

Noise Assessment

Land North of Water Lane, Angmering
March 2022

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CALA Management Ltd and Bellway Homes Ltd

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1. Introduction

- 1.1 Phlorum Ltd has been commissioned by CALA Management Ltd and Bellway Homes Ltd to provide a noise assessment report to support the Reserved Matters Application for 525 dwellings, S73 application for revision to associated Parameter Plans and discharge of Condition 9. Condition 9 and the associated reason for the condition is shown below:

"Prior to the commencement of the development, a noise mitigation scheme shall be submitted for approval to the Local Authority. The noise mitigation scheme shall include details relating to acoustic barriers for properties facing the A27 and Water Lane; and the façade treatment of all houses facing onto the existing light industrial/farm businesses in Dappers Lane and onto the A280, and associated landscaping. The approved mitigation shall be implemented in accordance with the details submitted and permanently retained thereafter."

Reason: To avoid unacceptable high levels of noise and in the interests of residential amenity, in accordance with Policy D DM1 and Policy QE DM1 of the Arun Local Plan. It is considered necessary for this to be a pre-commencement condition to ensure the agreed acoustic mitigation measures are implemented prior to the occupation of the development."

- 1.2 The site is one of three sites which make up the Angmering North Strategic Allocation (SD9). The outline planning application for Land North of Water Lane, Angmering (A/40/18/OUT) was approved in August 2019 for 525 residential dwellings, 3 ha of employment land, public open space, play area, access, associated infrastructure and landscaping.
- 1.3 The noise climate at the site has been established by both direct measurement and noise contour mapping and the suitability of the site for the proposed development considered against national and local planning policy, and guidelines on noise. Where necessary, mitigation measures have been recommended so that a noise climate suitable for the proposed development can be achieved.
- 1.4 Whilst reasonable efforts have been made to produce a report that is easy to understand, it is technical in nature. To assist the reader, an introduction to noise, and an explanation of the terminology used in this report are contained in Appendix A.

2. Site Description

Existing Site Conditions

- 2.1 The outline planning application for Land North of Water Lane, Angmering was approved in August 2019 for 525 residential dwellings, 3 ha of employment land, public open space, play area, access, associated infrastructure and landscaping.
- 2.2 The application site is located to the east of the existing village of Angmering. To the north of the site is the A27 and farmland and Water Lane is located to the south of the site. The A280 Angmering Bypass also runs to the south of the site. To the west of the site are light industrial and low density residential areas of Angmering.
- 2.3 The main noise sources in the vicinity of the application site are vehicles travelling on the local road network, specifically the A27 Trunk Road (Arundel Road) to the north of the site and Water Lane, immediately to the south of the site.
- 2.4 The noise assessment considers the effects of traffic generated by the development at nearby sensitive receptors and the effects of noise at the proposed residential dwellings.
- 2.5 A site location plan is included as Figure 1.

3. Guidance

Local Authority Consultation

- 3.1 The application will be submitted to Adur District Council (ADC) and there has been communication with the Environmental Health Department of ADC throughout the both outline application as discussed in the Phlorum Noise Assessment Report entitled 'Land North of Water Lane, Angmering', dated February 2018 and during the Reserved Matters Application, S73 application for revision to associated Parameter Plans and discharge of Condition 9.

National Planning Policy Framework

- 3.2 The Department for Communities and Local Government published the *National Planning Policy Framework* (NPPF) on 27th March 2012 and upon its publication, the majority of planning policy statements and guidance notes were withdrawn, including Planning Policy Guidance (PPG) 24 *Planning and Noise*, which until the emergence of the NPPF, set out the Government's position on how noise should be dealt with in the planning system.
- 3.3 The NPPF was revised on 24th July 2018, with the earlier 2012 version immediately withdrawn. A further update was published on 20th July 2021.
- 3.4 The general guiding principle in the NPPF is contained in Section 15 under the heading *Conserving and enhancing the natural environment*. Paragraph 174 states:

"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;"

- 3.5 The noise planning policy is contained in paragraph 185, which also appears in Section 15 of the NPPF:

"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.”

- 3.6 A footnote to paragraph 185(a) refers to the Explanatory Note of the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010), which defines both “*significant adverse impacts on health and quality of life*” and “*adverse impacts on health and quality of life*”.

Noise Policy Statement for England

- 3.7 The Department for Environment, Food and Rural Affairs published the *Noise Policy Statement for England* (NPSE) in March 2010. The explanatory note of the NPSE defines the terms used in the NPPF:

“2.20 There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

2.21 Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.”

- 3.8 The NPSE does not define the SOAEL numerically, stating at paragraph 2.22:

“2.22 It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may

constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."

- 3.9 There is no local or national guidance on how the three terms should be defined numerically.
- 3.10 There are three aims in the NPSE, two of which expand upon the first bullet point in paragraph 180 of the NPPF:

"The first aim of the Noise Policy Statement for England

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.

2.23 *The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development (paragraph 1.8).*

The second aim of the Noise Policy Statement for England

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.

2.24 *The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur.*

The third aim of the Noise Policy Statement for England

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.

2.25 *This aim seeks, where possible, positively to improve health and quality of life through the pro-active management of noise while also taking into account the guiding principles of sustainable development (paragraph 1.8), recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim."*

Planning Practice Guidance

3.11 In March 2014, the Government released Planning Practice Guidance (PPG) on noise, entitled 'Noise'. This document sets out a number of principles in the form of questions and answers, and reinforces the guidance set out in the NPPF and the NPSE. The noise PPG was last updated in December 2014.

3.12 The noise PPG notes that:

"Noise needs to be considered when new development may create additional noise and when new developments would be sensitive to the prevailing acoustic environment."

3.13 It goes on to note that:

"Local planning authorities' plan-making and decision taking should 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."*

3.14 The noise PPG broadly repeats the NPSE definitions of the NOEL, LOAEL and SOAEL and it provides a summary table to explain how the terms relate to each other and to typical human reactions to sound. The table is replicated below in Table 3.1.

Table 3.1 Planning Practice Guidance summary of noise exposure hierarchy

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	Observed adverse effect	Mitigate and reduce to a minimum

Perception	Examples of Outcomes	Increasing Effect Level	Action
	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.		
		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 the windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting back 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

3.15 It is noted that the text in paragraph 005 of the PPG for noise reiterates the point illustrated in Table 3.1, that there are degrees of adverse effect above the SOAEL. Table 3.1 defines two degrees of significant adverse effect: a significant observed adverse effect, which is deemed noticeable and disruptive, and an unacceptable adverse effect, which is deemed noticeable and very disruptive.

