ACOUSTIC DESIGN TECHNOLOGY
Noise and Vibration Consultants

ADT 2244

2 May 2017

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HUNSHELF PARK, STOCKSBRIDGE

ENVIRONMENTAL NOISE IMPACT ASSESSMENT

ACOUSTIC CONSULTANCY REPORT ADT 2244/ENIA

Revision	Date	Issued By	Checked by	Revision Notes
-	02 May 2017	Andrew Lockwood		-

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1.0 SUMMARY

Planning permission is being sought to build 10 new dwellings on the application site, located in Hunshelf Park, Stocksbridge.

Acoustic Design Technology Limited have undertaken an environmental noise survey over a three day period to measure the typical ambient noise levels both on the application site and at various positions on the nearby Tata Steel works site.

Following the government's Planning Practice Guidance, the existing noise levels on the application site would be classified as noticeable and intrusive, so the action should be to mitigate and reduce to a minimum.

Consideration has been given to possible means of reducing the noise emissions from the Tata Steel works, and also sound insulating the proposed dwellings against the existing levels of noise.

The conclusion of this report is that the existing levels of noise on the application site can be reduced to acceptable levels inside the proposed dwellings.

However, with the continued co-operation of Tata Steel, the intention is to attenuate a noisy fan and improve the sound insulation of some of the workshops, thereby reducing the resultant noise levels on the application site by around 10 dB(A). The resultant noise intrusion levels inside the new dwellings would then be reduced to near or below the threshold of audibility.

2.0 BASIS OF ASSESSMENT

2.1 Site Location

The application site is located on Hunshelf Park, a short cul-de-sac off Hunshelf Road in Stocksbridge, Sheffield, and is shown on the attached site plan 2244/SP1.

The surrounding area features a mixture of residential and commercial development. Hunshelf Park itself is a residential street with existing houses on both sides of the application site, and there are large areas of housing around 500 metres to the south. The intervening area is occupied by the Tata Steel works.

The Stocksbridge Bypass (the A616) runs parallel to Hunshelf Park approximately 150 metres to the north, and Manchester Road (the A6088) also runs east to west, approximately 250 metres to the south.

There is also an electrical substation just to the west of the junction of Hunshelf Park and Hunshelf Road.

2.2 Proposed Development

The proposal is to build 10 new dwellings on the application site, as shown on the planning application drawings.

2.3 Planning Policy

The National Planning Policy Framework (NPPF) sets out the general terms of reference for sustainable development, including noise. Section 123 states that planning policies and decisions should aim to:-

i. avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development

ii. mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions

iii. recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established and

iv. identify and protect areas of tranquility which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason

However, neither the NPPF nor the supplementary guidance Noise Policy Statement for England (NPSE) contain any fixed noise criteria, assessment methods or references to established standards such as BS 4142 or BS 8233.

For this development the key principles to be applied from the NPPF are

i. to ensure that future development provides satisfactory health and quality of life for the occupants of the new dwellings

ii. to ensure that existing businesses in the surrounding area may continue in their business without unreasonable restrictions arising from the development of the site

iii. to protect existing residents from noise generated by the development

The first and second of the above principles can be addressed by measuring the noise levels on the site and providing mitigation where necessary.

On the third issue of noise generated by the development, this should only be significant during the construction phase and can be addressed using standard planning conditions with appropriate hours of operation.

The government planning practice guidance website includes advice on a range of topics including noise. This section defines the action to be taken for various effect levels, based on perception of noise and typical outcomes. The attached table 2244/T1 replicates the summary table on the website.

3.0 ENVIRONMENTAL NOISE SURVEY

3.1 Introduction

An environmental noise survey was undertaken between 15:00 hours on Monday 5 September and 09:00 hours on Thursday 8 September 2016.

3.2 Instrumentation

The survey was undertaken using the instrumentation detailed in Appendix A of this report.

The meters were calibrated before and after each survey period. No significant drift occurred.

3.3 Procedure

Five measurement positions were selected, as indicated on the attached site plan 2244/SP1.

Positions 1 to 4 were located on an elevated walkway on the Tata Steel site, with the microphones positioned on tripods approximately 0.5 metres external to the facades of the Tata Steel workshops.

Position 5 was on the application site, with the microphone positioned on a tripod approximately 1.2 metres above the ground and at least 3.5 metres from any other acoustically reflective surface.

The noise levels were logged continuously for the duration of the survey period at positions 1 to 4 using the 4 channel Svantek meter, and for discrete periods at position 5 using the 01 dB meter. Both meters were set to store the octave band and 'A' weighted 100ms short-term L_{eq} for subsequent post processing.

3.4 Results

The logged data from each position has been post processed to determine $L_{Aeq,T}$ $L_{A90,T}$ and L_{Amax} levels for each 5 minute period, and these have been plotted on the attached time history graphs 2244/TH1 to TH5 for measurement positions 1 to 5 respectively.

Please refer to Appendix B for an explanation of the noise units and the A-weighting term used in this report.

3.5 Weather Conditions

As the survey was predominantly unmanned, it is not possible to give a detailed description of the weather for the entire period.

However, at the beginning and end of the survey, and also during the periods of manned monitoring, the weather was dry with no more than a light breeze, with similar conditions forecast throughout.

3.6 Description of Existing Acoustic Environment

As the survey was predominantly unmanned, it is not possible to give a detailed description of the noise climate for the entire survey period. However, at the beginning and end of the survey, and also during the periods of manned monitoring, the noise levels at all positions were primarily controlled by noise emanating from the Tata Steel site.

3.7 Discussion

Site observations identified that the most significant sources of noise affecting the application site are noise breakout from inside the various Tata Steel buildings, and a particularly noisy extract fan which terminates above the flat roof in approximately 3 metres from measurement position 1.

3.7.1 Extract Fan

Reference to graph 2244/TH1 shows a fairly constant background noise level of around 75 dB(A), increasing to around 95 dB(A) periodically when the extract fan operates.

There is clear correlation between the L_{A90} levels at position 1 when the fan is running and the highest L_{A90} levels recorded at position 5. In other words, the highest noise levels on the application site occur when the extract fan is running.

More detailed analysis shows that it is the fan, rather than any associated processes, that control the noise level on site. It therefore follows that if the noise emissions from the fan are reduced, there will be a corresponding reduction in the noise levels on the application site.

