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Project **Project Velocity**
Stanbridge Road, Havant PO9 2NS

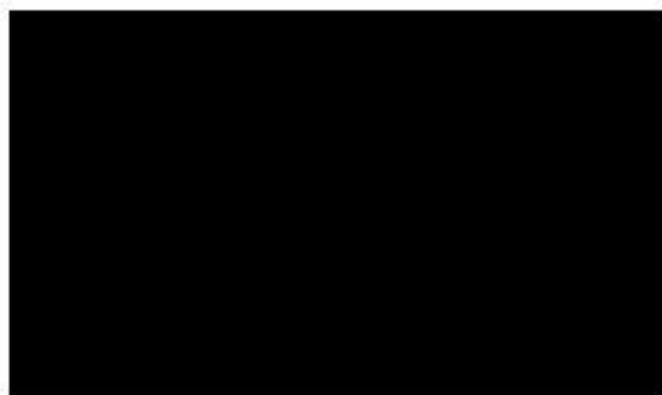
Title **Planning Compliance Assessment**
Sub Title **Mechanical Plant Equipment**

Client Area Europe Ltd
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Case No APP/16/00812

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Revision	Reason	Checked	Signature
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1. INTRODUCTION

- 1.1 Adnitt Acoustics have been commissioned by Area Europe Ltd to undertake an acoustic assessment in support of the new fixed mechanical plant equipment including condensers and compressors at Velocity, Stanbridge Road, Havant PO9 2NS.
- 1.2 An assessment of the impact from the mechanical plant equipment is required as part of the Reserved Matters Application, APP/16/00812, Condition 2.
- 1.3 Since this is a technical report it will be necessary to make use of some technical terms. To assist the reader, a glossary has been included in Appendix A.

Statement of Qualification

- 1.4 The measurements were undertaken by Robert Adnitt MEng FIOA for and on behalf of Adnitt Acoustic Services Ltd.
- 1.5 Robert is an acoustics expert with over 30 years' experience. He holds a Masters degree in Engineering Acoustics and Vibration from the University of Southampton, he is a Fellow of the Institute of Acoustics and a Director and Board member of the Association of Noise Consultants.
- 1.6 He specialises in acoustics of the built environment and has been the lead consultant on many major projects including leisure and entertainment, healthcare, residential and commercial.
- 1.7 Robert also has experience of environmental noise and vibration assessment as well as transportation, industrial noise, vibration and pollution noise.
- 1.8 The assessment was undertaken by Graham Shaw BSc(Hons) MSc MIOA MInstP for and on behalf of Adnitt Acoustic Services Ltd.
- 1.9 Graham has a BSc(Hons) in Physics with Music from the University of Edinburgh (2010) and an MSc (Distinction) in Architectural and Environmental Acoustics from London South Bank University (2012).
- 1.10 He has over nine years post-graduate experience as an Acoustical Consultant working as a Consultant for Adnitt Acoustics since January 2012.
- 1.11 Graham is a corporate member of both the Institute of Acoustics and Institute of Physics.

2. PLANNING CONDITION REQUIREMENTS AND GUIDANCE

Planning Condition

- 2.1 The following planning condition was imposed in the Reserved Matters Approval, APP/16/00812:

- 2 All mitigation measures to reduce noise emissions as outlined in the Noise Impact Assessment by Environoise dated Friday 29th July 2016, shall be adhered to at all times during which the units the subject of this permission are in use.
Reason: In the interests of the amenities of nearby residential properties and having due regard to Policy DM10 of the Havant Borough Local Plan (Core Strategy) 2011 and the National Planning Policy Framework 2012.

- 2.2 As the Environoise report does not give specific mechanical plant noise limits the assessment has been undertaken in accordance with the background noise levels in the Environoise report, the methodology in BS 4142:2014 and the recommended external amenity noise levels in BS 8233:2014 (based on WHO guidance).

