Bickerdike Allen Partners
Architecture
Acoustics
Technology

SUTTON DEPARTMENT OF WASTE

THERAPIA LANE INDUSTRIAL ESTATE

GREENLAND WAY

CROYDON, CR0 4TD

NOISE ASSESSMENT

Report to

Willmott Dixon Construction Limited
The Heights, Building One
Brooklands
Weybridge, Surrey
KT13 0NY

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15th December 2023

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Bickerdike Allen Partners LLP is an integrated practice of Architects, Acousticians, and Construction Technologists, celebrating over 60 years of continuous practice.

Architects: Design and project management services which cover all stages of design, from feasibility and planning through to construction on site and completion.

Acoustic Consultants: Expertise in planning and noise, the control of noise and vibration and the sound insulation and acoustic treatment of buildings.

Construction Technology Consultants: Expertise in building cladding, technical appraisals and defect investigation and provision of construction expert witness services.

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1.0 INTRODUCTION

Bickerdike Allen Partners LLP (BAP) have been instructed by Willmott Dixon Construction Ltd. on behalf of London Borough of Sutton, to carry out an acoustic assessment of the redevelopment of an industrial unit on the Therapia Lane industrial estate in Croydon, CR0 4TD.

The unit is currently vacant with the external forecourt area being used by two vehicle fleet hire companies. The unit is to be redeveloped into a vehicle fleet facility for Sutton Council's Department of Waste.

BAP visited the site in October 2023 to carry out an environmental noise survey. This report details the survey results and an assessment of potential noise impact from the proposed development, to satisfy Sutton Council's requirements.

The noise impact assessment follows the methodology in British Standard (BS) 4142:2014+A1 2019. This standard provides an objective method for measuring and assessing the potential impact of noise from commercial or industrial sources.

This report has been prepared specifically in response to instructions received from Willmott Dixon Construction Ltd. and is not intended for any other purpose. Survey work carried out in connection with this commission is limited in extent to the scope of those instructions. A glossary of acoustic terminology is included within Appendix 1.

2.0 STATEMENT OF COMPETENCE

Bickerdike Allen Partners are a firm of architects, acoustic consultants and building technology consultants, located at 121 Salusbury Road, London, NW6 6RG. The acoustic survey and assessment has been prepared by Tom Deering MSc MIOA.

Mr Deering is an Acoustic Consultant at BAP with 8 years of experience. He has a MSc in Environmental and Architectural Acoustics (London South Bank University). He is a corporate member of the Institute of Acoustics.

The assessment has been supervised and checked by David Trew CEng BEng MIOA. Mr Trew is a Partner at BAP with 24 years of experience working in acoustic consultancy. He has a BEng degree in Engineering Acoustics and Vibration (Southampton ISVR). He is a Chartered Engineer and a corporate member of the Institute of Acoustics.

Both Mr Trew and Mr Deering meet the criteria for a Suitably Qualified Acoustician (SQA) as defined by BREEAM.

3.0 SITE DETAILS

The project site is an industrial unit on the Therapia Lane Industrial Estate, on Greenland Way, Croydon, CR0 4TD. The site is shown marked up in red on the aerial photograph in Figure 1.

Figure 1: Site location

Imagery ©2023 Google, Bluesky, Getmapping Plc, Infoterra Ltd. & Bluesky, Maxar Technologies, The GeoInformation Group

The red line boundary drawing for the project is shown in Figure 2.