3.7.2 Noise Breakout from Workshops

The application site is also significantly affected by intermittent noise breakout from the various buildings, some of the highest levels being generated by a process that sounds like the cutting of steel with a circular saw. This was particularly noticeable towards the eastern end of the steel works and resulted in noise levels of up to around 60 dB $L_{Aeq,5mins}$ on the application site.

The noise levels measured at positions 2, 3 and 4 are progressively less affected by the extract fan due to the greater distances between them. However, reference to the attached graphs shows that at positions 3 and 4 in particular, there are still clear "steps" in the L_{A90} levels as various processes start and stop.

The sound insulation properties of the Tata Steel buildings are currently very poor, due primarily to the large openings in the walls at high level. It therefore follows that if the sound insulation of the buildings is improved, noise breakout levels will reduce and the resultant noise levels around the application site will also reduce.

4.0 NOISE IMPACT ASSESSMENT

4.1 Introduction

The site survey has established that:-

i Tata Steel works is a 24 hour operation and there is no significant difference between the daytime and nighttime noise levels emanating from the premises

ii ambient noise levels on the application site are controlled by noise emissions from the Tata Steel works, the level being around 60 dB $L_{Aeq,5mins}$ during the noisiest periods of operation. Averaged over a period of several hours or more, the level is around 55 dB $L_{Aeq,T}$.

iii the two distinctive noise sources affecting the application site are a particularly noisy extract fan and an internal operation that sounds like steel being cut by a circular saw. The fan emits predominantly low frequency noise, whereas noise breakout from the workshops is predominantly high frequency. The two sources therefore do not significantly add to each other.

Despite the fact that there are existing residential properties directly adjacent to the application site on both sides, Sheffield City Council have previously expressed concerns that the current levels of noise emanating from the Tata Steel works meant that it was questionable whether an acceptable noise environment could be achieved, given that no mitigation strategy had been presented.

4.2 Computer Modelling

To assist with the assessment, a computer model has been constructed using Datakustik Cadna/A 2017 set to calculate according to ISO 9613-2 using both direct and first order reflected rays. Within the model all buildings and barriers have been assumed to be acoustically reflective, with ground absorption taken in to account as appropriate. Receiver heights have been assumed to be 4.5m above ground level to account for 1st floor bedroom windows.

The model has been calibrated by assigning noise levels to the extract fan and the four easternmost workshop bays such that the predicted and measured levels correlate at the 5 measurement positions.

As the steel works is a large, complex noise source, the correlation is not exact, but is considered to be sufficiently accurate to allow it to be used as a datum against which the benefit of noise mitigation measures may be assessed.

As already mentioned, analysis of the data measured on the site shows that, when averaged over a period of several hours or more, noise egress from Tata Steel result in a level of approximately 55 dB $L_{Aeq,T}$ on the application site. The attached noise map 2244/NM1 shows how these average levels would vary around the perimeter of the proposed dwellings once constructed.

The short term $L_{Aeq,5mins}$ are typically around 5 dB higher during the noisiest periods of operation.

4.3 Application of Planning Practice Guidance (Noise)

The predicted levels are not particularly high, but the two main sources both have distinctive characteristics. Thus, in Planning Practice Guidance terms (refer to attached table 2244/T1), the perception would be *"noticeable and intrusive"*, and the recommended action is therefore to *"mitigate and reduce to a minimum"*.

There are two basic ways in which the noise can be mitigated. The first is to reduce the levels of noise emanating from the Tata Steel works if possible, and the second is to insulate the proposed dwellings against the external noise levels.

4.4 Attenuation of Noise Levels from Tata Steel

Preliminary discussions with a silencer manufacturer have established that by fitting a discharge silencer to the noisy extract fan, the noise emissions could be reduced by approximately 10 dB(A).

Additionally, by fitting acoustic louvers and blanking panels to the openings in the workshops as shown on the attached noise map 2244/NM2, noise breakout from the workshops can readily be reduced by at least 10 dB(A).

The attached noise map 2244/NM2 also shows the predicted levels around the perimeter of the proposed dwellings with these noise mitigation measures in place. It is understood that Tata Steel have already agreed in principle to allow the Developer to carry out these noise mitigation works on their site.

4.5 External Noise Intrusion into Proposed Dwellings

The design of the proposed dwellings is already well advanced and energy efficiency is one of the driving principles, with Passivhaus certification being the eventual aim. This is to be achieved by constructing the external building fabric out of materials with extremely high thermal insulation values, and with very good airtightness. The buildings will have a cross-laminated timber structure with external wood fibre insulation. They will incorporate triple glazing and whole house ventilation that does not require permanent ventilation openings in the habitable rooms.

Although the Passivhaus standard is primarily an energy and comfort standard, it incorporates rigorous quality control to ensure that thermal performance is as-designed. Continuous insulation and stringent airtightness requirements also help with acoustic performance and the Passivhaus planning process also incorporates strategies for avoiding summer overheating.

The form of construction chosen will also provide high levels of sound insulation against external noise intrusion, as follows:-

external facade / cladding system with independent internal wall lining	> R_w55 dB
triple glazing (8-18-4-18-11.52(55.4 laminate))	R_w44 dB

Furthermore, the provision of whole house ventilation means that the very high levels of sound insulation provided by the building fabric will not be compromised by the need to open the windows for ventilation.

The sample calculation 2244/C1 appended to this report shows that the proposed facade construction would reduce an external noise level of 55 dB $L_{Aeq,8hour}$ to around 24 dB $L_{Aeq,8hour}$ inside a typical bedroom overlooking the Tata Steel works.

Taking into account the variation in noise levels around the site as shown on the attached noise maps 2244/NM1 and NM2, the predicted noise levels inside the proposed dwellings are:-

Scenario	$L_{Aeq,8hour}$
with no noise mitigation measures to Tata Steel	between 2 dB and 25 dB
with the benefit of the proposed noise mitigation measures	between -8 dB and 14 dB

Thus, even without any noise mitigation measures to Tata Steel, external noise intrusion to the proposed dwellings would be low. With the benefit of the proposed noise mitigation measures to Tata Steel, noise break in to the proposed dwellings would be near or below the threshold of audibility.

4.6 Other Noise Sources

As noise from the Tata Steel works currently dominates the local noise climate at all times of the day and night, it was not possible to measure what the ambient noise levels would be in the absence of any noise from the steel works.

However, given the proximity of the A616, it is likely that this would be one of the dominant noise sources. Computer modelling using the methodology of Calculation of Road Traffic Noise predicts daytime levels of 45 – 50 dB L_{Aeq}, and nighttime levels of 40 – 45 dB L_{Aeq} on the application site.