3.16 The distinction between these two degrees of significant adverse effect is expanded upon in the text in paragraph 005 of the PPG for noise:

"005 Increasing noise exposure will at some point cause the significant observed adverse effect level boundary to be crossed. Above this level the noise causes a material change in

behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present. If the exposure is above this level the planning process should be used to avoid this effect occurring, by use of appropriate mitigation such as by altering the design and layout. Such decisions must be made taking account of the economic and social benefit of the activity causing the noise, but it is undesirable for such exposure to be caused.

At the highest extreme, noise exposure would cause extensive and sustained changes in behaviour without an ability to mitigate the effect of noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be prevented from occurring."

- 3.17 The PPG, which is the most recent manifestation of Government advice on how noise should be treated within the planning system, as opposed to a policy position as stated in the more recent NPPF, is clear that a significant adverse effect, which lies above the SOAEL but below an unacceptable adverse effect, can be addressed (or 'avoided' in the terms of the PPG) through the provision of mitigation, including noise insulation; it is not until an unacceptable adverse effect is reached that the cause of the effect should be prevented.
- 3.18 The noise PPG provides advice on how to mitigate the effects of noise, noting that there are options to reduce noise at source, to optimise site layouts, to use planning conditions, and provide insulation within affected properties.
- 3.19 The noise PPG also notes that:

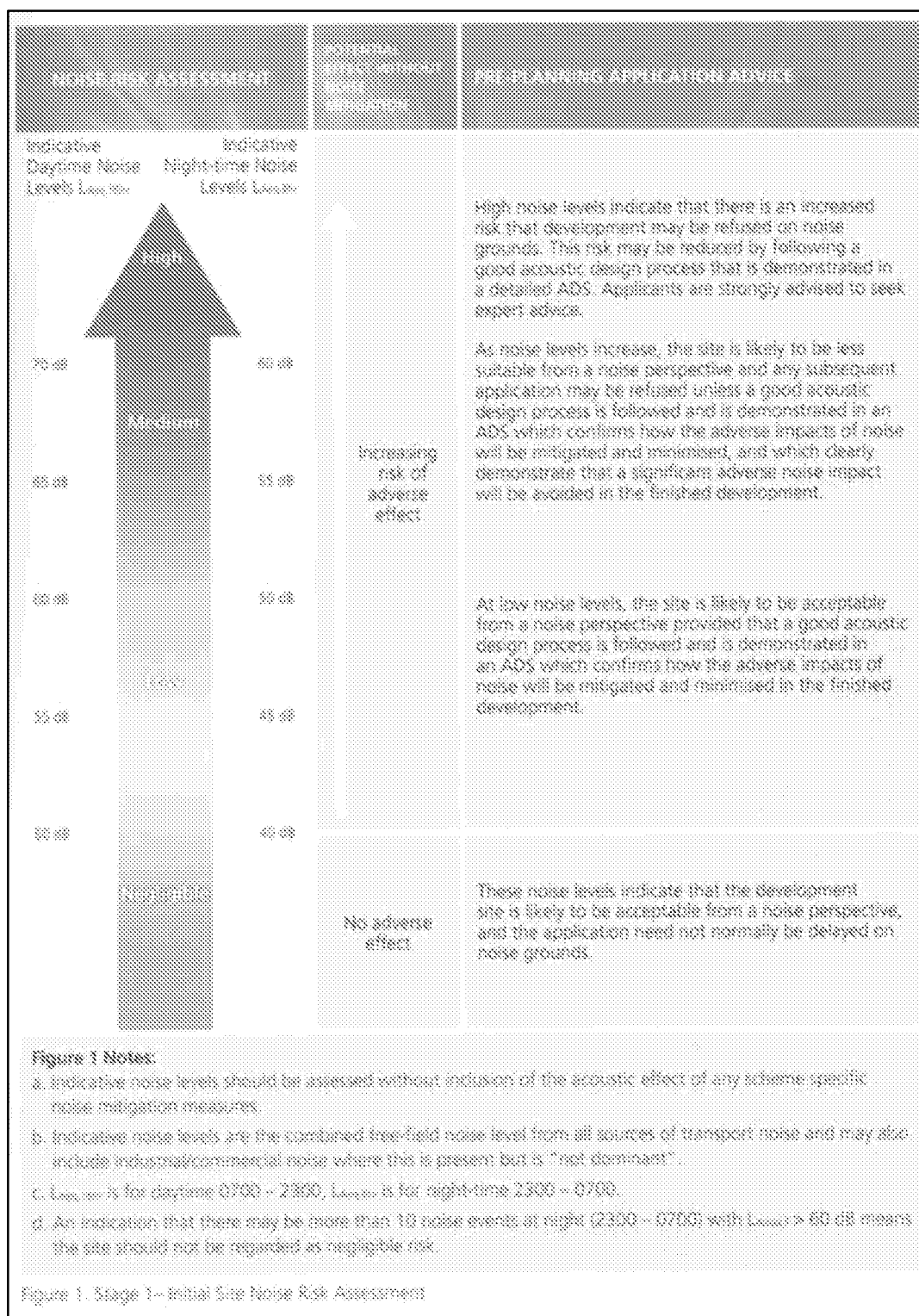
"The noise impact may be partially offset if the residents of those dwellings have access to:

- ☉ a relatively quiet façade (containing windows to habitable rooms) as part of their dwelling, and/or*
- ☉ a relatively quiet external amenity space for their sole use, (e.g. a garden or balcony). Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced with increasing noise exposure and could be such that significant adverse effects occur, and/or*
- ☉ a relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings, and/or*
- ☉ a relatively quiet, protected, external publically accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance)."*

ProPG

- 3.20 *Professional Practice Guidance on Planning and Noise* (ProPG) was released in May 2017. A joint publication by the Chartered Institute of Environmental Health, the Institute of Acoustics, and the Association of Noise Consultants, the document sets out a recommended approach for the management of noise within the planning system in England.
- 3.21 ProPG sets out a two-stage risk-based approach for new residential development:
- ❖ **Stage 1:** initial noise risk assessment of the proposed development;
 - ❖ **Stage 2:** a systematic consideration of four key elements:
 - Element 1: demonstrating a 'Good Acoustic Design Process';
 - Element 2: observing internal 'Noise Level Guidelines';
 - Element 3: undertaking an 'External Amenity Area Noise Assessment'; and
 - Element 4: consideration of 'Other Relevant Issues'.
- 3.22 The Stage 1 initial noise risk assessment should provide an indication of the likely risk of adverse effects from noise should no mitigation be included as part of the development proposals.
- 3.23 ProPG provides an illustrative noise risk scale, derived from current guidelines values and experience. The scale suggests that the risks are negligible where noise levels are below 50dB L_{Aeq} during the daytime and 40dB L_{Aeq} during the night-time. The scale suggests that a site would start to tend from a medium to a high risk when noise levels are above approximately 70dB L_{Aeq} during the daytime and above approximately 60dB L_{Aeq} during the night-time. Between these values, the level of risk increases through low to medium as noise levels increase. These values are all stated as indicative in the ProPG.
- 3.24 The ProPG states that this initial noise risk assessment is intended to support wider Government planning and noise policies and guidance, i.e. the NPPF, NPSE and PPG-Noise.
- 3.25 Figure 1 of the ProPG, which is replicated here as Figure 2, presents the risk hierarchy, with indicative noise levels that broadly equate to the different risk categories.