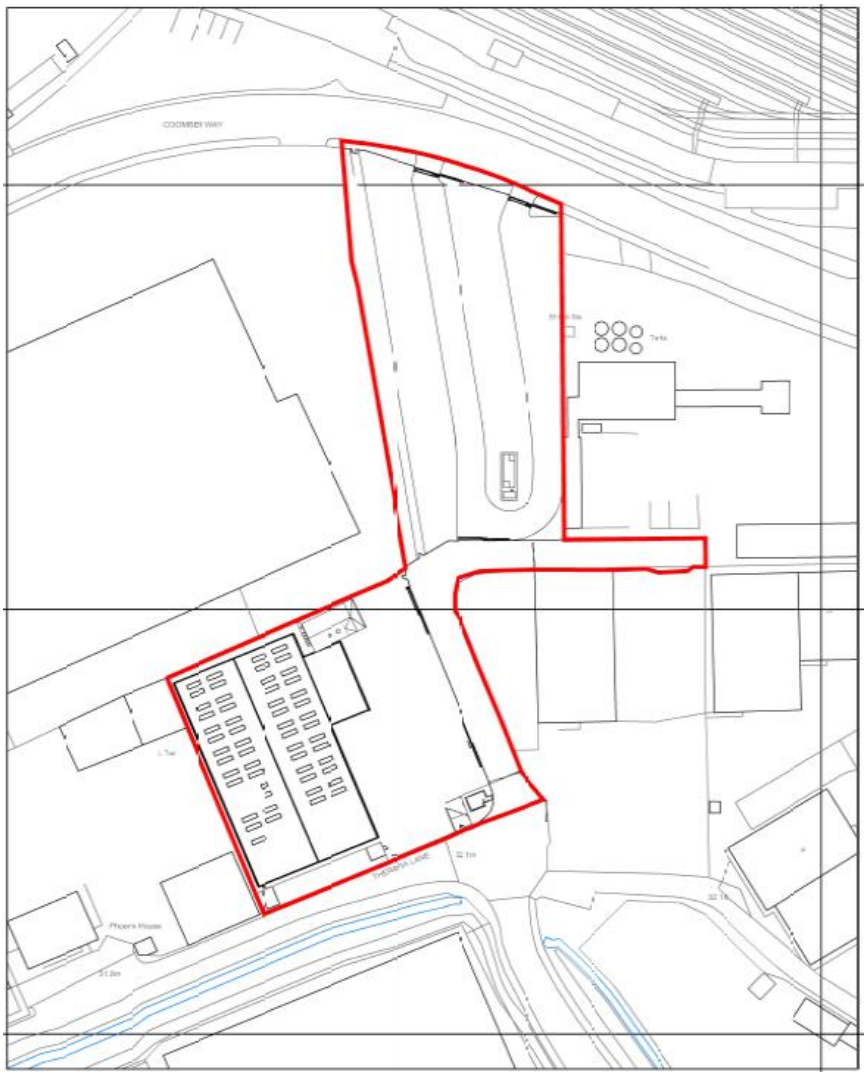

Figure 2: Project site boundary

The project site is surrounded on all sides by other industrial units, with a scaffolding business on the Western boundary and UPS depot to the South across Therapia Lane. There is a Transport for London Tramlink depot at 200 metres to the North.

The dominant source of noise across the site is industrial and commercial activity from surrounding units and local road traffic noise.

At 65 metres to the West, beyond the scaffolding business, there is a row of terraced housing (shown on Figure 1). These are the nearest noise sensitive receptors considered in the following assessment.

4.0 CRITERIA

4.1 Introduction

The redevelopment must comply with local and national planning policies in relation to noise. BAP also understand that optional acoustic credits apply using the BREEAM sustainability rating system. Relevant acoustic criteria are presented below.

4.2 Local Policy

The project site is in the Local Authority area of Sutton Council and will be required to meet the local policy on noise impact.

Sutton Council's key policy requirement in relation to noise is set out in the 2018 Local Plan

"P34.19 Noise and Vibration - Noise impacts depend on many factors, including volume, pitch, time of day, the frequency and pattern of noise events and its general character. Wherever practicable, noise-sensitive uses, such as housing, hospitals and schools, should be separated from major sources of noise, such as roads, railways and industrial activities. It is equally important that noise generating developments should, if possible, be sited away from existing sensitive uses. The Noise Policy Statement for England (DEFRA, 2010) defines a range of 'observed effect levels' as the basis for evaluating the overall effect of noise exposure on sensitive uses, including construction impacts."

The development is a noise generating industrial operation which is sited within an industrial estate away from noise sensitive uses. There are some noise sensitive uses at some distance from the site. Noise impact from the site will need to be controlled to prevent unacceptable noise impacts for these receptors. Policy 29 applies here

"*Policy 29: Protecting Amenity - The council will grant planning permission for development unless it adversely affects the amenities of future occupiers or those currently occupying adjoining or nearby properties, or has an unacceptable impact on the residents of the surrounding area. In assessing the impact of the proposed development, the council will take into consideration the following:…*

… e Noise and vibration levels and times when such disturbances are likely to occur…."

Also Policy 24 Environmental Protection section j "*Developments that would generate noise or vibration affecting existing noise-sensitive land uses, such as housing, schools and hospitals, will not be permitted unless adequate mitigation measures are proposed to reduce the adverse impacts to acceptable levels, having regard to the Mayor's Sustainable Design and Construction*

SPG. Where necessary, the council may set conditions or negotiate planning agreements to (reduce noise to acceptable levels, taking account of ambient noise levels and local character.)"

BAP have contacted the local environmental health department to see if any specific noise related planning conditions would apply. At the time of writing no specific guidance has been provided for this site. Nevertheless it is anticipated that Sutton Council will expect to see evidence that any new industrial or commercial noise sources (e.g., mechanical plant for air conditioning or extract) will be controlled to minimise impact at the nearest sensitive receptors and they may apply to a standard noise condition based on the British Standard BS4142 (see below).

The publicly available information for a nearby site (Carew Academy, ref: D2014/70919/LBC) contains a noise-related planning condition:

"Noise from plant, shall be assessed and rated in accordance with BS4142:2014. The rated noise level shall not exceed a noise level 5dB below the background noise level at nearby noise sensitive windows. Alternatively, the noise from plant shall not exceed 35 dB LAeq (5 minutes) at nearby noise sensitive windows."

BAP have adopted this as a standard to assess the noise impact from this site. The Local Plan refers to the Mayors Sustainable Development SPG which, in relation to noise policy, refers to the London Plan.

4.3 London Plan 2021

Policy D14 of the Greater London Authority (GLA) London Plan (2021) on 'Noise' states that development proposals should manage noise by:

"1) avoiding significant adverse noise impacts on health and quality of life

2) reflecting the Agent of Change principle as set out in Policy D13 Agent of Change

3) mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses

4) improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity)

5) separating new noise-sensitive development from major noise sources (such as road, rail, air transport and some types of industrial use) through the use of distance, screening, layout, orientation, uses and materials – in preference to sole reliance on sound insulation

6) where it is not possible to achieve separation of noise-sensitive development and noise sources without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through applying good acoustic design principles

7) promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver."