Local Authority Policy DM10

- 2.3 The local authority policy DM10 is as follows:

DM10 Pollution

Development that may cause pollution of water, air or soil or pollution through noise, smell, smoke, fumes, gases, steam, dust, vibration, light, heat, electromagnetic radiation and other pollutants will only be permitted where all of the following relevant criteria can be met:

1. The health and safety of existing and future users of the site, or nearby occupiers and residents is not put at risk.
2. National air quality standards or objectives would not be breached.
3. The water environment would not be detrimentally affected.
4. It would not lead to an unacceptable deterioration in the quality or potential yield of coastal, surface and ground water resources.
5. External lighting is of the minimum level of illumination and duration required for security and operational purposes.
6. External lighting would not interfere with safe navigation in either Chichester or Langstone Harbours and other coastal locations.

National Planning Policy

- 2.4 Since March 2012 national planning policy has been governed by the National Planning Policy Framework (NPPF). The February 2019 version of the NPPF states:

Paragraph 170

Planning policies and decisions should contribute to and enhance the natural and local environment by:...

- (e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;

Paragraph 180

Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason...

Paragraph 182

Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

- 2.5 The National Planning Practice Guidance, NPPG, (Updated July 2019) provides the following advice regarding noise:

"Plan-making and decision making need to take account of the acoustic environment and in doing so consider:

- *whether or not a significant adverse effect is occurring or likely to occur;*
- *whether or not an adverse effect is occurring or likely to occur; and*
- *whether or not a good standard of amenity can be achieved.*

In line with the Explanatory note of the Noise Policy Statement for England (NPSE), this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation. As noise is a complex technical issue, it may be appropriate to seek experienced specialist assistance when applying this policy."

- 2.6 The observed effect levels are defined as follows:

Significant Observed Adverse Effect Level (SOAEL): This is the level of noise exposure above which significant adverse effects on health and quality of life occur.

Lowest Observed Adverse Effect Level (LOAEL): this is the level of noise exposure above which adverse effects on health and quality of life can be detected.

No Observed Effect Level (NOEL): this is the level of noise exposure below which no effect at all on health or quality of life can be detected.

- 2.7 Although the word 'level' is used here, this does not mean that the effects can only be defined in terms of a single value of noise exposure. In some circumstances adverse effects are defined in terms of a combination of more than one factor such as noise exposure, the number of occurrences of the noise in a given time period, the duration of the noise and the time of day the noise occurs.
- 2.8 The table shown in Appendix B summarises the noise exposure hierarchy, based on the likely average response of those affected.

British Standard BS 4142:2014+A1:2019

- 2.9 BS 4142:2014 provides the following guidance on determining typical background noise levels.

"The background sound level is an underlying level of sound over a period, T, and might in part be an indication of relative quietness at a given location. It does not reflect the occurrence of transient and/or higher sound level events and is generally governed by continuous or semi-continuous sounds.

In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.

Among other considerations, diurnal patterns can have major influence on background sound levels and, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night-time period for sleep purposes. Furthermore, in this general context it can also be necessary to separately assess weekends and weekday periods.

Since the intention is to determine a background sound level in the absence of the specific sound that is under consideration, it is necessary to understand that the background sound level can in some circumstances legitimately include industrial and/or commercial sounds that are present as separate to the specific sound."

- 2.10 BS 4142:2014 provides the following guidance on the assessment of impacts:

"Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level from the rating level and consider the following:

- a) *Typically the greater this difference, the greater the magnitude of the impact.*

- b) *A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- c) *A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.*
- d) *The lower the rating level is relative to the measured background sound level, the less likely it is that specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*

NOTE 2 Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."

British Standard BS8233:2014

- 2.11 BS 8233:2014 states the following with respect to external amenity areas:

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable.

In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."

Consolidated Requirements

- 2.12 To comply with the requirements and with regard for Policy DM10 and National Planning Policy the following noise limits will be used in the assessment:
- *The cumulative rating level of all fixed mechanical plant items should be equal to or lower than the existing background noise level as measured at 1m from the windows of the nearest noise sensitive premises; and*
 - *The noise levels in the external amenity areas should comply with the threshold values set out in BS 8233:2014.*
- 2.13 These noise limits are commensurate with the Lowest Observed Adverse Effect Level (LOAEL) in the NPPG.