Figure 2: ProPG Stage 1 Risk Assessment



3.26 The Stage 2 full assessment should consider good acoustic design, internal noise levels, external amenity area noise levels, and assessment of any other issues.

- 3.27 The ProPG states that good acoustic design should consider factors such as reducing noise at source, site layouts, and building orientation. Solely relying on the sound insulation of building fabric to achieve acceptable acoustic conditions is not considered good acoustic design. Noise control measures should be considered against other requirements, such as ventilation, fire regulation and cost.
- 3.28 The ProPG refers to the criteria set out in BS8233: 2014 and the World Health Organisation's *Guidelines for Community Noise* for internal noise levels and noise levels in external amenity areas. The ProPG notes that internal noise levels should always be considered alongside requirements for ventilation and overheating. Note 5 under Figure 2 in the ProPG, which sets out the internal noise level guidelines replicated from BS8233: 2014 and the WHO guidelines, states:

"Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any facade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal LAeq target levels should not normally be exceeded, subject to the further advice in Note 7."

- 3.29 It is clear that the internal noise guidelines should be met for 'whole dwelling ventilation' conditions, which are effectively background ventilation. 'Whole dwelling ventilation' is defined in Approved Document F of the Building Regulations 2010.
- 3.30 Note 7 under Figure 2 of the ProPG states:

"Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal LAeq target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved."

- 3.31 The ProPG allows for the relaxation of the internal guideline noise levels by up to 5dB and the internal noise levels would still be regarded as reasonable.
- 3.32 For 'purge ventilation' conditions, the ProPG does not specify internal noise criteria, stating at paragraph 2.35:

"It should also be noted that the internal noise level guidelines are generally not applicable under "purge ventilation" conditions as defined by Building Regulations Approved Document F, as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food)."

- 3.33 For thermal control, i.e. overheating conditions, ProPG states that the potential noise levels should be assessed, stating at paragraph 2.38:

"Where mechanical services are used as part of the ventilation or thermal comfort strategy for the scheme, the impact of noise generated by these systems on occupants should also be assessed."

3.34 The ProPG goes on to state in paragraph 2.72(h):

"Reasonable steps should be taken to minimise overheating during summer months through good design. Where openable windows / ventilators are proposed to mitigate overheating and where the internal noise level guidelines are likely to be exceeded when they are open a more detailed assessment of the potential impact on occupants during the overheating condition should be provided in the ADS. This more detailed assessment may include: (i) the alternative design measures considered / applied to reduce noise impact on occupants, (ii) the expected internal noise levels when windows / ventilators are opened to provide relief from overheating, and (iii) an estimate of the amount of time that windows are likely to be open to provide relief from overheating."

3.35 Consideration of overheating issues is outside the scope of this noise assessment. However, it is clear that while the ProPG does require internal noise levels to be considered under thermal control conditions, no internal noise criteria are applied.

3.36 The ProPG states that other relevant issues include compliance with relevant national and local policies, magnitude of compliance with the ProPG itself, the likely occupants of the development, acoustic design against unintended adverse consequences and acoustic design against wider planning objectives.

British Standard 8233

3.37 The scope of British Standard (BS) 8233: 2014 *Guidance on sound insulation and noise reduction for buildings* is the provision of recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new or refurbished buildings undergoing a change of use rather than to assess the effect of changes in the external noise climate.

3.38 BS8233: 2014 suggests suitable internal noise levels within different types of buildings, including residential dwellings, as shown in Table 3.2.

Table 3.2: BS8233 recommended internal noise levels, dB

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35dB LAeq,16hour	-
Dining	Dining room/area	40dB LAeq,16hour	-
Sleeping (daytime resting)	Bedroom	35dB LAeq,16hour	30dB LAeq,8hour

- 3.39 BS8233 contains the following relevant guidance in footnotes to the above information:

Note 4: Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or LAmax,F, depending on the character and number of events per night. Sporadic noise events could require separate values.

Note 5: If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.

Note 7: Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved."

- 3.40 Although Note 4 above refers to setting a guideline value for maximum noise levels, BS8233: 2014 does not provide any guidance on a suitable criterion.
- 3.41 Placing the BS8233: 2014 guidance into the context required by the NPPF and the NPSE, it is considered that where the internal noise levels meet the guideline values set out in Table 3.2, there is considered to be no observed effect.
- 3.42 Since BS8233: 2014 allows for a 5dB relaxation in the guideline values in Table 3.2 (Note 7 above), it is considered that internal noise levels up to 5dB above the guideline values in Table 3.2 may still be acceptable.

- 3.43 BS8233:2014 states that 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.

World Health Organisation

- 3.44 The World Health Organisation (WHO) *Guidelines for Community Noise* (1999) also sets out guidance on suitable internal and external noise levels in and around residential properties. The guidance on internal and external noise levels is the same as set out in BS8233: 2014 in terms of L_{Aeq} values, but the WHO guidelines also provide guidance on night-time maximum noise levels, stating:

"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10-15 times per night."

- 3.45 The WHO guidelines suggest the possibility of sleep disturbance if continuous noise in bedrooms exceeds 30dB $L_{Aeq,8hrs}$ during the night-time, and therefore internal noise levels above this value can be considered to be above the LOAEL. This internal value can be translated to an external value by the addition of 10dB, to account for the typical reduction through an open window. Therefore, external night-time noise levels of 40dB $L_{Aeq,8hrs}$ can be defined as the LOAEL.
- 3.46 The WHO published their *Night Noise Guidelines for Europe* in 2009. This document sets an external 'night noise guideline' (NNG) of 40dB. This is consistent with the LOAEL value determined above. The NNG also sets an interim target of 55dB in situation where the 40dB value cannot be met. Above 55dB the NNG notes that the situation is considered increasingly dangerous for public health. On the basis of the above, a free-field external value of 55dB $L_{Aeq,8hrs}$ is considered to be the night-time SOAEL.

Noise Insulation Regulations

- 3.47 The Noise Insulation Regulations 1975 (as amended 1988) set out conditions, which if satisfied, require the promoter of a new road to offer affected residents sound insulation or a grant in respect of sound insulation.