4.4 National Planning Policy Framework (NPPF): 2023

The relevant national planning policy under the 2023 NPPF for new development with regards to noise is provided below.

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

…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; …"

"185. 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[65];…"*

[65] See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010).

4.5 Noise Policy Statement for England (NPSE)

The Noise Policy Statement for England (NPSE) provides the framework for noise management decisions to be made that ensure noise levels do not place an unacceptable burden on society.

The stated aims of the Noise Policy Statement for England are to:

- *Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development;*

- *Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development; and*
- *Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*

In respect of achieving the first aim above, the NPSE defines the Significant Observed Adverse Effect Level (SOAEL) as "*This is the level above which significant adverse effects on health and quality of life occur*".

4.6 British Standard (BS) 4142:2014+A1:2019

BS 4142:2014+A1:2019 *"Methods for rating and assessing industrial and commercial sound"* is the standard by which the environmental impact from industrial or commercial noise is normally assessed in the UK. The standard details a method for rating and assessing the noise emitted by an existing or proposed industrial or commercial sound source in order to determine the likelihood that the source is having, or will have, an adverse impact on sensitive receptors.

Section 11 of the standard describes the initial estimate of impact based on the difference between the rating level and the typical background sound level as follows:

"Typically, the greater this difference, the greater the magnitude of the impact

a) A difference of around + 10dB or more is likely to be an indication of a significant adverse impact, depending on the context.

b) A difference of around + 5dB is likely to be an indication of an adverse impact, depending on the context.

c) The lower the rating level is relative to the measured background sound level, the less likely it is that the 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."

The resultant Rating Level is then considered in context of the assessment site and/or development (for example, consideration of the absolute level of the sound inside or outside a nearby dwelling or other sensitive receptor) to arrive at the conclusion regarding the potential impacts of the industrial or commercial sound.

It is desirable that the initial BS 4142 noise rating from any new mechanical plant should be controlled to a level equal to background. This would be classified under BS 4142 as having a

"*low impact"*. This is a reasonable target for this site although a more stringent 5 dB below background target has been adopted based local standards.

It should be noted that achieving a performance standard based on prevailing background sound levels may not always be reasonably practicable. Site specific contextual factors may need to be considered when agreeing reasonable noise standards with the local authority.

4.7 BREEAM UK REFURBISHMENT (2014)

There are four available optional BREEAM credits related to acoustics, three being for Hea05 "Acoustic Performance" and one for Pol05 "Noise attenuation".

Optional credits for BREEAM are not considered under the planning system. However, as will be seen below there are some synergies between acoustic design standards required for both BREEAM and the local authority.

Hea05 Acoustic Performance – Office buildings

BAP have been advised that optional BREEAM credits are being sought for the cellular offices and meeting rooms within the refurbishment project.

First Credit – Sound insulation

Criteria:

The BREEAM manual[1] states that "*The sound insulation between acoustically sensitive rooms and other occupied areas complies with the performance criteria given in Section 7 of BS 8233:2014.*" Section 7.7.6.1 of BS8233 states the following with regards to the sound insulation between offices:

"Privacy between offices and between an office and an occupied space requires effective insulation and moderate background noise to mask intruding speech. In order to achieve unintelligible speech from another office, the minimum sound insulation between two offices needs to be approximately D_w = 38 dB. Where privacy is important the minimum sound insulation should be D_w = 48 dB. It is possible that voices can be heard, but the conversation is not usually understood. Where the internal ambient noise level is low it might be necessary to design for higher insulation values."

BS8233:2014 also within section 7.7.6.1 recommends that guidance from the British Council for offices (BCO) as well as the Finishes and Interiors Sector (FIS previously the Association of

[1] https://files.bregroup.com/breeam/technicalmanuals/ndrefurb2014manual/#05_health/hea05.htm%3FTocPath%3D5.0%2520Health%2520and%2520Wellbeing%7C_____5

Interior Specialists AIS) can also be used. The minimum performance standards can therefore be site specific depending on client requirements regarding privacy. BAP have recommended adopting the reasonable performance standard of ≥38 dB D_w.

To achieve design stage credits a commitment must be made to carry out compliance testing. The testing requirement is:

"*A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with the acoustic testing and measurement procedures outlined in the Additional information section of this BREEAM issue.*"

Bickerdike Allen Partners are a compliant test body based on BREEAM requirements. We are not currently instructed to carry out acoustic commissioning testing. This testing will be required if this optional credit is required for BREEAM.

Second Credit – Internal indoor ambient noise levels

Criteria:

"Achieve indoor noise levels that comply with the design ranges given in Section 7 of BS8233:2014[2]*."*

Current guidance within the British Council for Offices (BCO) guide to specification is consistent with section 7 of 8233:2014. Further details on recommended performance standards are provided below.

Testing requirement:

"*A programme of acoustic measurements is carried out by a compliant test body in accordance with the acoustic testing and measurement procedures outlined in Methodology.*"

As above Bickerdike Allen Partners are a compliant test body based on BREEAM requirements. We are not currently instructed to carry out acoustic commissioning testing. This testing will be required if this optional credit is required for BREEAM.