3. THE SITE AND ITS SURROUNDINGS

- 3.1 The site is located at Stanbridge Road, Havant PO9 2NS within the industrial estate and next to the main railway line between Havant and Guildford.
- 3.2 The local area is mainly industrial and commercial units to the west of the railway line and mainly residential dwellings to the east of the railway line.
- 3.3 The nearest noise sensitive buildings are the dwellings on Nutwick Road to the east of the site.
- 3.4 The existing noise environment has been found to be dominated mainly by road traffic noise, railway noise and noise from the surrounding commercial units.
- 3.5 There are three main mechanical plant areas to the front of the building; 2x condenser plant enclosures which are open at the top; and 1x compressor enclosure which is a fully enclosed acoustic enclosure.
- 3.6 There is a small condenser unit to the side of the building and 2x condenser units to the rear of the building.
- 3.7 The mechanical plant locations are detailed in Section 5 and on the appended site plan E21008/SP1.

4. MEASUREMENT METHODOLOGY

- 4.1 Attended plant noise measurements were undertaken on Monday 8 February 2021 to establish the noise levels of the fixed mechanical plant on site and at the closest residential dwellings.
- 4.2 Both sound level meters were positioned on tripods at 1.5m from ground level and at least 1m away from any reflective surfaces.
- 4.3 The measurement locations are detailed in Section 5 and on the appended site plan E21008/SP1.
- 4.4 The measurements of the mechanical plant equipment were under partial free-field conditions due to the reflections from the façade of the Velocity buildings. The measurements at Nutwick Road were under free-field conditions.
- 4.5 The acoustic parameters L_{Aeq} and L_{A90} , including octave bands, were measured at each location during the survey.
- 4.6 The results from the measurements are detailed in Section 5.

Equipment and Weather Conditions

- 4.7 The weather during the survey was generally dry with some snow over the measurement period. Wind speeds were below 5 m/s as advised by BS 4142:2014.
- 4.8 A sensitivity check was undertaken on the sound level meters before and after the measurements and the variation was within 0.5dB.
- 4.9 The schedule of noise survey equipment is presented together with calibration dates in Table E21008/T1. Copies of the associated calibration certificates are available upon request.

Description	Manufacturer/Model	Serial Number	Calibration Date	Certificate Number
Integrating sound level meter	Cirrus Optimus Green CR:171B	G061814	27/10/2020	148255
Microphone	Cirrus MK224	213233D	09/10/2020	148257
Acoustic Calibrator	Cirrus CR:515	60506	29/10/2020	148256
Integrating sound level meter	Cirrus Optimus Green CR:171A	G061843	04/08/2020	144573
Microphone	Cirrus MK224	20045639	23/07/2020	144574
Acoustic Calibrator	Cirrus CR:515	93335	05/08/2020	144572
Table E21008/T1.- Survey Equipment Schedule				

5. MEASUREMENT RESULTS

5.1 The following table summarises the measurements of the mechanical plant items that were undertaken. The measurement locations are shown on the attached site plan, E210008/SP1.

Measurement Location	Brief Description	L _{Aeq,T} , dB	L _{A90} , dB	Octave Band Centre Frequency, L _{Aeq,T} , dB							
				63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
P1	Inside plant enclosure 1	72	71	No Octave Band Data							
P2	5m from enclosure 1	60	57	73	62	58	57	54	51	47	40
P3	Car Park 5m from enclosure 1 (opposite side)	59	55	67	60	58	58	54	46	41	37
P4	Compressor at 5m ¹	57	56	61	58	55	52	51	51	49	41
P4	Compressor at 5m ¹	63	62	65	62	58	58	56	58	57	43
P5	2m from condenser enclosure 2 (door open)	62	61	73	65	60	59	56	54	52	41
P5	2m from condenser enclosure 2 (door closed)	59	59	69	65	57	57	53	53	48	37
P6	2m from condenser to the side	54	52	56	53	53	49	49	48	42	35
P7	2m from the condenser to the rear	64	63	61	66	70	57	57	57	50	46

Table E21008/T2. - Mechanical Plant Noise Measurements

All values are partial free-field

¹The compressor unit was located in an acoustic enclosure and was inaudible. The main source of noise during the condenser operation was from the air hoses attached to the compressor internally - however these did not have the equipment connection on the end and are expected to be quieter when the equipment is fitted.