There would also be contributions from other sources such as road traffic from the town and the railway line but it is outside the scope of this assessment to attempt to model them.

However, this means that if the proposed noise mitigation measures to Tata Steel are carried out, the resultant noise levels on the application site will be of comparable magnitude to the levels of noise from other environmental noise sources and will therefore lose much of their currently distinctive character.

5.0 CONCLUSIONS

5.1 A site survey has established that the ambient noise levels on the application site are currently controlled by noise emissions from the Tata Steel works, with average daytime / nighttime levels of around 55 dB $L_{Aeq.T}$, rising periodically to around 60 dB $L_{Aeq,5mins}$ during short periods of intense activity.

5.2 Although these levels are not especially high for an urban environment, the noise emissions from the steel works have clearly identifiable characteristics and are therefore more noticeable, and potentially disturbing than the same levels of road traffic noise would be.

5.3 Computer modeling has established that by fitting a silencer to an identified extract fan and fitting acoustic louvres or blanking plates to some of the large, high level openings in the workshops, the resultant noise levels on the application site could be reduced by around 10 dB(A). It is understood that Tata Steel have already agreed to allow the Developer to implement these works on their site.

5.4 In subjective terms, this means that noise emissions from the steel works only sound about half as loud on the application site as they currently do. Furthermore, the residual noise would lose much of its currently distinctive character as it would be partially masked by road traffic noise emanating from both the A616 and the town centre.

5.5 The proposed development is for 10 energy efficient dwellings provided with whole house ventilation systems that obviate the need to open the windows. With the windows closed, the existing levels of noise would be reduced to between 1 and 24 dB $L_{Aeq,T}$ inside the proposed dwellings. With the benefit of the proposed mitigation measures to Tata Steel, the internal noise levels would be reduced to near or below the threshold of audibility.

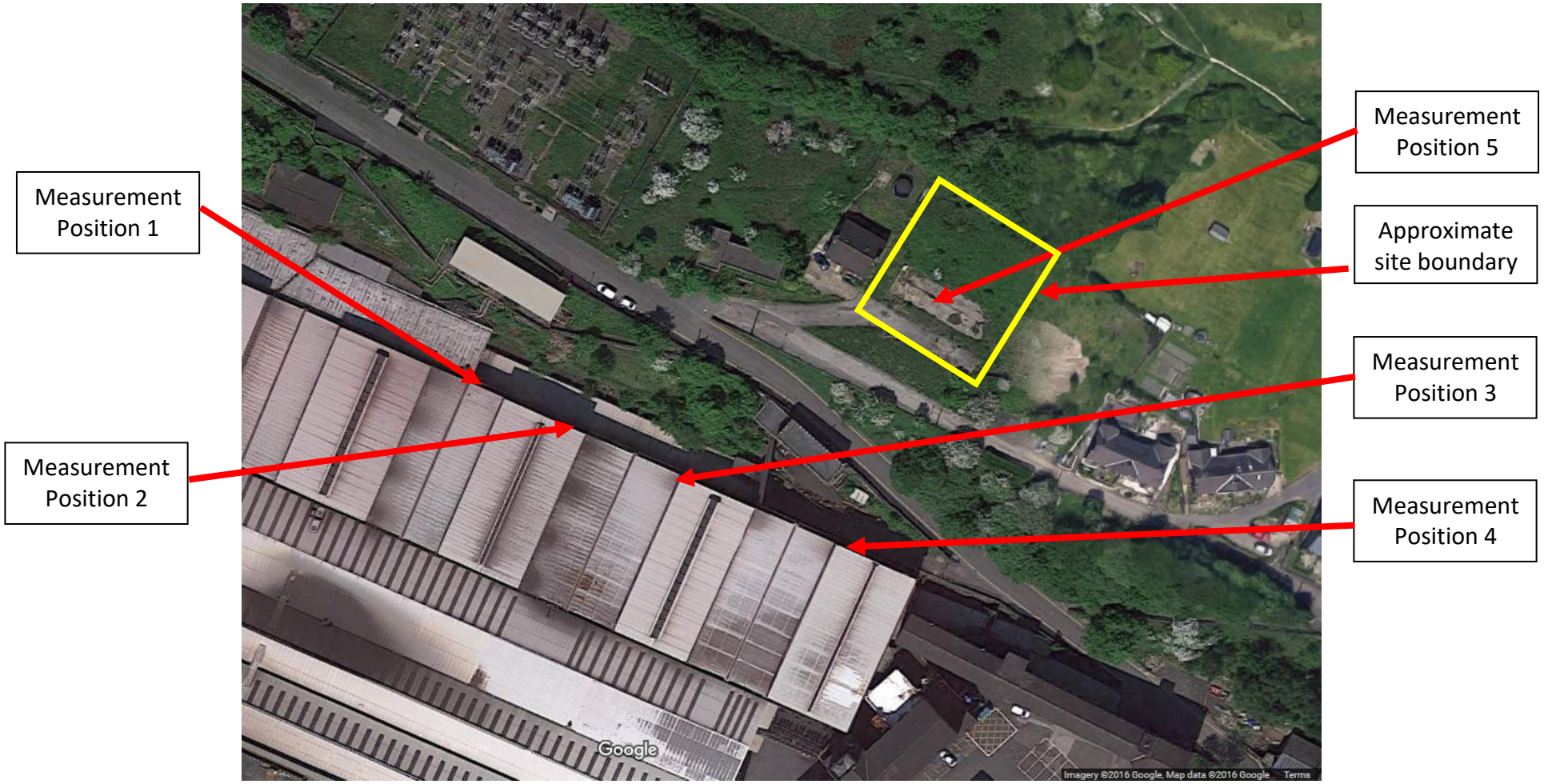
5.6 The conclusion of this report is therefore that with or without the benefit of the noise mitigation measures proposed for the Tata Steel works, the application site is acoustically suitable for residential development.