- 3.48 Although legislation framed with reference to new roads is not directly relevant to the proposed development considered here, the noise levels at which sound insulation must be offered provide an indication of what constitutes a significant level of noise from these sources; these values may be used to define the level at which significant adverse effects occur, i.e. the SOAEL.
- 3.49 The Noise Insulation Regulations indicate that sound insulation should be offered when, inter alia, road traffic noise exceeds a façade noise level of 68dB $L_{A10,18hrs}$. This value can be converted to a 16 hour L_{Aeq} to match the form of the guidance recommended in BS8233 by subtracting 5dB. This correction includes a -3dB correction to remove the façade correction, a further -3dB correction to convert the 18 hour L_{A10} noise level to an 18 hour L_{Aeq} noise level, and a +1dB correction to convert the 18 hour L_{Aeq} to a 16 hour L_{Aeq} . The resulting value of 63dB $L_{Aeq,16hrs}$ is considered to be the daytime SOAEL.
- 3.50 Since noise levels of 63dB $L_{Aeq,16hrs}$ can be controlled through the provision of appropriate ventilation, as required by the Noise Insulation Regulations, it is reasonable to suggest that the point at which an unacceptable adverse effect occurs is higher than this value.
- 3.51 The sound insulation package specified in the Noise Insulation Regulations is known to give a sound reduction of approximately 35dB. At external noise levels in excess of 70dB at night the internal noise levels will exceed the reasonable criterion in BS8233 of 35dB. A noise level 1dB below this value is therefore taken to be the upper limit of acceptability for residential properties at night.
- 3.52 This 69dB $L_{Aeq,8hrs}$ limit has been converted to a free-field value of 66dB to be consistent with the free-field values used elsewhere in this report.
- 3.53 On this basis, and in the absence of any local definition, the point at which night-time noise levels result in an unacceptable adverse effect is considered to be 66dB $L_{Aeq,8hrs}$.

BRE Research Paper

- 3.54 A Building Research Establishment (BRE) survey titled *The effectiveness and acceptability of measures for insulating dwellings against traffic noise* (Utley W et al, Journal of Sound and Vibration (1986) Vol 109(1), pages 1-18) found that the insulation package supplied under the Noise Insulation Regulations is inadequate for road traffic noise levels of 78dB $L_{A10,18hrs}$ and above at a façade.
- 3.55 This figure is equivalent to a free-field level of 75dB $L_{A10,18hrs}$; which in turn is equivalent to 73dB $L_{Aeq,16hrs}$. If mitigation specified under the Noise Insulation Regulations becomes ineffectual at 73dB $L_{Aeq,16hrs}$, it can be concluded that 72dB $L_{Aeq,16hrs}$ is the highest noise level at which the mitigation remains effective.

- 3.56 On this basis, and in the absence of any local definition, the point at which daytime noise levels result in an unacceptable adverse effect is considered to be 72dB LAeq,16hrs.

Summary

- 3.57 The suitability of the site has been assessed in the following ways:
- ☛ Determining the external noise levels across the site, to compare with the LOAEL and SOAEL, as defined above. For clarity, the LOAEL and SOAEL adopted for this site are shown in Table 3.3; and
 - ☛ Calculating the sound reduction performances required of the external building fabric, particularly the glazing units, so that suitable internal noise levels are achieved;

Table 3.3: LOAEL and SOAEL for this site

Effect	Daytime LAeq,16hrs (dB)	Night-time LAeq,8hrs (dB)	Comments
No Observed Effect	<50	<40	The parts of the site that have noise levels below these values are considered acceptable for residential development without the need for further mitigation
LOAEL	50	40	
Observed Adverse Effect	50-55	40-45	Although the parts of the site that have noise levels between these values are above the LOAEL, BS8233 suggests that they would be acceptable.
	55-63	45-55	The parts of the site that have noise levels between these values are above the LOAEL, and are considered acceptable for residential development, although mitigation may be required.
SOAEL	63	55	
Significant Observed Adverse Effect	63-72	55-66	The parts of the site that have noise levels between these values are above the SOAEL but below the point at which an unacceptable adverse effect occurs. Planning policy states that Significant Adverse Effects should be avoided and the Noise PPG states that the planning

Effect	Daytime L _{Aeq,16hrs} (dB)	Night-time L _{Aeq,8hrs} (dB)	Comments
			process should be used to do this by use of appropriate mitigation.
Unacceptable Adverse Effect	>72	>66	The noise PPG states that this situation should be prevented; however, no indication is given of how to do this.

Notes:

(1): Below these ranges adverse comment is not expected.

(2): Above these ranges adverse comment is very likely.

3.58 It is considered that the above values can also be related to the levels of risk described in the ProPG:

- ☞ noise levels below the LOAEL, i.e. below 50dB L_{Aeq,16hrs} during the daytime and below 40dB L_{Aeq,8hrs} during the night-time, are considered to be a negligible risk;
- ☞ noise levels above the LOAEL but below the SOAEL, i.e. between 50dB L_{Aeq,16hrs} and 63dB L_{Aeq,16hrs} during the daytime and between 40dB L_{Aeq,8hrs} and 55dB L_{Aeq,8hrs} during the night-time, are considered to range from a low to medium risk;
- ☞ noise levels above 63dB L_{Aeq,16hrs} i.e. the SOAEL, but below 72dB L_{Aeq,16hrs} during the daytime, and above 55dB L_{Aeq,8hrs}, i.e. the SOAEL, but below 66dB L_{Aeq,8hrs} during the night-time, are considered to range from a medium to high risk; and
- ☞ noise levels that result in an unacceptable adverse effect, i.e. above 72dB L_{Aeq,16hrs} during the daytime and above 66dB L_{Aeq,8hrs} during the night-time, are considered to be a high risk.

3.59 The lower and upper ends of these ranges, representing negligible and high risks respectively, accord with the advice set out the ProPG.

Industrial/Commercial Noise

3.60 The noise from the adjacent industrial use should be considered against the guidance in BS 4142:2014+A1:2019 *'Methods for rating and assessing industrial and commercial sound'*.