5.2 It was confirmed that the mechanical plant items were operating at typical duty throughout the measurements and is therefore representative of typical conditions.

5.3 The following table summarises the simultaneous measurements that were undertaken at location P8 next to the nearest noise sensitive receivers.

Measurement Location	Brief Description	Measurement Duration	L _{Aeq,T} , dB	L _{A90} , dB	Octave Band Centre Frequency, L _{Aeq,T} , dB							
					63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
P8	Location next to dwellings on Nutwick Road.	5 minutes	43	40	54	43	40	40	39	34	29	24
		5 minutes	50	41	54	49	48	46	46	43	38	26
		5 minutes	44	40	57	47	41	40	40	37	29	23

Table E21008/T3. - Measurements at the Nearest Noise Sensitive Receiver

All values are free-field

5.4 The mechanical plant was not audible at this location which is a good indication that the mechanical plant items comply with the noise limits at the dwellings on Nutwick Road.

- 5.5 For completeness, a noise model has been produced and the predicted noise rating levels at the dwellings on Nutwick Road have been calculated using the methodology in BS4142. This is detailed in Section 6.

6. BS4142 IMPACT ASSESSMENT

Noise Limits

- 6.1 As discussed in section 2 the following requirements are based on the Environ background noise levels, the guidance in BS4142 and BS8233 and with regard for Policy DM10 and National Planning Policy.
- 6.2 It has been confirmed that the Velocity industrial units will only operate during the daytime, typically between 08:00 and 18:00, so only the daytime background sound level is relevant.

Noise Sensitive Location	Measurement Period	Minimum Background Sound Level (From Environoise Report)	Cumulative Mechanical Plant Noise Criteria
1m from the window of the nearest noise sensitive dwellings on Nutwick Road	Daytime (07:00 - 23:00)	39 dB $L_{A90,15min}$	≤ 39 dB $L_{Aeq,T}$ (rating level)
External amenity areas (gardens) to the noise sensitive dwellings on Nutwick Road	Daytime (07:00 - 23:00)	39 dB $L_{A90,15min}$	≤ 50 dB $L_{Aeq,T}$

Table E21008/T4.- Mechanical Plant Noise Emission Criteria
This is a cumulative noise limit for ALL fixed mechanical plant equipment.

Noise Model

- 6.3 As the mechanical plant items were inaudible at the dwellings on Nutwick Road a 3D noise model has been produced using proprietary software Cadna(A) v.2020 to calculate the specific sound levels at Nutwick Road.
- 6.4 The noise model has been calibrated to the measured noise levels and sound sources have been identified for the two condenser units to the front of the Velocity building, the condenser unit to the side and the condenser units to the rear.
- 6.5 The compressor was inaudible immediately outside the compressor enclosure which is reflected in the noise model.
- 6.6 As the equipment was running continuously throughout the measurement periods the L_{A90} is equivalent to the specific $L_{Aeq,T}$ of the mechanical plant equipment and has been used to calculate the specific noise level in the Cadna noise model.
- 6.7 The solid barrier between the Velocity yard and the railway has also been included in the model.

6.8 The following parameters were used in setting up the Cadna(A) model:

- Ground absorption of 0.5;
- All buildings set to partially reflect with the two main Velocity buildings set to fully reflect;
- Order of reflections set to 2;
- Noise sources calibrated to the measured noise levels;
- Open Street Map data has been used for the buildings, road and railways;

BS4142 Assessment

6.9 The specific sound levels calculated in the noise model need to be adjusted in accordance with the methodology in BS4142 to obtain the rating level.

6.10 The following table summarises the BS4142 assessment:

Results		Relevant BS4142:2014 Section	Comments
Mechanical plant sound level	Various - as measured on site.	7.1 7.3.1	Taken from the measurements
Typical background sound level at nearest noise sensitive receiver	$L_{A90(15\text{ min})}$ 39dB	8.1.3 8.3	Taken from the Environoise report (this is a minimum background sound level)
Specific sound level at 1m from the window nearest noise sensitive property on Nutwick Road	$L_{Aeq(60\text{ min})}$ 34dB	7.3.4 7.3.5	Taken from the Cadna model
Acoustic feature correction	0dB	9.2	The condenser units operate continuously and are not tonal or impulsive, so no feature correction is applied. In any case the units are inaudible at Nutwick Road.
Rating level: Nearest noise sensitive property on Nutwick Road	34dB	9.2	
Excess of rating level over background sound level	-5dB	11	
Uncertainty of the assessment	±2dB	10	Uncertainty does not affect the outcome of the assessment
Table E21008/T5.- BS 4142:2014 Assessment Summary			

6.11 The rating level at the nearest dwellings on Nutwick Road is calculated to be below the recommended plant noise criteria and therefore complies with Planning Condition 2.