FOR ACOUSTIC DESIGN TECHNOLOGY

PLANNING PRACTICE GUIDANCE

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Table 2244/T1



Notes

Description
Site plan showing noise monitoring locations

Project
Hunshelf Park, Stocksbridge

Survey Date
5 to 8 September 2016

Drawing No.
2244/SP1

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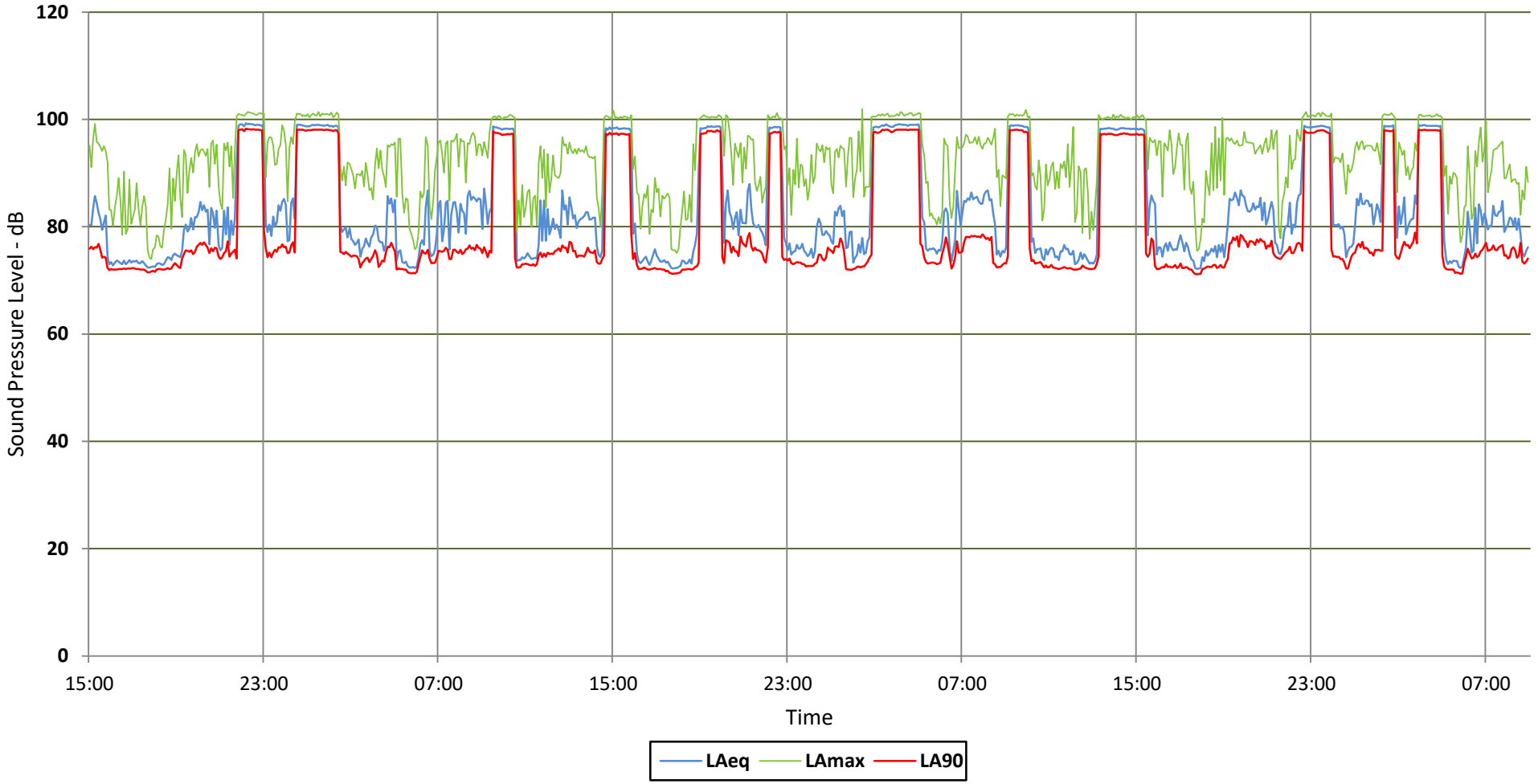

Notes	Description	
	Time History Graph - Measurement Position 1	
	Project	
	Hunshelf Park, Stocksbridge	
	Survey Date	**Drawing No.**
	5 - 8 September 2016	2244/TH1

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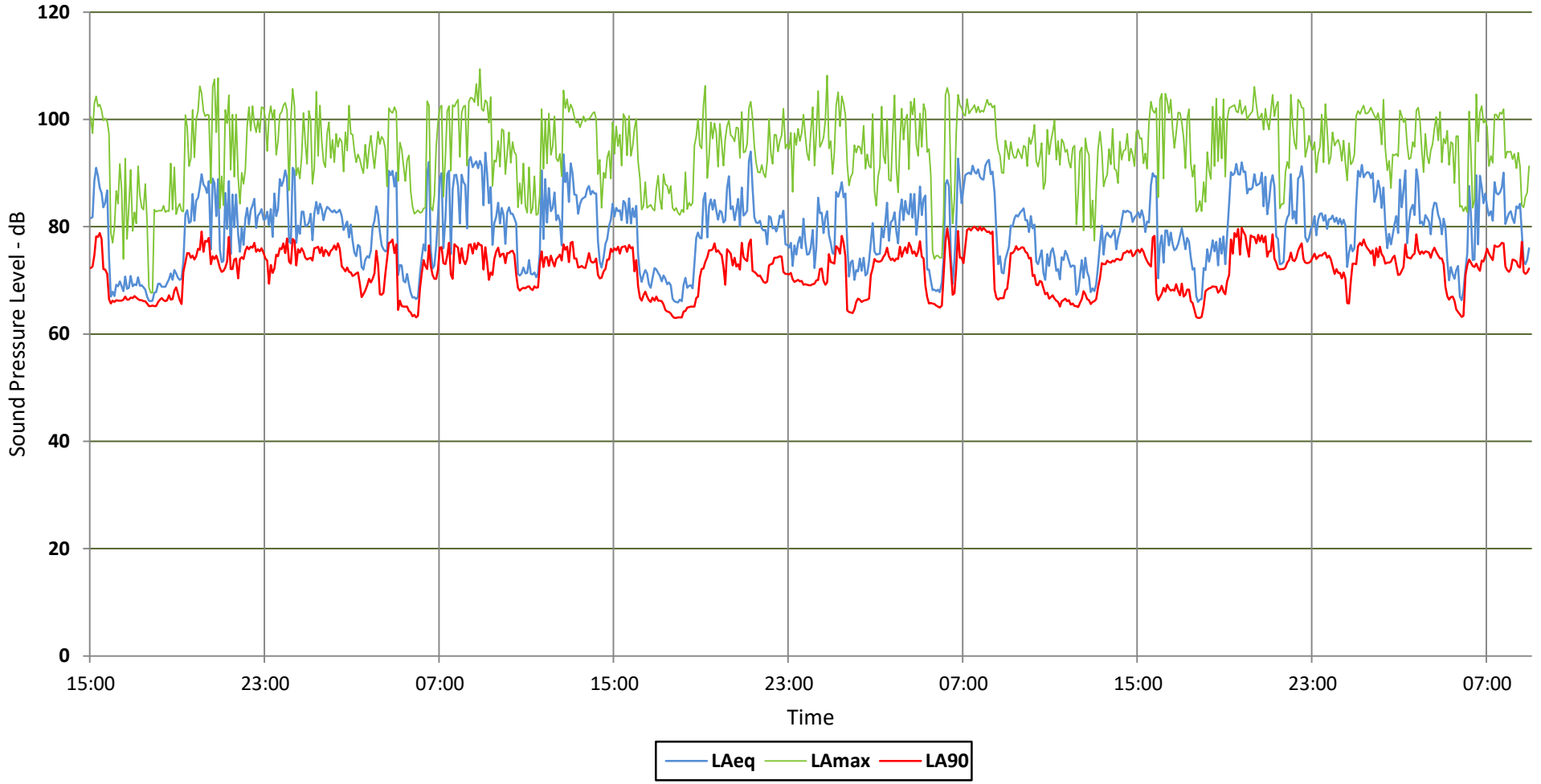