Third Credit – Room acoustics

Criteria:

"*Acoustic environment (control of reverberation, sound absorption and speech transmission index):*

[2] Table 6 of BS 8233:2014 provides a range of design targets with regard to internal noise levels in non-domestic buildings. This is a design item to be decided by the project team.

Achieve the requirements relating to sound absorption and reverberation times, where applicable, set out in Section 7 of BS 8233:2014."

Like indoor ambient noise levels the control of reverberation/sound absorption specification recommendations within the current BCO guide is consistent (and referred to) within Section 7 of BS8233:2014.

Testing requirement:

"A programme of acoustic measurements is carried out by a compliant test body in accordance with the acoustic testing and measurement procedures outlines in the Additional information section of this BREEAM issue."

BREEAM credit "Pol 05 Noise attenuation"

- "*The credit can be awarded by default where there are or will be no noise-sensitive areas or buildings within 800 m radius of the assessed development. This does not apply here.*
- *Where there are or will be noise-sensitive areas or buildings within 800 m radius of the assessed development the noise level from the proposed site/building, the noise level in the locality of the nearest or most exposed noise-sensitive development, is no greater than +5 dB during the day (07:00 hr to 23:00 hr) and +3 dB at night (23:00 hr to 07:00 hr) compared to the background noise level.*
- *Where the noise source(s) from the proposed site/building is greater than the levels described above, measures have been installed to attenuate the noise at its source to a level where it will comply with the criterion."*

The local planning policy requirements for noise control are more onerous than the BREEAM Pol 05 credit. They required plant noise emissions to be 5 dB below background noise levels. The Pol 05 credit will therefore be achieved by default assuming the local planning policy requirements are met.

4.8 BCO Guidelines

Indoor ambient noise levels

The British Council for Offices (BCO) – Guide to Specification 2019 offers criteria for noise generated by building services based on building services noise being constant. It offers a relaxation of +5dB for variable air volume (VAV) systems for worst case conditions (at maximum design duty) to avoid overdesign, provided these criteria are achieved under typical conditions, these being defined as *"that which is not exceeded for more than, say, 10 days of the year or 5% of the operating time."*. These criteria are also based on building services noise without a specific

character. Where individual noise sources are impulsive or tonal they shall be at least 5 dB lower.

The BCO guidelines provide the following criteria for internal ambient noise levels in offices from building services. Separate guidelines are provided for the ingress of external environmental noise.

Location	Design Limit (NR)
Open-plan offices, reception areas, lift lobbies, circulation spaces	≤ NR40
Speculative offices	≤ NR38
Cellular offices / meeting rooms	≤ NR35
Toilets	≤ NR 45

Table 1: BCO recommended building services noise levels

An acoustically absorbent suspended ceiling achieving Absorption Class A, which extends over all areas except for light fittings, air diffusers, grilles and relatively narrow plasterboard margins is recommended by British Council for Offices (BCO) – Guide to Specification 2019.

For smaller areas the FIS guide makes reference to BB93[3] standards as shown below:

Location	T_{mf} (seconds)
Audio-visual conference rooms, interview rooms, meeting rooms	<0.8
Atria and circulation space	<1.5
Offices, staff rooms	<1.0

Table 2: Reverberation time criteria

4.9 BS4142:2014

4.10 Control of M&E and plant noise – external

British Standard 4142: 2014+A1: 2019 contains guidance on assessing and rating the impact of industrial and commercial sound.

Corrections are applied to the noise level of the plant items being assessed at a location representative of the nearest noise sensitive receptor to generate a rating level. This is then compared to the prevailing background noise level at the same location.

[3] BB93 BB93: acoustic design of schools - performance standards (2014)

The amount by which the rating level exceeds the background level can be used to make an initial assessment of impact, depending on the site's context. The standard states:

"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.

Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (see Clause 8) from the rating level (see Clause 9).

NOTE 1 More than one assessment might be appropriate.

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

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5 dB 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 the 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 source having a low impact, depending on context."

Evidence suggests the local authority adopt plant noise conditions which are consistent with the current version of BS4142. The current version of BS4142 includes additional pragmatic guidance on circumstances where contextual factors may require a non-standard approach/planning condition.

4.11 Traffic noise

Changes in road traffic noise due to development can be assessed in detail by adopting the methodology within the Highways England document LA111 Noise and Vibration from the Design Manual for Roads and Bridges, 2020. In terms of noise impact substantial changes in traffic volume are require to result in significant noise impacts.

5.0 ENVIRONMENTAL NOISE SURVEY

5.1 Survey methodology

BAP carried out an environmental noise survey at the site between Wednesday 25th and Monday 30th October 2023. The purpose of this survey was to:

- Assess current ambient noise levels around the site and at the nearest noise sensitive receptor. This is based on measurements and observations of contextual factors.
- Determine the representative background noise level during the day and night.

The sound level meter used during the survey is Class 1 under BS EN 61672-1:2013. The sound level meter was field calibrated at 1 kHz before and after the survey with no significant drift observed.

Full details of the monitoring equipment used during the environmental noise survey, including serial numbers and calibration histories, can be found in Table 3.

