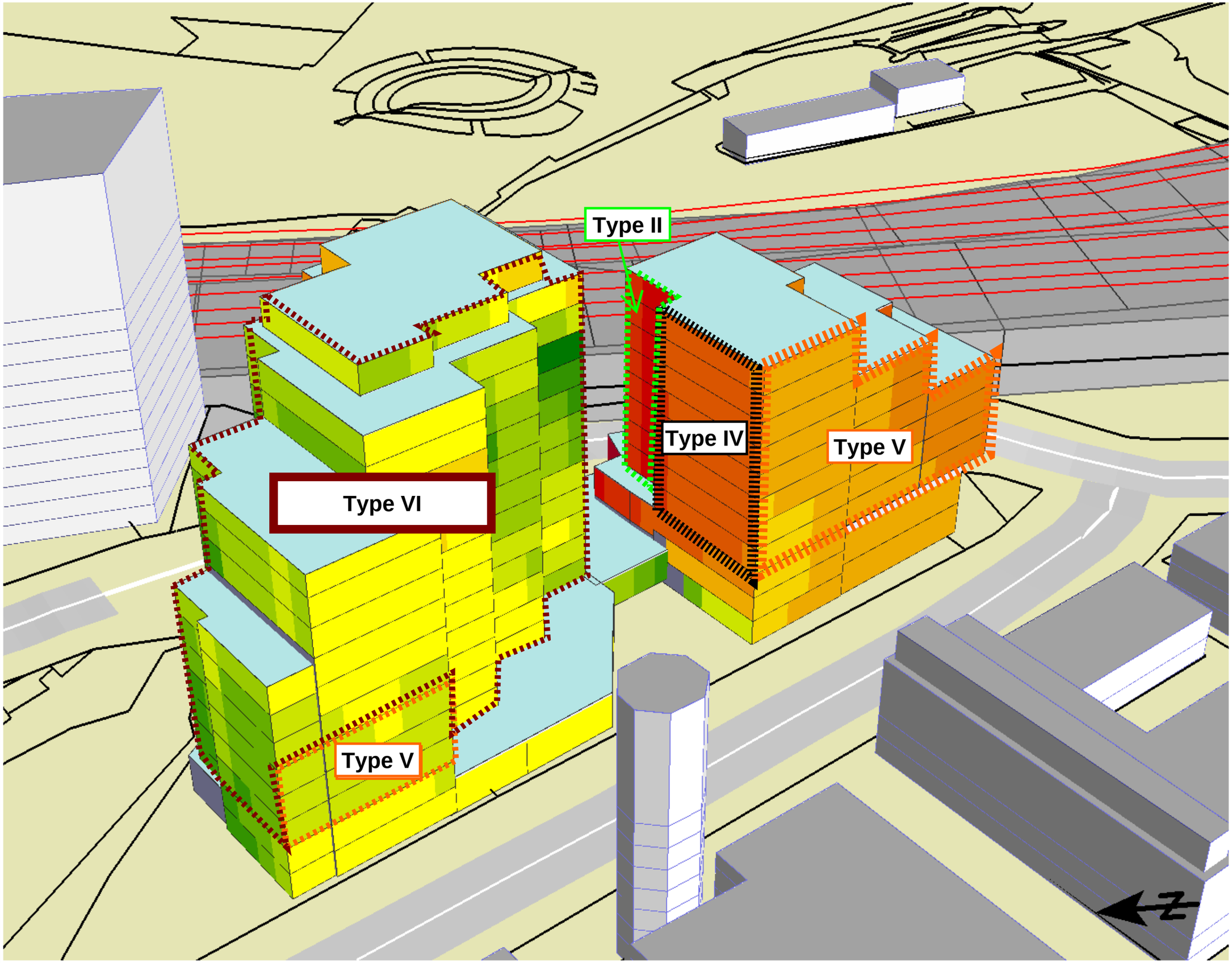
Scale 1:5322

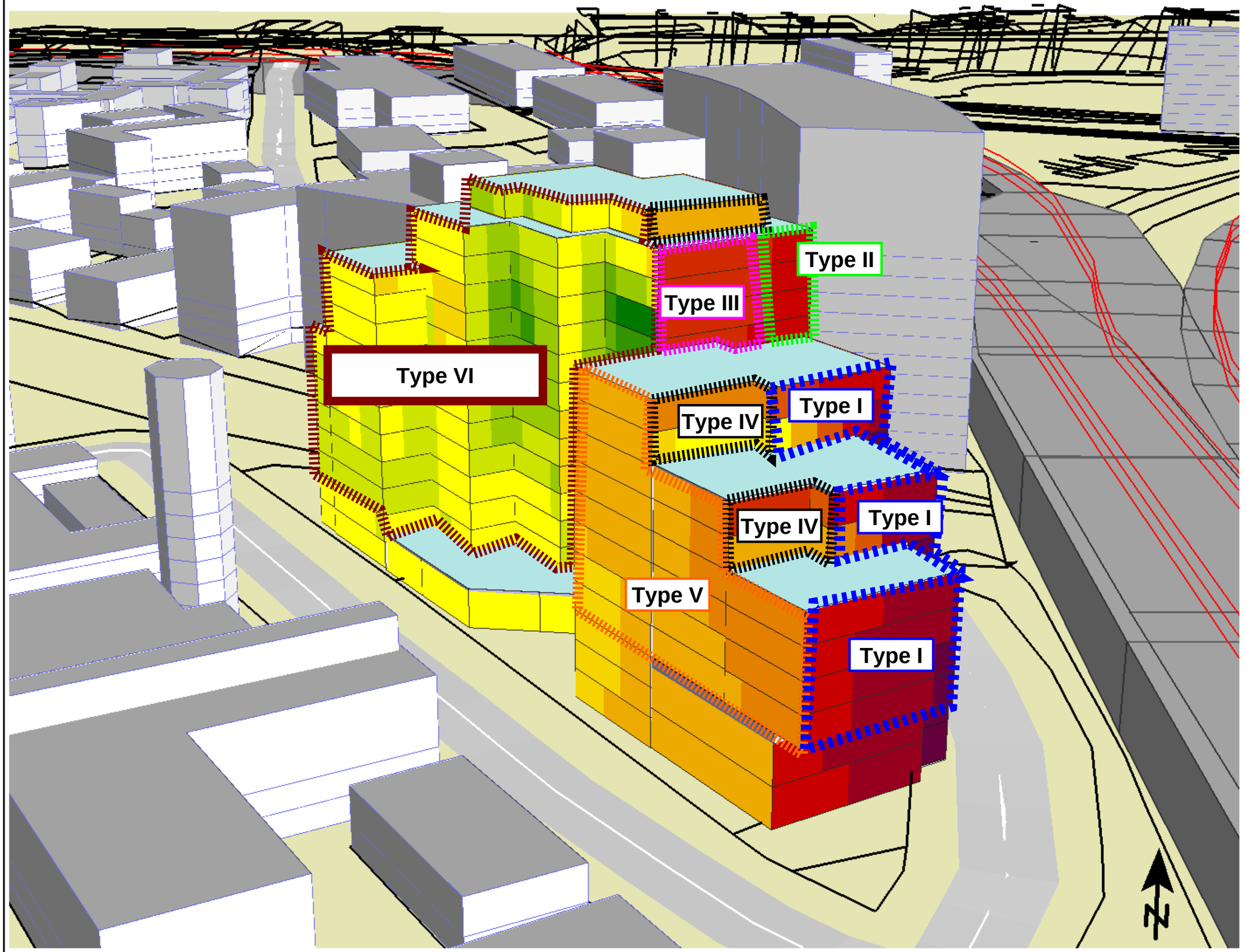
0 25 50 100 150 200 m