Notes	Description	
	Time History Graph - Measurement Position 2	
	Project	
	Hunshelf Park, Stocksbridge	
	Survey Date	**Drawing No.**
	5 - 8 September 2016	2244/TH2

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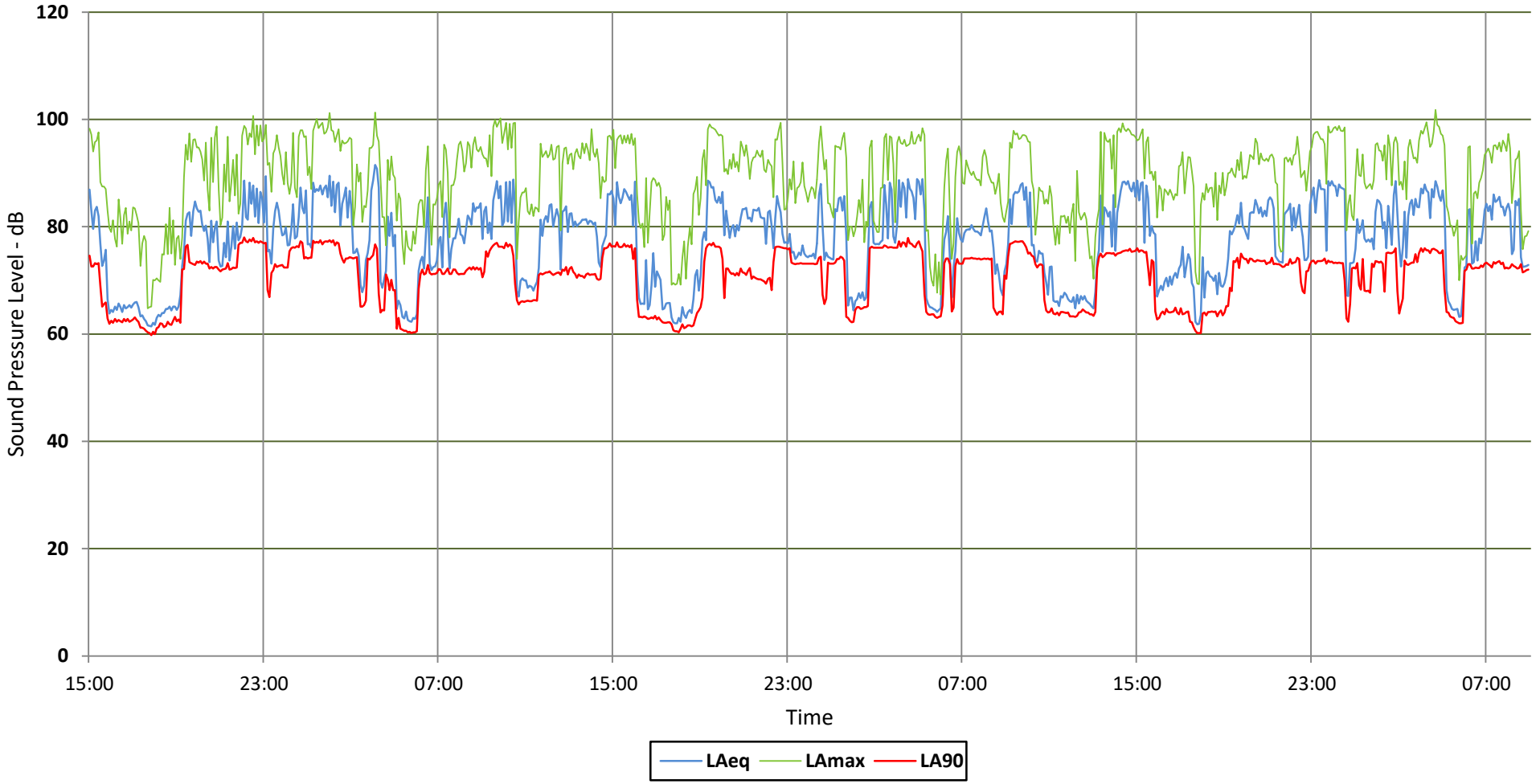

Notes	Description	
	Time History Graph - Measurement Position 3	
	Project	
	Hunshelf Park, Stocksbridge	
	Survey Date	**Drawing No.**
	5 - 8 September 2016	2244/TH3