- 3.61 BS4142:2014+A1:2019 provides a methodology that determines the significance of adverse impact at dwellings potentially affected by noise of an industrial nature. BS 4142 refers specifically to sound from fixed installations which comprise mechanical and electrical plant and equipment; sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.
- 3.62 The basis of the standard requires a comparison to be made between the 'background noise level' of the assessment area and the 'specific noise level' of the noise source under consideration. There are five key definitions relating to this relationship;
- ☞ Background Noise Level - $L_{A90,T}$ - this is defined in the Standard as 'the 'A' weighted sound pressure level of the residual noise at the assessment position which is exceeded for 90 % of the given time interval, T , measured using time weighting F and quoted to the nearest number of whole decibels.
 - ☞ Specific Noise Level - $L_{Aeq,T}$ - this is the equivalent continuous 'A' weighted sound pressure level over a given time interval.
 - ☞ Residual Noise - this is defined as the ambient noise remaining in a given situation when the specific noise source is suppressed to a degree such that it does not contribute to the ambient noise.
 - ☞ Ambient Noise - totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far.
 - ☞ Rating Level - $L_{Aeq,T}$ - the specific noise level plus any adjustment made for the characteristic features of the noise.
- 3.63 The background level, wherever possible should be determined at the location where the assessment is to be made. Situations will arise where, due to circumstances which influence this level unduly, for example the specific noise level is operating continuously and thus the residual noise cannot be measured at this point, the background level may be determined in other ways. This may be, for example, by measuring at a different location or a different time which are nevertheless representative of the assessment position.
- 3.64 A further acoustic correction to the specific noise level is made if the sound has tonal or impulsive characteristics.
- 3.65 Once all necessary adjustments have been made, the background and the specific noise levels are compared. The standard states that the greater this difference is, the greater is the magnitude of the impact.
- ☞ A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

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

3.66 The assessment should consider the level of uncertainty in the data and associated calculations. Where the level of uncertainty could affect the conclusion, reasonable practicable steps should be taken to reduce the level of uncertainty.

4. Environmental Surveys

- *****
- 4.1 The baseline noise measurements at the site are reported in the Phlorum Noise Assessment Report entitled 'Land North of Water Lane, Angmering', dated February 2018 and these baseline levels are also reproduced below.
 - 4.2 An assessment of the existing noise climate has been undertaken at two representative locations with 24-hour noise measurements from 13th to 15th January 2016. These measurements provide an indication of the likely noise effects of the existing road network.
 - 4.3 The main noise sources are vehicles travelling on the local road network, particularly the A27 to the north of the site and Water Lane to the south.
 - 4.4 As the A27 and Water Lane are the busiest roads in the vicinity of the application site, noise measurements were taken adjacent to these roads. The measurement locations are shown on Figure 3 and the baseline noise levels are shown graphically in Appendix B, Figures B1 and B2.
 - 4.5 At each measurement location the microphone was located 1.5m above the ground and in a free-field location. A summary of the measured 24 hour noise levels is shown in Table 3.1.

Table 4.1: Summary of day and night-time noise levels

Location	Date	Period	Noise Levels, dB(A)			
			L_{Aeq}	L_{Amax}	L_{10}	L_{50}
1. A27 - 95m from road	13-Jan-16	Day	60.0	68.5	60.8	54.8
	13/14 Jan 16	Night	52.0	63.3	54.4	37.3
2. Water Lane - 80m from road	14-Jan-16	Day	46.9	60.2	48.0	43.7
	14/15 Jan 16	Night	37.4	48.4	39.2	30.9

- 4.6 The 24 hour noise data has been analysed at sites 1 and 2 as shown graphically in Appendix B. The external noise measurements indicate that at Site 1 the typical maximum noise level at night was $L_{Amax,f}$ 63 dB at a distance of 95m from the nearside carriageway of the A27 and no maximum noise events at night exceeded a maximum noise levels of $L_{Amax,f}$ 70 dB. The maximum night-time noise levels at a distance of 80m from Water Lane did not exceed a level of $L_{Amax,f}$ 55 dB.

Industrial/Commercial Noise

S G Tanks

- 4.7 Short term measurements were taken on 23 June 2021 to determine the noise from the S G Tanks premises located on the western boundary of the site. S G Tanks have changed the way that they operate since a noise survey on 28 June 2018 and source noise measurements were taken of activities at the new workshop location. The building where they used to construct the tanks is located on the boundary of the development site is now used as a Storeroom.
- 4.8 The tank construction activities have been moved further from the development site and relocated into a solid brick building, which is shielded from the site by the Storeroom, which has a 5m high roof ridge height. The shutters on the opening in the new workshop building are still kept open to prevent overheating.
- 4.9 During the site visit a 1 hour measurement was taken at a distance of 5m from the open doors (Site 3 on Figure 3) and the noise level was $L_{Aeq,1\text{ hr}}$ 72 dB. The site owners indicated that the on-site activities during the measurement period represented a worst case scenario. This corresponded with many visits to S G Tanks where site observations indicated that there is generally very little noise from the site but there is short bursts of noisy activity. For the purposes of the BS4142 assessment the worst case hourly period of noise from the relocated S G Tanks activities has been used.

Small Industrial Units Near Culberry Nursery

- 4.10 Attended noise surveys were undertaken on 8 August 2018 to determine the noise from the small industrial/commercial Units Near Culberry Nursery.
- 4.11 It was observed that there was very little activity from the small industrial units located behind Culberry Nursery during the survey. There was occasional metal grinding noise that occurred intermittently and lasted for a few minutes at a time. Other noise sources included distant road traffic noise, wind noise, birdsong and occasional horns from the nearby racing circuit.
- 4.12 Noise measurements were taken on the boundary closest to the grinding noise and the measured noise levels are shown in Table 4.2. The measurements were taken at Site 4, as shown on Figure 3.

Table 4.2: Noise Levels adjacent small industrial units located behind Culberry Nursery

Activity	Period	Noise Levels, dB(A)		
		L_{Aeq}	L_{Amax}	L_{min}
Intermittent metal grinding	1245-1345	56.8	74.9	54.8
Baseline noise without grinding	1345-1440	50.0	63.8	45.1

- 4.13 The weather during all of the above surveys was suitable for noise measurement, it being dry with wind speeds of less than 5m/s.
- 4.14 The noise equipment for all of the above surveys comprised Larson Davis 824 Sound Analysers and Larson Davis 820 sound level meters. At each survey the calibration of the instrumentation was checked using a Larson Davis CAL200 acoustic calibrator both before and after the survey and no significant drift was noted. All equipment was within the current manufacturer's periods of calibration at the times of the survey.