BAP Reference	Description	Serial Number	Calibration Date	Certificate Number	Calibration Due
B&K 2270-2	Bruel & Kjaer Type 2270 Investigator	3027597	04/04/2023	UCRT23/1476	02/04/2025
	Bruel & Kjaer Type ZC 0032 Preamplifier	28381	04/04/2023	UCRT23/1476	02/04/2025
	Bruel & Kjaer Type 4189 Microphone	3181186	04/04/2023	UCRT23/1476	02/04/2025
	Bruel & Kjaer Type 4231 Calibrator	1859113	20/07/2023	UCRT23/1958	18/07/2024
DUO-1	DUO Smart Noise Monitor	12068	14/09/2023	UCRT23/2179	12/09/2025
	DUO Preamplifier	11108	14/09/2023	UCRT23/2179	12/09/2025
	GRAS-40CD Microphone	224324	14/09/2023	UCRT23/2179	12/09/2025
	Bruel & Kjaer Type 4231 Calibrator	1883753	03/04/2023	UCRT23/1466	01/04/2024

Table 3: Equipment details

All the noise measurements from the survey were taken with the sound level meter fixed to a tripod at a height of 1.3 metres above the ground.

Weather conditions at the site during the survey were mild, with brief spells of light rain and wind speeds under 5 m/s. These conditions are considered suitable for obtaining representative measurement results.

During the survey, an unattended noise monitor was set up to continuously record data between 15:00 on 25th October and 12:45 on 30th October. The monitor was set up at the rear of the existing building, indicated as measurement position (MP) 1 on the aerial photograph in Figure 3.

Additional attended measurements were taken at a position representative of the nearest sensitive receptor) on Therapia Lane. This was 3 metres from the roadside of Therapia Lane, indicated as MP2 in Figure 3.

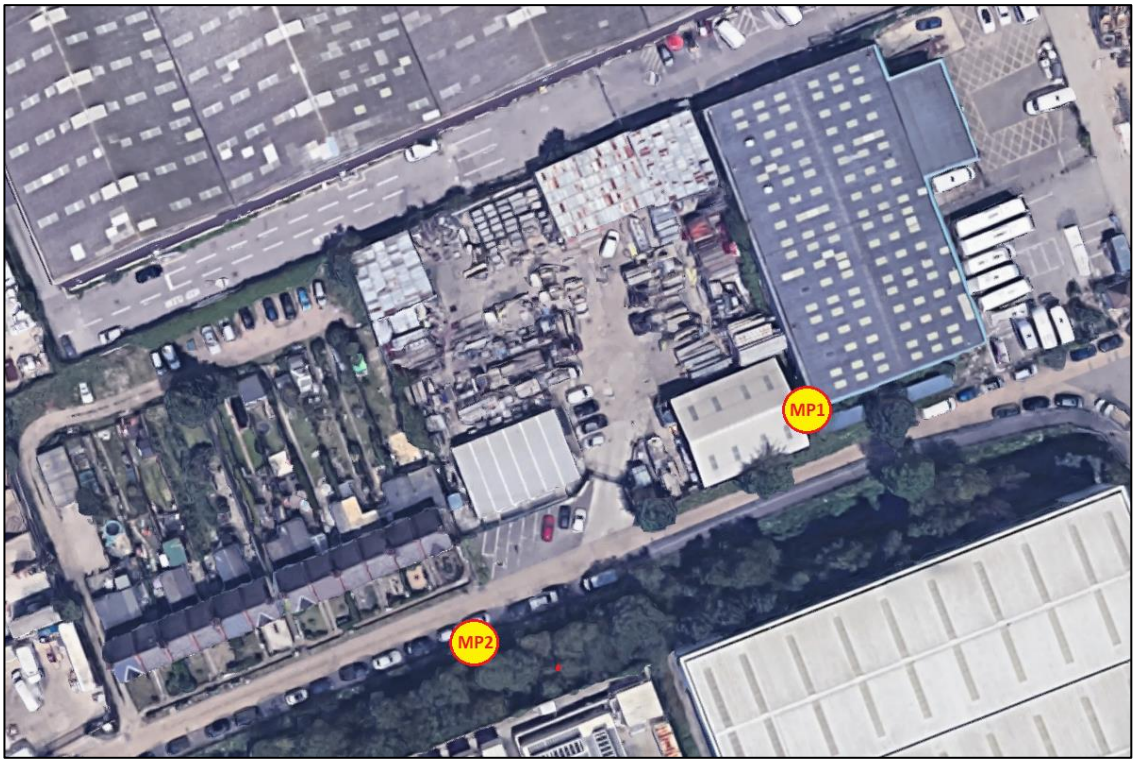

Figure 3: Survey measurement positions

The attended measurements were carried out at MP2 between 12:30 and 13:15, with a set of 3, 15 minute measurements being taken (45 minutes total) at 1-second logging resolution, in parameters including ambient or continuous average ($L_{Aeq,T}$), maximum ($L_{AF,Max,T}$) and background ($L_{AF90,T}$). Summary data is presented in this report. Raw data can be made available on request.