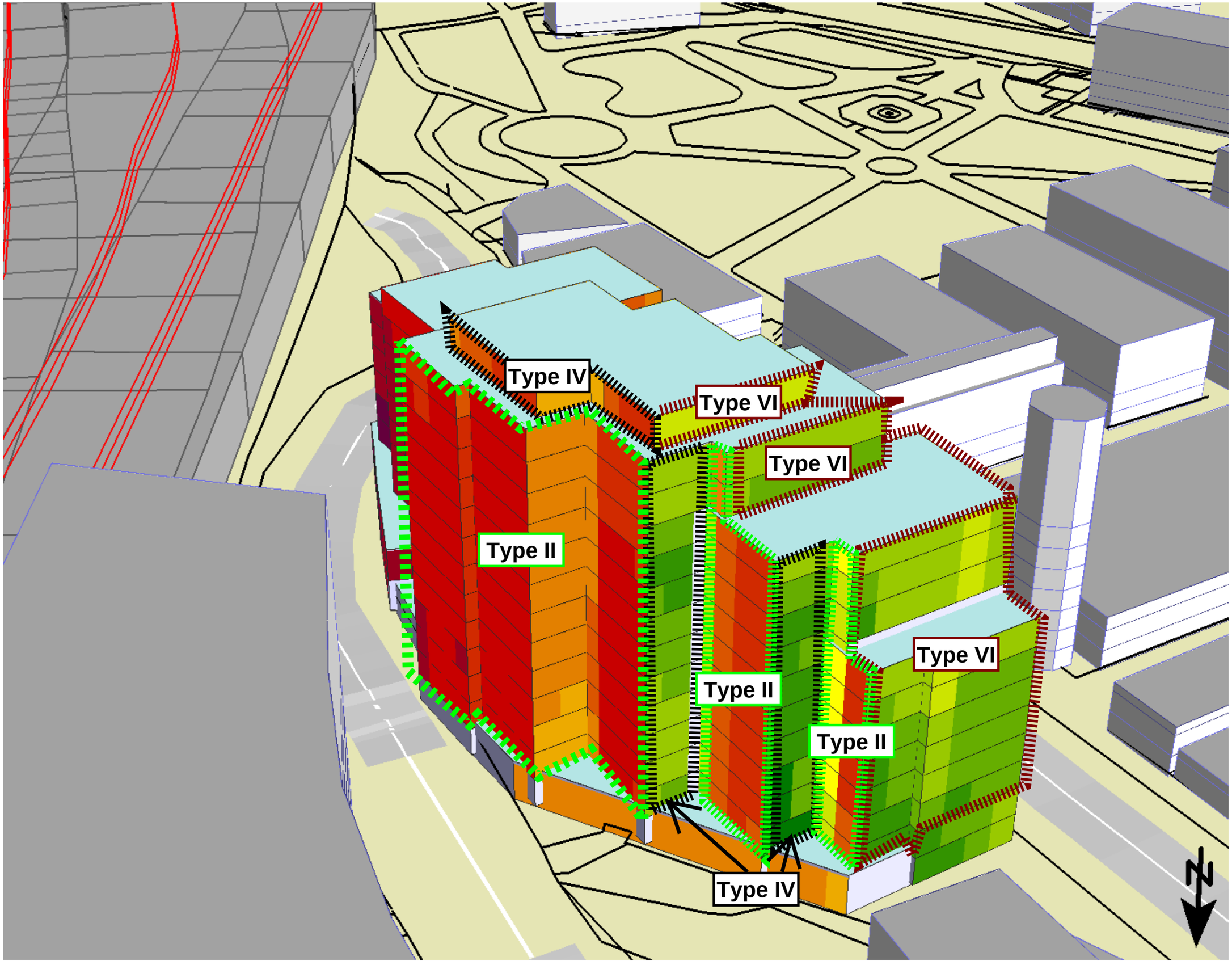
SHARPS REDMORE
ACOUSTIC CONSULTANTS

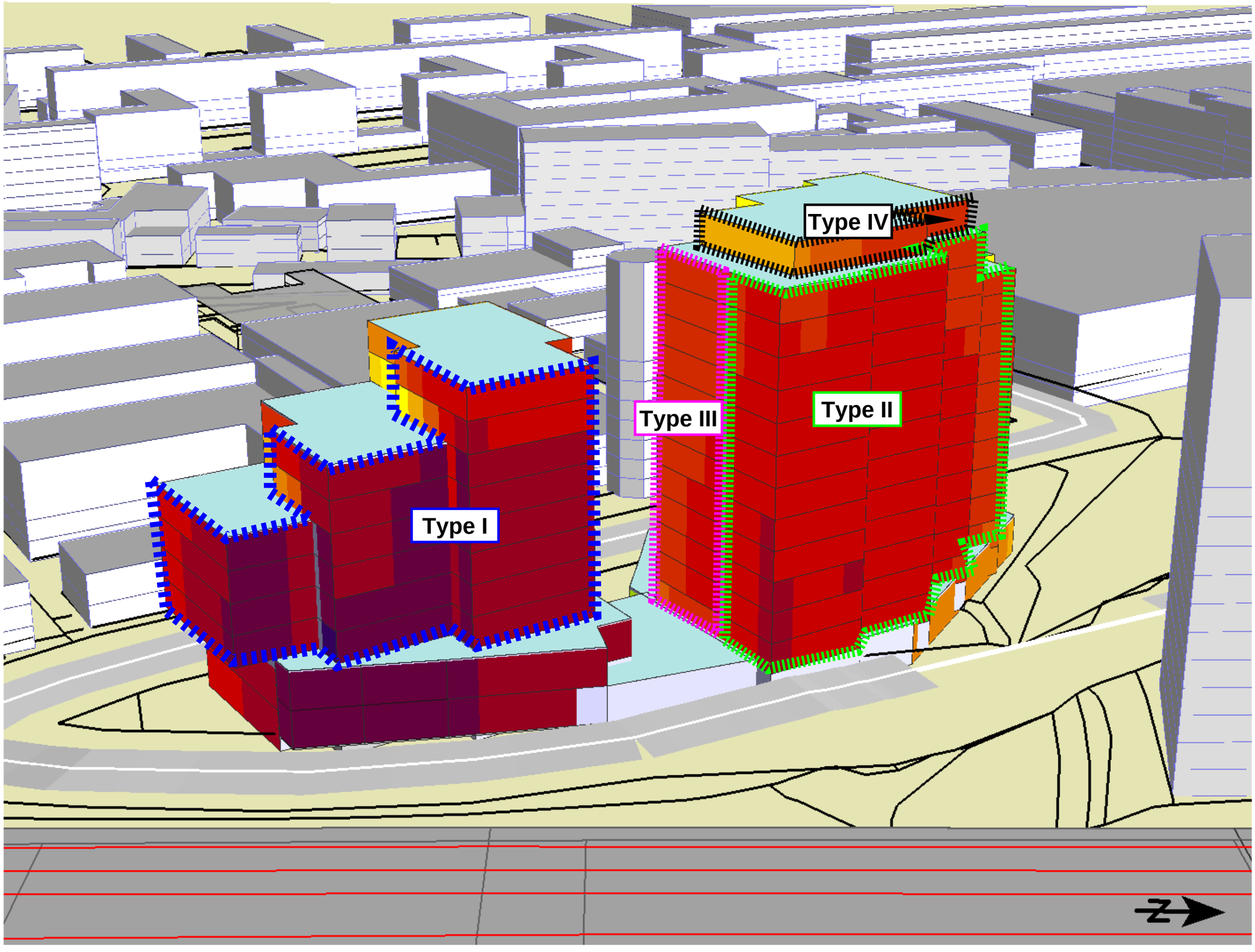
APPENDIX D

Window System Extents


Type II
Type IV
Type V
Type VI
Type V
N


Type II
Type III
Type VI
Type IV
Type I
Type IV
Type I
Type V
Type I
N


Type IV
Type VI
Type VI
Type II
Type VI
Type II
Type II
Type IV
N


Type IV
Type III
Type II
Type I