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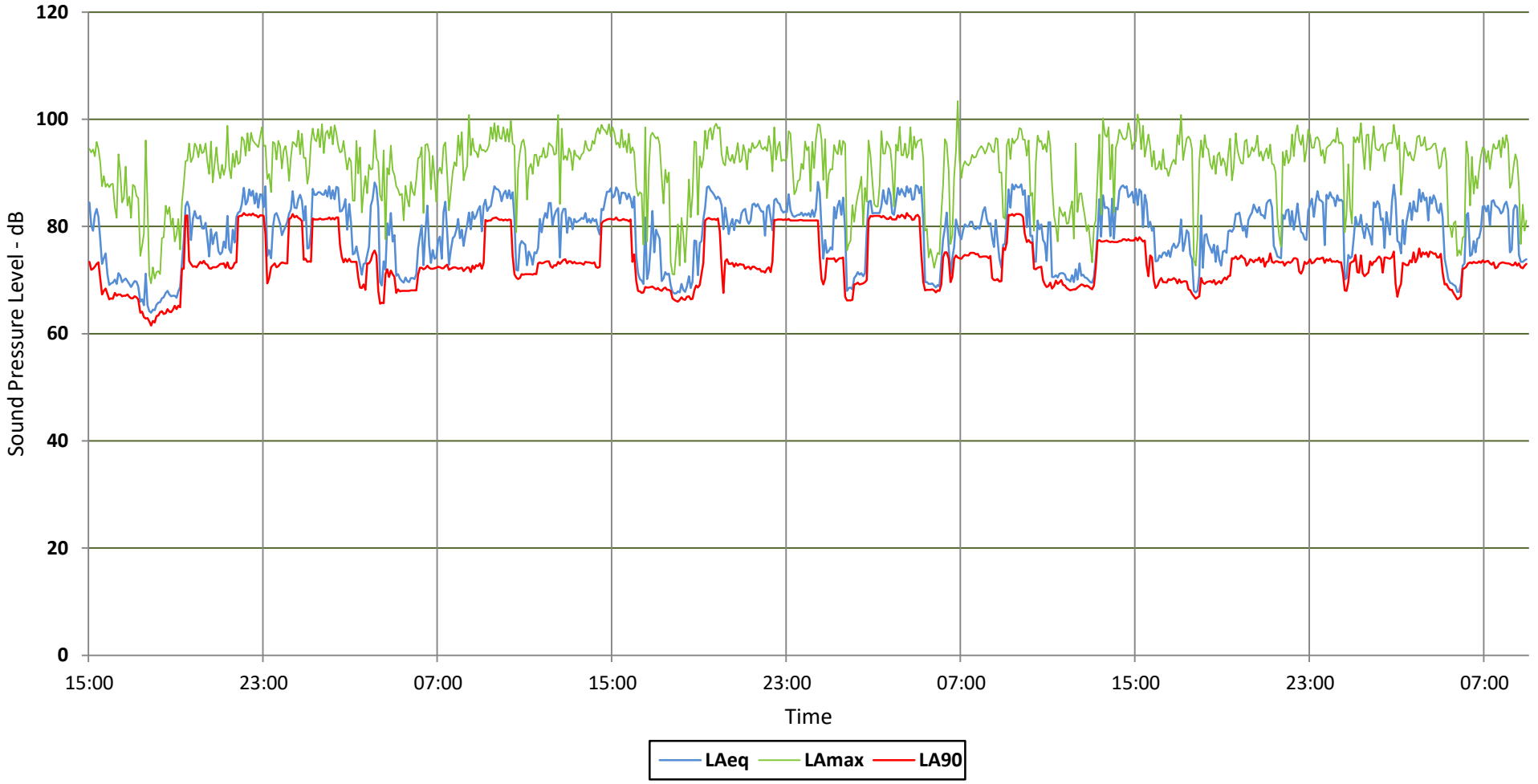

Notes	Description	
	Time History Graph - Measurement Position 4	
	Project	
	Hunshelf Park, Stocksbridge	
	Survey Date	**Drawing No.**
	5 - 8 September 2016	2244/TH4

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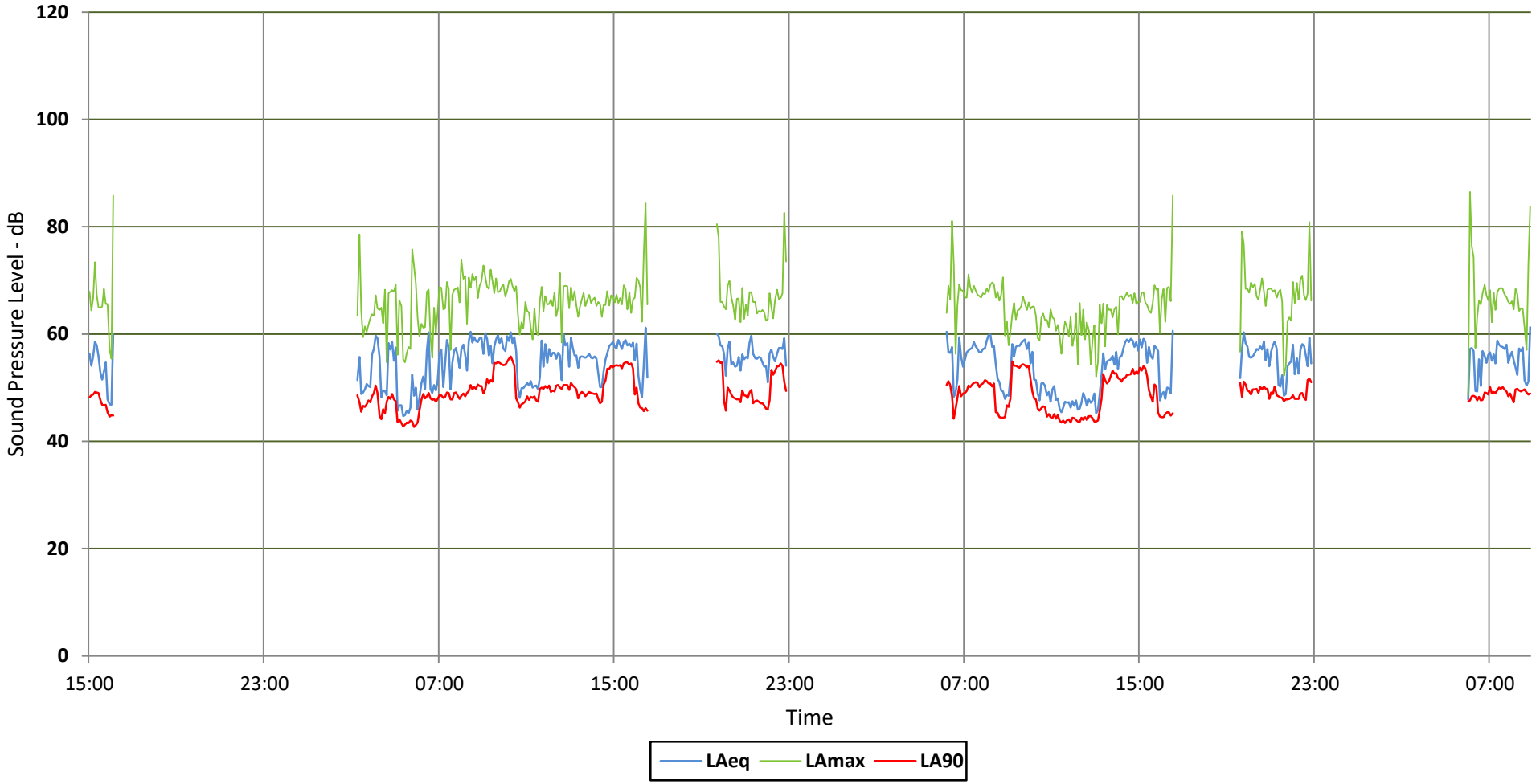