External Amenity Areas

- 6.12 The noise levels from the fixed mechanical plant in the external amenity levels are calculated to be below 39dB $L_{Aeq,T}$ in all garden areas at a height of 1.5m (typical person sitting down).
- 6.13 This complies with the requirements of BS8233 (≤ 50 dB $L_{Aeq,T}$) and therefore complies with Planning Condition 2.
- 6.14 A noise contour map is appended, E21008/NM1, which shows the predicted noise levels at a height of 1.5m. All of the green areas on the contour map are equal to or below 39dB $L_{Aeq,T}$.

Comment on Uncertainty

- 6.15 As the Cadna model utilises the prediction model from ISO 9613-2:1996, the uncertainty can be estimated using the methodology provided in the ISO standard as follows:

Height, h *)	Distance, d *)	
	$0 < d < 100$ m	$100 \text{ m} < d < 1\,000$ m
$0 < h < 5$ m	± 3 dB	± 3 dB
$5 \text{ m} < h < 30$ m	± 1 dB	± 3 dB
*) h is the mean height of the source and receiver. d is the distance between the source and receiver.		
NOTE — These estimates have been made from situations where there are no effects due to reflection or attenuation due to screening.		

- 6.16 The uncertainty estimated in ISO 9613-2:1996 for source of receiver heights of less than 5m and receivers that are less than 100m away from the source is ± 3 dB.
- 6.17 The uncertainty of the measurements from the sound level meter is ± 1 dB.
- 6.18 The distances for the noise measurements of the mechanical plant equipment was confirmed using a laser measurer and the uncertainty is estimated to be ± 10 cm. This converts to less than ± 0.5 dB.
- 6.19 The combined uncertainty has been calculated using the methodology described in UKAS M3003 - The Expression of Uncertainty and Confidence in Measurement (Edition 3 - November 2012).
- 6.20 The known uncertainties were first converted into standard uncertainties and the standard uncertainties were then combined using a summation in quadrature.
- 6.21 The combined standard uncertainty for the noise levels is estimated to be ± 2 dB.

Summary

- 6.22 Both the rating levels and external amenity noise levels are calculated to achieve the criteria set out in Section 2 and Section 6. The criteria are also calculated to be achieved when taking into account the upper bound of the estimated combined uncertainty (+2dB).
- 6.23 The mechanical plant items were also noted to be inaudible at the dwellings on Nutwick Avenue.
- 6.24 Therefore the fixed mechanical plant items, as installed, comply with the requirements of Planning Condition 2 with no additional mitigation measures required.

7. CONCLUSION

- 7.1 Adnitt Acoustics have undertaken an acoustic assessment in support of the new fixed mechanical plant equipment including condensers and compressors at Velocity, Stanbridge Road, Havant PO9 2NS.
- 7.2 An assessment of the impact from the mechanical plant equipment is required as part of the Reserved Matters Application, APP/16/00812, Condition 2 which refers to the Environoise planning report.
- 7.3 As the Environoise report does not give specific mechanical plant noise limits the assessment has been undertaken in accordance with the background noise levels in the Environoise report; the methodology in BS 4142:2014; the recommended external amenity noise levels in BS 8233:2014 (based on WHO guidance); and with regard for Policy DM10 and National Planning Policy.
- 7.4 Measurements of the fixed mechanical plant items was undertaken on Monday 8th February 2021 this included a measurement location at the nearest noise sensitive dwellings on Nutwick Road.
- 7.5 The mechanical plant was not audible at the Nutwick Road measurement location which is a good indication that the mechanical plant items comply with the noise limits at the dwellings on Nutwick Road.
- 7.6 For completeness, a noise model was produced and the predicted noise rating levels at the dwellings on Nutwick Road were calculated using the methodology in BS4142. This is detailed in Section 6.
- 7.7 Both the rating levels and external amenity noise levels are calculated to achieve the criteria set out in Section 2 and Section 6. The criteria are also calculated to be achieved when taking into account the upper bound of the estimated combined uncertainty (+2dB).
- 7.8 The mechanical plant items were also noted to be inaudible at the dwellings on Nutwick Avenue.
- 7.9 Therefore the fixed mechanical plant items, as installed, comply with the requirements of Planning Condition 2 with no additional mitigation measures required.