During the survey, at the NSR location (i.e., outside the facades of the row of terraced houses), road traffic was counted and the following contextual notes were taken:

- Industrial noise from the surrounding units is dominant including regular vehicle movements and impulsive loading and manual handling noise from the neighbouring scaffolding business.
- Distant road traffic noise (likely Beddington Lane / B272) is audible when industrial noise is quiet.

- Aircraft was regularly audible.

5.2 Survey results

This section provides a summary of noise measurement results. The ambient, background and maximum noise levels measured at the NSR position during the attended measurements on 25th October are presented in Table 4. The levels presented in Table 4 are in free-field conditions.

Time	Duration (mins)	Ambient noise level (dB $L_{Aeq, 15\ min}$)	Background noise level (dB $L_{AF90, 15\ min}$)	Maximum noise level (dB $L_{AFMax, 15\ min}$)
12:30:00	00:15:00	51	40	80
12:45:00	00:15:00	56	42	79
13:00:00	00:15:00	49	40	73

Table 4: Attended measurement data summary

The ambient and background noise levels measured at the NSR position during the long-term unattended measurements are presented in Table 5. The data presented in Table 5 covers the entire survey period between 15:00 on 25th October and 12:45 on 30th October (i.e., the "Night" level represents the average or minimum level measured during each of the 5 nights during the survey). The daytime unattended survey data background sound levels are very similar to those measured in free field conditions outside the nearest dwelling.

Time Period		Ambient noise level (dB $L_{Aeq, T}$)	Background noise level (dB $L_{AF90, T}$)	
			Average	Minimum
Day	07:00 – 23:00	56	41	35
Day	07:00 – 19:00	57	41	37
Evening	19:00 – 23:00	48	39	35
Night	2300 – 07:00	47	38	32

Table 5: Long-term unattended measurement data summary

The long-term unattended dataset is presented as a graph in Figure 4.

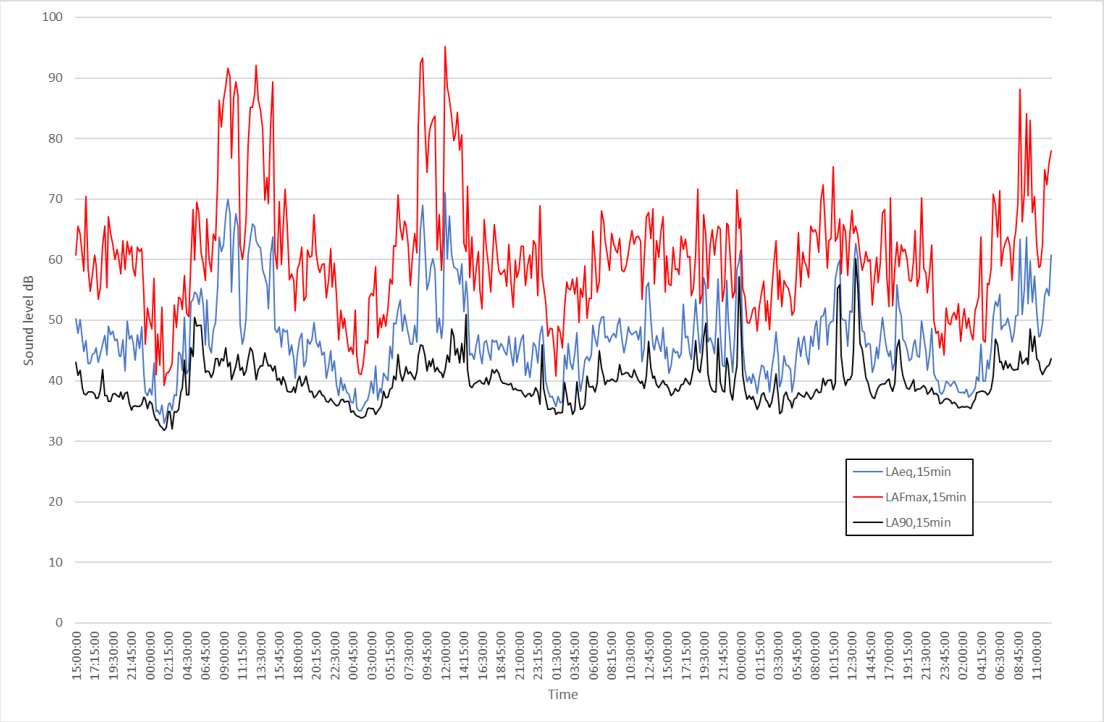

Figure 4: Long-term survey data graph

6.0 NOISE IMPACT ASSESSMENT

6.1 Operational noise from traffic

The project site sits at the corner of Therapia Lane and Greenland Way. The NSR assessment location is on Therapia Lane. Therapia Lane is a one-way single lane road with very low traffic flows. The traffic along this road is local access for residents and some commercial vehicles accessing the industrial estate.

During the attended noise survey the local road traffic count past the NSR survey position on Therapia Lane between 12:30 and 13:15 was 10 cars and 4 HGVs.

The current design for the project shows that a new site access will be created to the North (off Coomber Way). A layout drawing showing the existing and proposed vehicle access routes is shown in Figure 5.