Notes	Description	
	Time History Graph - Measurement Position 5	
	Project	
	Hunshelf Park, Stocksbridge	
	Survey Date	**Drawing No.**
	5 - 8 September 2016	2244/TH5

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APPENDIX A - INSTRUMENTATION

Manufacturer	Type and / or Model	Serial Number	Last Laboratory Calibration
Svantek	Svan 958 4 Channel Sound and Vibration Analyser	23430	August 2014
Microtech Gefell	MK 250 Microphone (Mic 1)	9633	August 2014
Svantek	SV12L Preamplifier	30209	August 2014
Microtech Gefell	MK 250 Microphone (Mic 2)	9623	August 2014
Svantek	SV12L Preamplifier	30255	August 2014
Microtech Gefell	MK 250 Microphone (Mic 3)	9615	August 2014
Svantek	SV12L Preamplifier	30256	August 2014
Microtech Gefell	MK 255 Microphone (Mic 4)	12328	May 2015
Svantek	SV12L Preamplifier	47684	September 2015
01dB	(Black) Solo Class 1 Sound Level Meter	65201	September 2015
01dB	PRE 21 S Pre-Amplifier	15619	September 2015
01dB	MCE 212 ½ inch Microphone	101204	September 2015
Norsonic	Nor1251 Calibrator (Cal 4)	33453	December 2015
Norsonic	Nor1251 Calibrator (Cal 5)	34220	January 2016

APPENDIX B

Acoustic Terminology

The annoyance produced by noise is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and any variations in its level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

A-weighting The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the A-weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average person. It is also possible to calculate the A-weighted noise level by applying certain corrections to an un-weighted spectrum.

When the noise being measured has variable amplitude, such as traffic noise, it is necessary to qualify the basic dB unit. This may be done using a statistical index L_n dB, where n is any value between 0 and 100, and is the percentage of the sample time for which the stated level is exceeded. In defining the use of the index, both the value of n and the length of the sample period must be stated.

L_{10} L_{10}, being the level exceeded for 10% of the time, has been shown to be a good indicator for traffic noise intrusion, and is used in assessing the effect of traffic noise on residential or commercial premises.

L_{90} L_{90} is the level exceeded for 90% of the time, and is used as a measure of background noise level, as it excludes the effects of occasional transient levels, such as individual passing cars or aircraft.

In addition to the statistical noise indices defined above, the following noise units are also used to define variable amplitude noise sources:

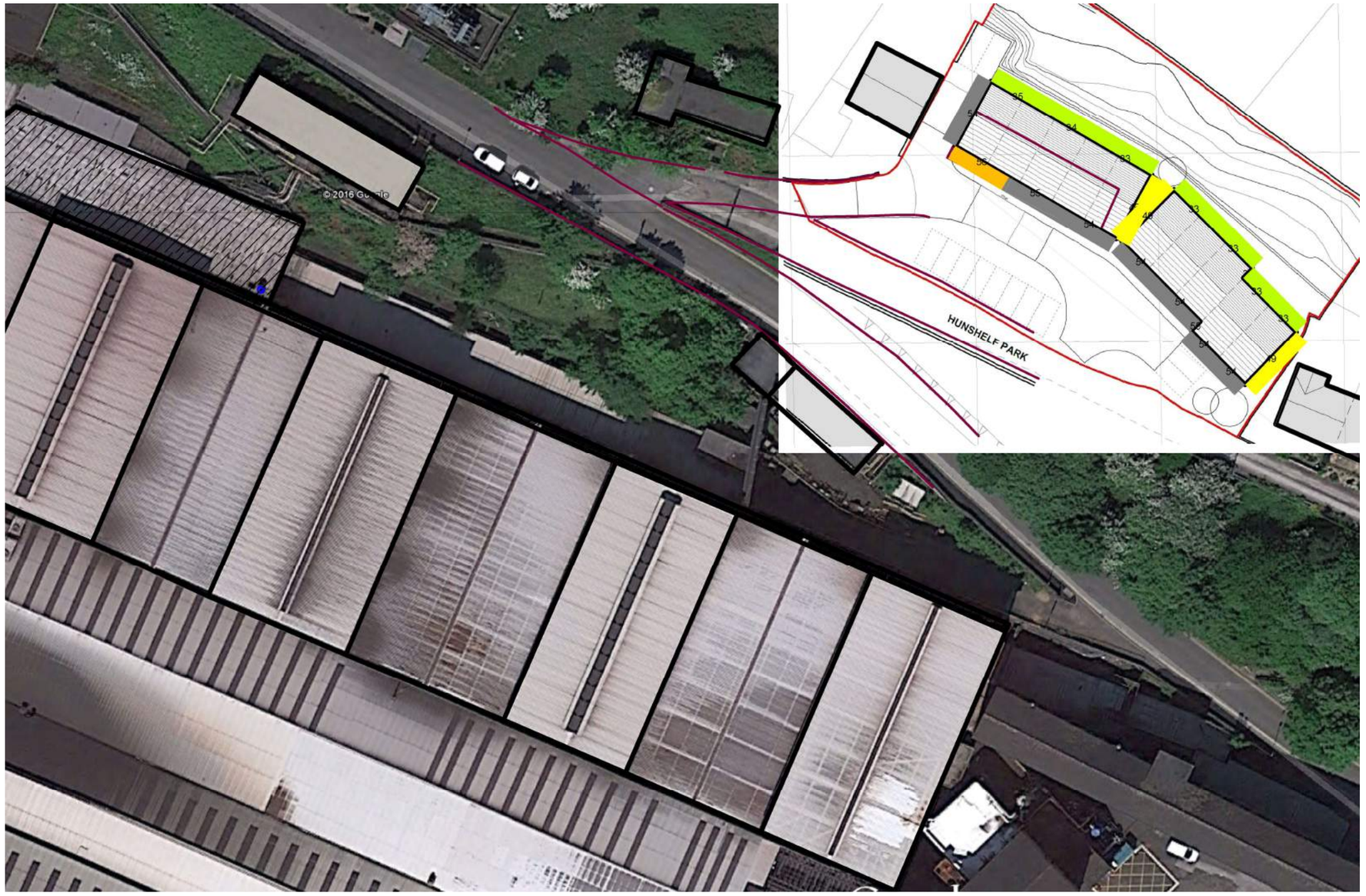
$L_{eq,T}$ $L_{eq,T}$ is defined as the notional steady sound pressure level which, over a stated period of time, would contain the same amount of acoustical energy as the actual fluctuating sound measured over the same period. In other words, it is a measure of the "average" noise level

L_{max} L_{max} is the maximum time-weighted sound pressure level recorded over the stated time period.