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for ADNITT ACOUSTICS

APPENDIX A: GLOSSARY OF ACOUSTIC TERMS

Ambient Noise	The noise climate heard over a period of time due to all normal sources, in the absence of extraneous or atypical sounds. Used to describe noise in the absence of the introduced sound, generally.		
Ambient Noise Level	Describes the average noise level of the ambient noise over a stated period of time, e.g. hourly noise		
	Parameter: A-weighted Continuous Equivalent Sound Pressure Level determined over the time period T.	$L_{eq,T}$ or $L_{Aeq,T}$	
	Expressed in decibels / A-weighted decibels		dB(A) or dB
Decibel scale dB	A linear numbering scale used to define a logarithmic amplitude scale, thereby compressing a wide range of amplitude values to a small set of numbers		
dB(A)	An electronic filter in a sound level meter, which approximates under defined conditions the frequency response of the human ear.		
$L_{Aeq,T}$	The equivalent continuous sound level. The steady dB(A) level which would produce the same A-weighted sound energy over a stated period of time as the measured sound pressure level.		
L_{Amax}	The maximum dB(A) level measured during a survey period.		
L_{A10}	The dB(A) level exceeded for 10% of the survey period, often used as a quantifier of traffic noise level.		
L_{A90}	The dB(A) level exceeded for 90% of the survey period. Used in BS 4142:1997/2014 as being representative of the background noise level.		
Acoustic screening	Physical barrier to sound formed by fence, wall, building or other structure, which has the effect of reducing the sound transmitted.		
Individual Event Noise	The noise of a distinctive event with the varying noise climate, usually a transient activity, such as a vehicle pass-by, aircraft flyover or similar, rather than an isolated impulsive noise.		
Individual Event Noise Level	Describes the highest noise level during the event as measured under particular conditions of time-weighting		
	Parameter: A-weighted Maximum Sound Pressure Level with FAST or SLOW time weighting	$L_{Amax,FAST}$ or $L_{Amax,F}$ $L_{Amax,SLOW}$ or $L_{Amax,S}$	
	Expressed in decibels / A-weighted decibels		dB(A) or dB
Sound Reduction Index R_w	Single number rating used to describe the sound insulation of building elements as defined in BS EN ISO 717 1997.		
Weighted element-normalized level difference $D_{n,e,w}$	Single number rating used to describe the sound insulation of building elements as defined in BS EN ISO 717 1997.		

APPENDIX B: NOISE EXPOSURE HIERARCHY

<i>Response</i>	<i>Examples of Outcomes</i>	<i>Increasing Effect Level</i>	<i>Action</i>
No Observed Effect Level			
<i>Not present</i>	<i>No Effect</i>	<i>No Observed Adverse Effect Level</i>	<i>No specific measures required</i>
No Observed Adverse Effect Level			
<i>Present and not intrusive</i>	<i>Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life</i>	<i>No Observed Adverse Effect Level</i>	<i>No specific measures required</i>
Lowest Observed Adverse Effect Level			
<i>Present and intrusive</i>	<i>Noise can be heard and causes small changes in behaviour, attitude or other physiological response, 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 small actual or perceived change in the quality of life.</i>	<i>Observed Adverse Effect</i>	<i>Mitigate and reduce to a minimum</i>
Significant Observed Adverse Effect Level			
<i>Present and disruptive</i>	<i>The noise causes a material change in behaviour, attitude or other physiological response, 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.</i>	<i>Significant Observed Adverse Effect</i>	<i>Avoid</i>
<i>Present and very disruptive</i>	<i>Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.</i>	<i>Unacceptable Adverse Effect</i>	<i>Prevent</i>