5. Noise Mapping

- *****
- 5.1 In order to determine the effects of noise from road traffic on the proposed development, the impact from local roads have been assessed using IMMI noise modelling software. The IMMI model has been validated and approved on numerous road traffic schemes on UK roads.
- 5.2 The model considers the road traffic flows in the day (0700-2300 hrs) using TRL (Transport Research Laboratory) methodology and night-time (2300-0700 hrs), traffic speeds and % HGV's for the site layout plan and traffic flows for the proposed year of opening of the Development. The model takes the site topography, distance attenuation, ground effects, receptor heights and sound attenuation provided by existing landforms and structures.
- 5.3 To reduce the noise in gardens to within acceptable levels on the nearest residential properties to the A27 the following noise mitigation measures have been included in the site layout design:
- ☛ The gardens have been located behind the nearest properties to the A27 such that they are shielded by the buildings.
 - ☛ Where possible, garages have been situated in the gaps between the buildings facing the A27.
 - ☛ A scheme of 1.8m high acoustic barriers have been located between any remaining gaps between the buildings/garages facing the A27.
- 5.4 The day and night-time noise contours for the development site, including the noise mitigation measures that have been incorporated into the site layout design are shown in Appendix C, Figures C1 and C2 respectively.
- 5.5 As shown on Figure C1, the daytime noise levels at plots 247 & 248 are above $L_{Aeq,16hr}$ 55 dB in the gardens due to a significant unobstructed angle of view to the A27 and additional noise mitigation has therefore been considered for these plots. The noise contours for plots 247 & 248 with a 3m high acoustic barrier at the perimeter of the gardens is shown in Appendix C, Figure C3. With the increased barrier height the predicted noise levels in the gardens are below $L_{Aeq,16hr}$ 55 dB.
- 5.6 The predicted noise levels on the plots that overlook both the A27 and Water Lane along with the required sound insulation requirements are shown in Appendix D. The predicted noise levels on the end elevations of plots 25, 30 and 31 that overlook Water Lane have been included for completeness but there will be no habitable rooms on these elevations and so are not included in the noise calculations for sound insulation measures.

- 5.7 Condition 9 requires noise mitigation measures to be considered at proposed residential properties facing the A280. The nearest plot to the A280 is Plot 54 and the predicted façade noise levels on the elevation facing the A280 at 1st floor level is $L_{Aeq,16\text{ hr}}$ 56 dB in the daytime and $L_{Aeq,8\text{ hr}}$ 48 dB at night.

6. Assessment

Road Traffic Noise

- 6.1 The noise levels for each elevation and floor of each individual plot due to road traffic noise has been predicted (the full set of results is available on request). The noise levels at plots with the highest noise levels adjacent to both Water Lane and the A27 and a representative plot at the centre of the site have been considered against the guidance provided in ProPG.
- 6.2 The predicted free field noise levels at Plot 25 are considered to represent the highest noise levels adjacent to Water Lane. It is assumed that there will be no windows of habitable rooms on the south elevation (overlooking Water Lane) and so the noise levels in the east elevation have been considered, where the predicted free-field noise levels at 1st floor level are $L_{Aeq,16hr}$ 60 dB in the daytime and $L_{Aeq,8hr}$ 51 dB at night. These levels are above LOAEL but below SOAEL and are considered acceptable for residential development, although mitigation may be required.
- 6.3 The predicted free field noise levels at Plot 256 are considered to represent the highest noise levels adjacent to the A27. The noise levels on the north facing elevation have been considered, where the predicted free-field noise levels at 1st floor level are $L_{Aeq,16hr}$ 65 dB in the daytime and $L_{Aeq,8hr}$ 56 dB at night. These levels are above SOAEL but below the point at which an unacceptable adverse effect occurs. Planning policy states that Significant Adverse Effects should be avoided and the Noise PPG states that the planning process should be used to do this by use of appropriate mitigation.
- 6.4 The predicted free field noise levels at Plot 450 are considered to represent the noise levels at the centre of the site. The highest noise levels are at the north facing elevation at 1st floor level of $L_{Aeq,16hr}$ 45 dB in the daytime and $L_{Aeq,8hr}$ 36 dB at night. These levels are below LOAEL and are considered acceptable for residential development without the need for further mitigation.
- 6.5 In terms of the level of noise risk, as described in the ProPG, it is considered that the majority of the site, as represented by plot 450 is considered to be a negligible risk. The properties that face on to the A27 are in the range of medium to high risk and the properties overlooking Water Lane are considered to range from a low to medium risk.
- 6.6 The site is considered acceptable for residential use, subject to the incorporation of suitable mitigation, which is considered in the next section of this report.

Industrial/Commercial Noise

- 6.7 The noise impact of the industrial/commercial units located on the western boundary of the development site have been considered at the nearest proposed residential properties on the developments site.

S G Tanks

- 6.8 The noise from activities at S G Tanks was addressed in a Technical Note dated February 2018 and entitled 'Supplementary Technical Note to Noise Report'. In the note it was indicated that:

"It should be noted that during discussions with the S G Tanks operators (both with Phlorum and ADC) it was stated that the noisy activities may be located further from the development boundary in a new building. If this occurs, the noise impact on the residential development would be significantly reduced."

- 6.9 A site visit and meeting was held with the operators of S G Tanks on 23rd June 2021 and as previously discussed in the Supplementary Technical Note the noisy activities have been relocated to a brick building further from the development. Furthermore, the previous location of these activities is now a storeroom and acts as a barrier between the noise and the development.
- 6.10 The same assessment methodology has been used as in the Supplementary Technical Note but the source noise level from the building with the relocated 'noisy activities' of $L_{Aeq,1\text{ hr}} 72\text{ dB}$ at 5m has been used. Due to the complexity of the noise predictions (orientation of opening in relocated building, barrier effects of storeroom, flanking noise etc.) the noise has been predicted using IMMI modelling software.
- 6.11 The BS4142 assessment is based on the following assumptions as shown below:
- ❖ A impulsivity acoustic correction of +6 dB is used in the BS4142 assessment as shown in the Supplementary Technical Note (the sound is not considered to be tonal but is clearly perceptible).
 - ❖ The 1 hour noise measurement was taken 5m from the open doors, and provides an activity noise levels of $L_{Aeq,1\text{ hr}} 72\text{ dB}$. The noise levels measured on 23rd June 2021 were higher than those previously measured and S G Tanks stated that they had especially brought in a second welder for the day to provide a worst case scenario. Furthermore, the operators were aware of the noise survey and were understandably keen to show how noisy they could potentially be. It is considered that $L_{Aeq,1\text{ hr}} 72\text{ dB}$ at 5m provides a 'worst case' and previous site observations from numerous site visits indicate that activities at S G Tanks are generally significantly quieter.

- ☛ S G Tanks stated that they need the doors to the building with 'noisy activities' to be open (acoustically weakest path) for cooling even though they have extract ventilation, which they use in cooler winter months.
- ☛ The background noise level used for the assessment is from the Supplementary Technical Note. As the commercial noise is intermittent and there was no noise from S G tanks from 1430 hrs onwards, the background noise level used for the assessment is the lowest measured 15 min noise level after 1430 hours of $L_{A90, 15 \text{ mins}}$ 49.2 dB.