Figure 5: Site access layout drawings

BAP have liaised with the transport consultants on the design team (David Tucker Associates) who have confirmed that the project is not expected to significantly increase traffic flows along

Therapia Lane. The new vehicle access created to the North may slightly reduce operational traffic along Therapia Lane. No significant adverse noise impact is expected.

6.2 Mechanical plant noise sources

BAP have received indicative information on the mechanical plant installation from the project M&E consultants (Van Zyl & De Villiers). The details of this equipment where relevant to external noise are presented in Figure 5.

Equipment	Plant selection	Number of items	External noise level for a single unit (SPL dBA)
Air conditioning condensers	Mitsubishi PURY-EP200YNW-A2	2	59 at 1 metre
AHU Supply (internal, ducted to environment)	Nuaire Boxer B22V/NN/AS-L	1	58 at 3 metres
AHU Discharge (internal, ducted to environment)	Nuaire Boxer B22V/NN/AS-L	1	58 at 3 metres
Server room external condenser	Mitsubishi PUZ-ZM50VKA	1	46 at 1 metre

Table 6: Mechanical plant information

6.3 Mechanical plant noise impact assessment

BAP have carried out predictions of the cumulative noise level generated at the NSR assessment location (nearest housing on Therapia Lane) from all the items of mechanical plant detailed in Table 6. The predictions are made under the following assumptions:

- The distance between source and receiver is 65 metres (see Figure 1).
- No screening effect has been included between source and receiver to illustrate a 'worst-case'.
- No rating penalty has been applied under BS 4142:2014+A1:2019 (i.e., the plant noise is assumed to be broadband air movement noise without any acoustic characteristics such as tonality or impulsivity).

- The mechanical plant is assumed to operate over 24-hours.

A noise impact for the mechanical plant installation is presented in Table 7 below, following the method of rating and assessment in BS 4142:2014+A1:2019. The assessment indicates a low potential impact from the proposed mechanical plant installation at the NSR location.

Description	Assessment Result	Relevant Clause	Comments
Predicted specific sound level	35 dB $L_{Aeq, 15min}$	7.3.6	Predicted cumulative noise level from all items of mechanical plant (Table 6). This assumes no incidental noise screening by buildings or atmosphere side attenuation.
Acoustic feature correction	0	9	The noise is steady, broadband air movement noise with no noticeable character when assessed at the nearest noise sensitive receptor
On time correction	N/A	7.3.14	Source is continuous.
Rating level	(35 + 0) = 35	9	
Background sound level	38 dB $L_{AF90, 15 min}$	8.1.2	Representative background sound level as measured during the night. Daytime background noise levels around 3 dB higher.
Excess of rating level over background sound level	-3 dB	11	-
Assessment of impact		11	The lower the rating level is relative to the measured background sound level, the less likely it is that the 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.**
Uncertainty of the assessment			This assessment is based on preliminary plant selections which are likely to change as the design develops. The assessment assumes pessimistic assumptions regarding incidental screening and attenuation. The rating level of the completed project is likely to be lower

Table 7: BS 4142:2014+A1:2019 assessment

The initial BS4142:2014 rating demonstrates a low impact depending on context. The predicted noise level is 3 dB below background noise at night.

BAP understand that the Local Authority are likely to require a standard 5 dB below background. This can be achieved with standard noise control measures. These include designing and positioning the external mechanical plant to benefit from incidental screening by buildings, atmosphere-side attenuation in the design of air handling plant and acoustic screening where buildings do not provide incidental screening.

The above calculations make pessimistic assumptions about the location of the mechanical plant (i.e., assuming all plant is closest to the nearest receptor) and does not include any attenuation.

The current design shows that the AHUs will be located in a first floor plant room terminating on the north-facing façade of the building. The location of the external air conditioning condenser units is to be confirmed. The above predictions can be updated when plant selections and locations are confirmed.

7.0 COMPLIANCE TESTING

The project can achieve the BREEAM acoustic credits for Hea05 and Pol05 subject to commissioning testing meeting the requirements below.

7.1 Compliant test body

The acoustic testing must be carried out by a Compliant Test Body is defined as :

- Organisations having United Kingdom Accreditation Scheme (UKAS) accreditation to the appropriate scope (for e.g. to BS EN ISO/IEC 17025), or who are accredited by a member of the International Accreditation Forum (IAF - www.iaf.nu) to the appropriate scope OR
- Organisations or individuals registered with the Association of Noise Consultants (ANC) Registration Scheme OR
- Companies or individuals that have been declared competent by an organisation who can provide evidence that they follow the relevant principles of BS EN ISO/IEC 17024 (Conformity assessment - General requirements for bodies operating certification of persons)10 in relation to BREEAM requirements.

Bickerdike Allen Partners LLP are an organisation registered with the Association of Noise Consultants Registration scheme and therefore meet the Complaint Test Body Requirements.