Figure E21008/ NM 1 : Noise Contour Map at 1.5m height

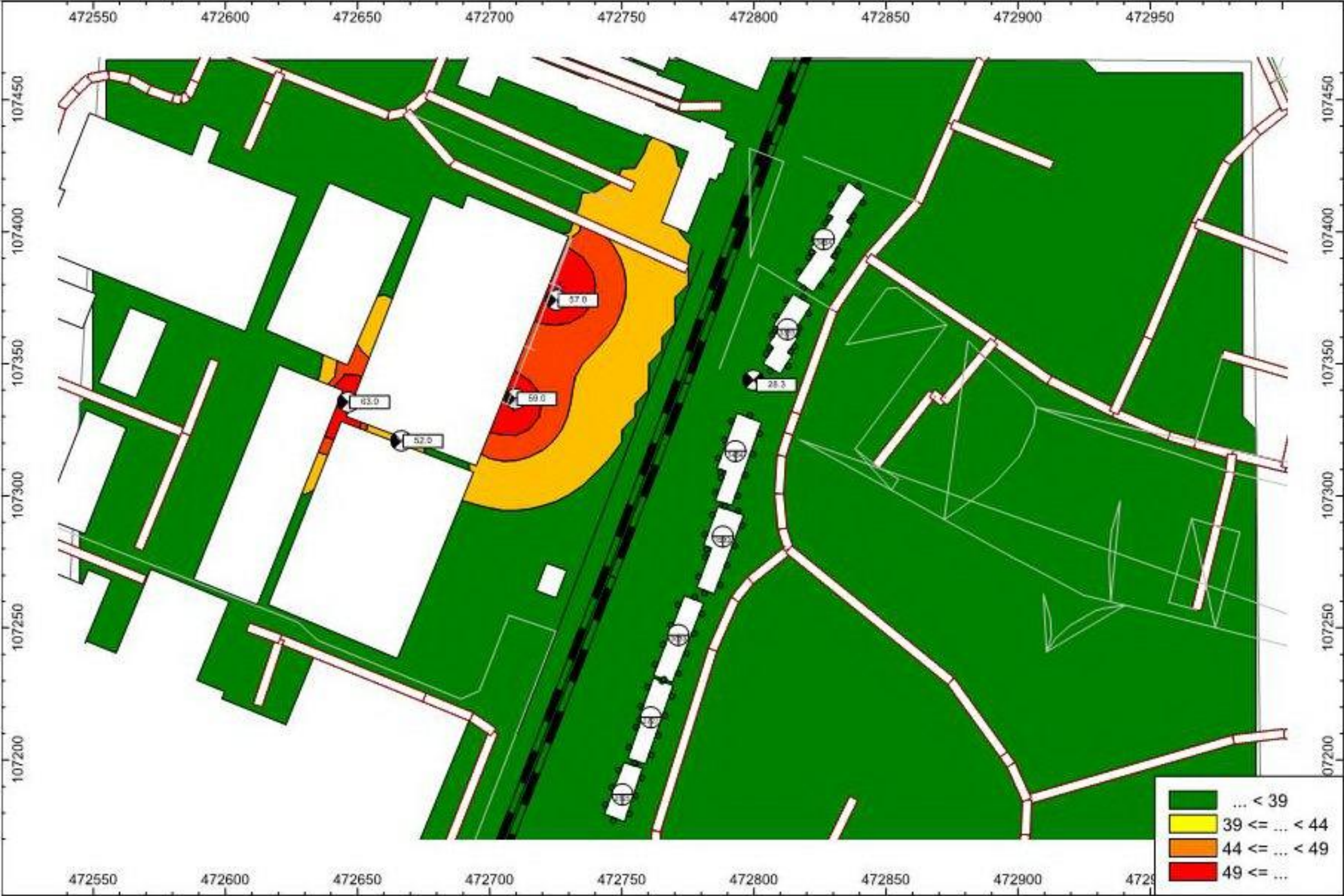


Figure E21008/ SP 1 : Site Plan Showing Measurement and Plant Locations