6.12 The BS4142 assessment at the closest elevation of the site layout plan is shown in Table 6.1 and the location of the source and nearest residential property is shown in Figure 4.

Table 6.1 – BS4142 Assessment for S G Tanks

Source Parameters	Parameters
Calculated Specific Noise Level	$L_{Aeq,T}$ 36 dB
Background Noise level	$L_{A90,T}$ 49 dB
Acoustic Correction	+6 dB
Rating Level	$(36+6) = 42$ dB
Excess of rating over background level	$(49-42) = -7$ dB

- 6.13 The BS4142 noise assessment provides an excess of rating over background level of -7 dB in the daytime. BS4142 states that a difference of around +5 dB is likely to be an indication of an adverse impact and that 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. In this case, the context is that the noise predictions are based on 'worst case' hourly noise levels and typical operations will produce significantly lower noise levels.
- 6.14 BS4142 requires that the uncertainty of the assessment is considered. The uncertainty has been minimised by using source noise measurements at the site and using IMMI noise modelling software to predict the noise levels at the nearest proposed residential properties.
- 6.15 The noise predictions indicate that the BS4142 target provided by ADC of an excess over rating level of -5 dB has been achieved for activities at S G Tanks.

Small Industrial Units Near Culberry Nursery

- 6.16 The noise from activities at the small industrial units located near Culberry Nursery was addressed in a Technical Note dated February 2018 and entitled 'Supplementary Technical Note to Noise Report'.

- 6.17 Daytime noise measurements were taken at the nearest proposed residential properties (site 4 in supplementary note) whilst grinding noise was taking place. The measurements were taken 3m from the boundary and approx. 5m from the grinding noise.
- 6.18 The revised site layout plan has moved the nearest residential from 18m to 34m from the site boundary and the BS4142 assessment has been revised to take this distance into account.
- 6.19 The assumptions used in the BS4142 assessment are the same as in the Supplementary Note and summarised below:
- ☛ A impulsivity acoustic correction of +6 dB is used in the BS4142 assessment as shown in the Supplementary Technical Note (the sound is not considered to be tonal but is clearly perceptible).
 - ☛ Residual and background noise measurements were taken when there was no grinding noise present.
- 6.20 The BS4142 assessment at the closest elevation of the latest site layout plan is shown in Table 6.2 and the location of the source and nearest residential property is shown in Figure 4.

Table 6.2 – BS4142 Assessment for Small Industrial Units Near Culberry Nursery

BS4142 Assessment	Daytime
Ambient Noise Level at 5m, $L_{s(5m)}$	$L_{Aeq,T}$ 57 dB
Residual Noise Level at 5m, $L_{r(5m)}$	$L_{Aeq,T}$ 50 dB
Specific Noise Level at 5m, $L_{s(5m)}$	$L_{Aeq,T}$ 56 dB
Specific Noise Level extrapolated to 34m, $L_{s(34m)}$	$L_{Aeq,T}$ 39 dB
Background Noise level	$L_{A90,T}$ 45 dB
Acoustic Correction	+6 dB
Rating Level	$(39+6) = 45$ dB
Excess of rating over background level	$(45-45) = 0$ dB

- 6.21 The BS4142 noise assessment provides an excess of rating over background level of 0 dB in the daytime. BS4142 states that a difference of around +5 dB is likely to be an indication of an adverse impact and that 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. In this case, the context is that the noise predictions are based on 'worst case' hourly noise levels and typical operations will produce significantly lower noise levels.
- 6.22 BS4142 requires that the uncertainty of the assessment is considered. The uncertainty has been minimised by using source noise measurements taken at the site.

- 6.23 The noise predictions indicate that the BS4142 target provided by ADC of an excess over rating level of -5 dB is exceeded by 5 dB and that noise mitigation measures are required to provide a further 5 dB noise reduction.

7. Mitigation

Sound Insulation & Ventilation

- 7.1 The noise levels at the majority of the site are below LOAEL. At properties close to Water Lane the noise is above LOAEL and below SOAEL. At properties overlooking the A27 the noise is above SOAEL but below the point at which an unacceptable adverse effect occurs, so the inclusion of mitigation measures should meet the requirements of the NPPF, NPSE and noise PPG.
- 7.2 Consideration has been given to the specification of building materials to control internal noise levels, so that they achieve the following criteria:
- ☛ Bedrooms 30dB $L_{Aeq,8hr}$ (23:00 to 07:00 hours)
 - ☛ Living rooms 35dB $L_{Aeq,16hr}$ (07:00 to 23:00 hours)
 - ☛ All habitable rooms 45dB L_{Amax} (not to be exceeded more than ten times per night).
- 7.3 The ambient sound levels used in the assessment are described in section 6. The maximum noise level at night did not exceed $L_{Amax,f}$ 70 dB at a distance of 95m from the nearside carriageway of the A27. The maximum night-time noise levels at a distance of 80m from Water Lane did not exceed a level of $L_{Amax,f}$ 55 dB.
- 7.4 The maximum noise levels have been extrapolated to represent the noise at 69m from the A27 and 10m from Water Lane, which represent the nearest proposed residential properties to these roads. The maximum façade noise levels are $L_{Amax,f}$ 75 dB at the nearest residential to the A27 and $L_{Amax,f}$ 76 dB at the nearest residential to Water Lane. To provide a worst case the maximum measured night-time noise levels have been used for the assessment rather than the 10th highest as discussed in ProPG.
- 7.5 The calculated sound reduction performance requirements apply to the whole external building fabric. However, since windows are typically the weakest link in the external building fabric, in terms of acoustic performance, the values below will particularly apply to the windows.
- 7.6 The predicted façade noise levels at locations that represent the nearest properties to the A27, Water Lane and the centre of the site and the sound reduction performances required of the external building fabric are shown in Table 7.1. The maximum noise levels are taken from the 24 hour noise surveys at Sites 1 and 2.