7.2 Testing procedures

Measurements of sound insulation (airborne and impact) should be made in accordance with the relevant part of BS EN ISO 140 series, or the successor to these standards. For measurements of reverberation time, the relevant principles of BS EN ISO 354:2003 should be used and the guidance provided in BS EN ISO 140-7:1998 should be followed in respect of the number of source and microphone positions, and decay measurements. For measurements of ambient noise, when no specific guidance is available, the following procedures should be used:

1. Noise from both internal sources (e.g. mechanical ventilation systems, plant noise, noise-making systems) and external sources (e.g. traffic noise transmitted via the building façade) should be included, and, where windows are openable as part of the ventilation strategy, these should be assumed to be open for the purposes of calculations and open for measurements. If openable windows are not part of the background/permanent ventilation strategy, then these should be assumed to be closed for the purposes of calculation and closed for measurements.
2. Noise from occupants and office equipment (e.g. computers) should not be included in the measurements.
3. Unless otherwise stated in the referenced document, a rate of testing of at least one in ten rooms/spaces of each performance level shall be subject to on-site performance testing.
4. Measurements should be made in at least four rooms in which noise levels can be expected to be greatest either because they are on the noisiest façade or because they are on a naturally ventilated façade.
5. Where different ventilation strategies are used, measurements should be conducted in rooms utilising each strategy. Otherwise, measurements should be made in rooms on the noisiest façade.
6. T in $L_{Aeq,T}$ is taken as the duration of the normal working day (typically 8 hours between 09.00 and 17.00).
7. Measurements need not be made over a period of 8 hours if a shorter measurement period can be used. In this case, measurements should be made when external noise levels are representative of normal conditions throughout the day.
8. Measurement periods less than 30 minutes may give representative values for indoor ambient noise levels and may be utilised where this is the case. However measurement periods shorter than 5 minutes should not be used.

9. Measurements should be taken in a minimum of three locations in rooms at a height of 1.2m above the floor level and at least 1m away from any surface.
10. The measured level of ambient noise should be used to determine compliance with the criteria for acoustically sensitive rooms. If at the time of acoustic commissioning it is not possible to measure ambient noise levels in the absence of construction or other extraneous noise sources that will not be present when the building is complete, then, for mechanical services the lower level of 35 dB, L_{Aeq} or the lowest design limit for the acoustically sensitive space should be used.

8.0 SUMMARY

Bickerdike Allen Partners LLP (BAP) have been instructed by Willmott Dixon Construction Ltd. on behalf of London Borough of Sutton, to carry out an acoustic assessment of the redevelopment of an industrial unit on the Therapia Lane industrial estate in Croydon.

BAP have carried out an independent assessment of the noise environment in accordance with relevant standards and guidelines to quantify the impact of the development on the nearest residential properties.

A BS 4142:2014+A1:2019 assessment of noise from the units demonstrates a low potential for impact on the nearby neighbours from both operational traffic flows and the proposed mechanical plant installation that will serve the project.

Advice has been provided on meeting the available optional BREEAM credits for acoustics both at interim design stage and post construction stage. The Pol05 credit is achieved by default along with the local planning criteria. The Hea05 credits are achieved by incorporating suitable acoustic design and a programme of compliance testing by a compliant test body.

Tom Deering
for Bickerdike Allen Partners LLP

David Trew
Partner

APPENDIX 1
GLOSSARY OF ACOUSTIC TERMINOLOGY

The Decibel, dB

The unit used to describe the magnitude of sound is the decibel (dB) and the quantity measured is the sound pressure level. The decibel scale is logarithmic and it ascribes equal values to proportional changes in sound pressure, which is a characteristic of the ear. Use of a logarithmic scale has the added advantage that it compresses the very wide range of sound pressures to which the ear may typically be exposed to a more manageable range of numbers. The threshold of hearing occurs at approximately 0 dB (which corresponds to a reference sound pressure of 2 x 10^{-5} Pascals) and the threshold of pain is around 120 dB.

The sound energy radiated by a source can also be expressed in decibels. The sound power is a measure of the total sound energy radiated by a source per second, in watts. The sound power level, L_w is expressed in decibels, referenced to 10^{-12} watts.

Frequency, Hz

Frequency is analogous to musical pitch. It depends upon the rate of vibration of the air molecules that transmit the sound and is measure as the number of cycles per second or Hertz (Hz). The human ear is sensitive to sound in the range 20 Hz to 20,000 Hz (20 kHz). For acoustic engineering purposes, the frequency range is normally divided up into discrete bands. The most commonly used bands are octave bands, in which the upper limiting frequency for any band is twice the lower limiting frequency, and one-third octave bands, in which each octave band is divided into three. The bands are described by their centre frequency value and the ranges which are typically used for building acoustics purposes are 63 Hz to 4 kHz (octave bands) and 100 Hz to 3150 Hz (one-third octave bands).

A-weighting

The sensitivity of the ear is frequency dependent. Sound level meters are fitted with a weighting network which approximates to this response and allows sound levels to be expressed as an overall single figure value, in dB(A).

Environmental Noise Descriptors

Where noise levels vary with time, it is necessary to express the results of a measurement over a period of time in statistical terms. Some commonly used descriptors follow.

Statistical Term	Description
$L_{Aeq, T}$	The most widely applicable unit is the equivalent continuous A-weighted sound pressure level (LAeq, T). It is an energy average and is defined as the level of a notional sound which (over a defined period of time, T) would deliver the same A-weighted sound energy as the actual fluctuating sound.
L_{A90}	The level exceeded for 90% of the time is normally used to describe background noise.
$L_{Amax,T}$	The maximum A-weighted sound pressure level, normally associated with a time weighting, F (fast), or S (slow)