SAMPLE EXTERNAL NOISE INTRUSION CALCULATION

		Octave Band Centre Frequency - Hz								dB(A)	NR
		63	125	250	500	1k	2k	4k	8k		
Incident noise level		61	62	55	50	50	47	46	36	55	
Direct Field											
Composite SRI of structure (from below)		23	32	37	47	48	51	55	55		
Direct L_p		38	30	18	3	2	-4	-9	-19		
Reverberant Field											
Composite SRI of structure (from below)		23	32	37	47	48	51	55	55		
10 log (S / A)		0	0	0	-1	-2	-4	-4	-4		
Constant (for point source)		6	6	6	6	6	6	6	6		
Reverberant L_p		44	36	24	8	6	-2	-7	-17		
Total L_p		45	37	25	9	7	0	-5	-15	24	17
Composite SRI Calculation											
Proposed CLT system	3.9	22	34	48	55	55	55	55	55		
Triple Glazing	2.9	25	30	33	44	45	48	55	55		
Composite SRI		23	33	38	49	50	52	55	55		

CALCULATION 2244/C1



NOTES

DESCRIPTION

Existing

PROJECT

Hunshelf Park, Stocksbridge

DATE	**PLOT NO.**
2 May 2017	2244/NM1

ADT

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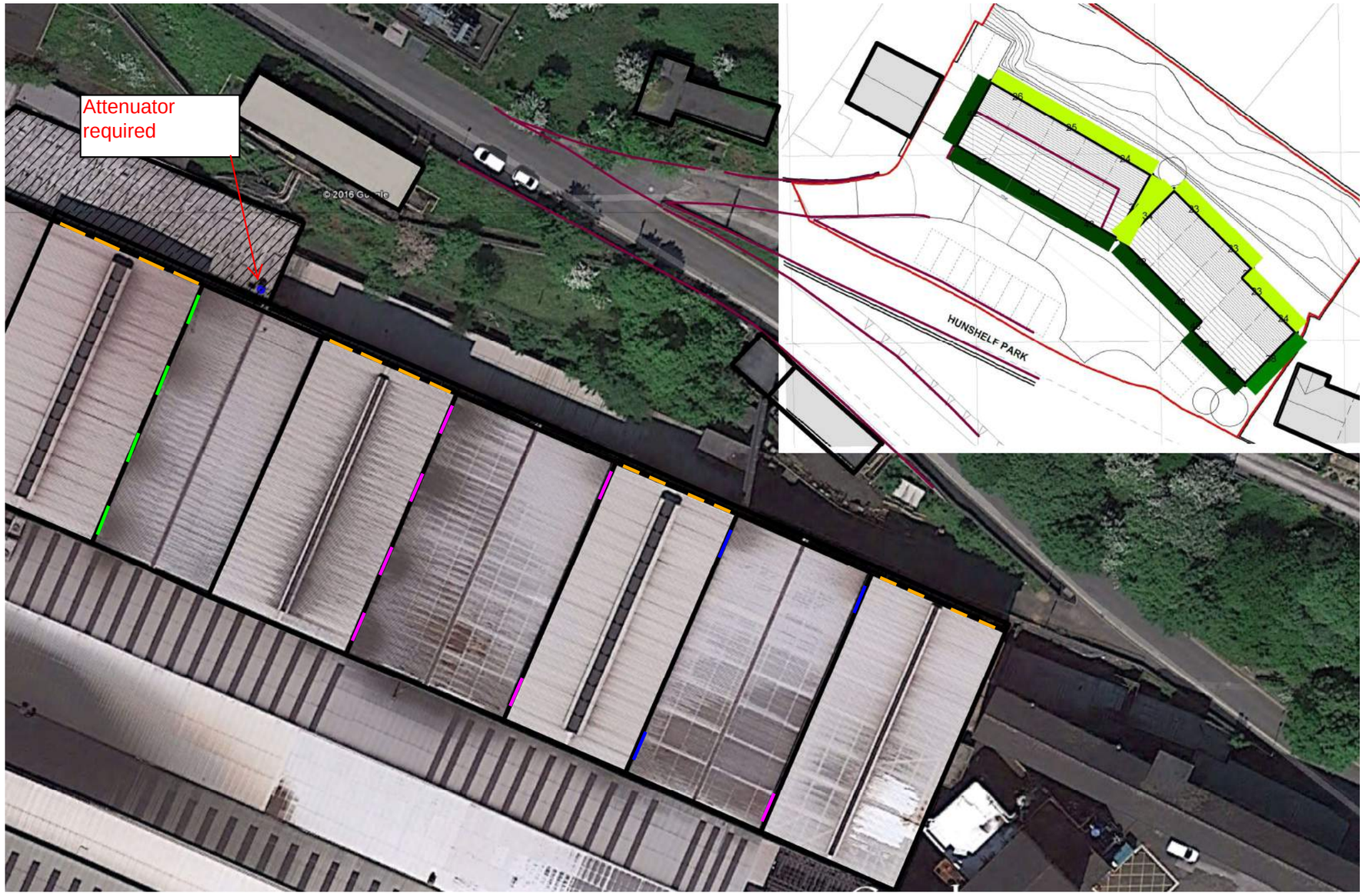

NOTES

- Existing Louvre
- Low attenuation acoustic louvre
- High attenuation acoustic louvre
- Sealed Window Aperture

DESCRIPTION

With Mitigation Measures to Tata Steel

PROJECT

Hunshelf Park, Stocksbridge

DATE	**PLOT NO.**
2 May 2017	2244/NM2

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