Table 7.1: Required sound reduction performances, dB

Location	Period	Target Noise Level	Facade Noise Level	Required Sound Reduction Performance
Nearest Residential to A27	Day	35dB LAeq,16hrs	68	33
	Night	30dB LAeq,8hrs	59	29
	Night	45dB LAFmax	75	30
Nearest Residential to Water Lane	Day	35dB LAeq,16hrs	63	28
	Night	30dB LAeq,8hrs	54	24
	Night	45dB LAFmax	76	31
Nearest residential to A280	Day	35dB LAeq,16hrs	56	21
	Night	30dB LAeq,8hrs	48	18
Centre of Site	Day	35dB LAeq,16hrs	48	13
	Night	30dB LAeq,8hrs	39	9

- 7.7 Windows do not reduce noise equally across the entire frequency spectrum, so the frequency content of the sound will influence the overall sound reduction performance of a given window, and by extension, the resulting noise levels within the property.
- 7.8 However, many glazing manufacturers test their products under laboratory conditions using a typical road traffic noise frequency spectrum source. The resultant measured noise attenuation, in dB, gives a very useful guide to in-situ sound reduction performance of the window for situations where road traffic noise dominates, known as the R_{TRA} .
- 7.9 It can be seen from Table 7.1 that a sound reduction performance of up to R_{TRA} 33 dB would be required to achieve all of the criteria at the elevations overlooking the A27 and Water Lane and R_w 31 dB for maximum noise events.
- 7.10 An example of an glazing unit that should be considered on the elevation overlooking the A27 is 6mm/16mm argon/8.8mm Pilkington Optiphon, which provides 34 dB R_{TRA} and 41 dB R_w .
- 7.11 An example of an glazing unit that should be considered on the elevations with windows closest to Water Lane is 10mm/(6 to 16mm)/6mm construction, which provides 32 dB R_{TRA} and 35 dB R_w .
- 7.12 At the majority of properties located at the centre of the site including the nearest properties to the A280, standard double glazing such as 4mm/(6 to 16mm)/4mm construction will meet the internal noise targets, which provides 25 dB R_{TRA} and 29 dB R_w .
- 7.13 The required sound insulation for each elevation of every individual property at each floor has been calculated and is available as a separate spreadsheet as the dataset is too large to include in the report. However, the predicted noise levels at the plots overlooking the A27 and Water Lane are shown in Appendix D.

- 7.14 It is noted that the sound reduction performances stated as achievable by the identified glazing units are based on laboratory tests. In practice, the actual on-site performance may be lower, depending on the quality of the fitting. The sound reduction performances in Table 7.1 should be interpreted as in-situ sound reduction performances.
- 7.15 Glazing units other than those suggested may be suitable and it is the responsibility of the glazing manufacturer to recommend and provide appropriate systems. The above analysis demonstrates that a design solution is feasible at the site for the purposes of a planning application. Further detailed calculations may be necessary to inform glazing procurement decisions.
- 7.16 Internal noise levels should be considered in the context of room ventilation and overheating requirements. As the sound reduction performance requirements are greater than 10dB, the windows will need to be closed to achieve the internal noise criteria. However, the windows should be openable so that the choice of opening or closing windows is with the occupants. Therefore, an alternative form of ventilation and/or cooling will be required so that occupants can retain access to fresh air and retain thermal comfort without compromising their noise climate. The ventilation and/or cooling system chosen should be designed so that it does not compromise the sound insulation performance of the building fabric.
- 7.17 Acoustically treated mechanical ventilation (MEV System 3 or 4 - The Building Regulations, Approved Document F) will be provided such as MVHR for the residential properties overlooking the A27 and Water Lane.
- 7.18 The February 2018 Noise Report provided an indication of the required sound insulation measures with a caveat that:

"When the final layout plans are available the glazing specifications for individual dwellings can be determined across the site."

"To enable the option for windows to be closed to meet the noise targets, acoustically treated ventilation should be provided to habitable rooms that overlook the A27 and Water Lane. The windows should be openable such that the choice of meeting the internal noise levels is with the occupants".

The methodology of mitigating the noise by means of appropriate glazing and ventilation is provided in the February 2018 Noise Report, which was used to obtain the outline permission.

- 7.19 A meeting was held with the case officer on Tuesday 26th October 2021 where ADC indicated that they are likely to resist artificial ventilation if included in the suite of noise mitigation measures. It was clear from the February 2018 Noise Report that appropriate ventilation would be required to meet the internal noise targets and this was not raised as an issue when the outline application was granted.

- 7.20 We are not aware of any Local Policy changes since the 2018 Noise Report that state that 'artificial ventilation' is not allowed. Closing windows to secure a good internal environment for short or long periods is not a new mitigating factor and has been in use across the UK ever since the publication of the Noise Insulation Regulations 1975. The principle of closed windows and an alternative means of ventilation that meets with the current Building Regulations in terms of background ventilation to secure a good sustainable internal environment for resting and sleeping has been used on many developments across the UK.
- 7.21 This issue was clarified in an email sent by Phlorum on 9th July 2021 (reproduced in Appendix E) and it was confirmed that the approach used in the outline application was appropriate.

Industrial Noise

- 7.22 The noise impact of the industrial/commercial units located on the western boundary of the development site have been considered at the nearest proposed residential properties on the developments site.
- 7.23 The IMMI noise predictions for S G Tanks, with the relocated noise source and the storeroom acting as a noise barrier provide an excess of rating over background level of -7 dB in the daytime. This meets the ADC target of '-5 dB' and no further noise mitigation is required.
- 7.24 In an email dated 3rd July 2021 ADC stated that:

"The original document applied the same correction of +6dB for impulsivity (when I would argue that a +9 correction should apply)".

- 7.25 In response Phlorum stated that:

"I do not understand why the request for a +9 dB impulsivity correction (rather than the +6 dB) was not raised with the Supplementary Technical Note to Noise Report dated February 2018. Nothing has changed since Feb 2018 except the noise source has moved further from the development site boundary so would be less perceptible at the development."

- 7.26 As discussed in the Phlorum response the +6dB acoustic correction has been previously used without comment from ADC and as the source noise levels is now further away from the development and is also now shielded by the storeroom with a 5m ridge height, it is considered that the correct acoustic correction of -6 dB has been applied.
- 7.27 The noise predictions/assessment for the small industrial units located near Culberry Nursery indicated that the BS4142 target provided by ADC of an excess over rating level of -5 dB is exceeded by 5 dB and that noise mitigation measures are required to provide a further 5 dB noise reduction.

- 7.28 A standard 1.8m acoustic barrier located on the boundary of the development would provide the required 5 dB(A) reduction in noise levels. The location of this barrier is shown in Figure 4.
- 7.29 All acoustic barriers that are discussed in this report should be constructed from close boarded, overlapping timber with a minimum thickness of 15mm. The barrier should be suitably treated to prevent warping and rot due to weathering. There must be no cracks or gaps in the barrier. The overall attenuation will be limited by transmission over and around the barrier, provided that the barrier material has a mass per unit of surface area in excess of 10 Kg/m² and there are no gaps at the joints.

Amenity Space Noise

- 7.30 BS8233:2014 states that 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.
- 7.31 However, in considering the application of an outdoor criterion of 50-55 dB LAeq, which is derived from the earlier World Health Organisation (WHO) guidance, it is important to take account of the feasibility of achieving such a level. A review of 'Health effect-based noise assessment methods: A review and feasibility study' (NPL Report CMAM 16, 1998) reported the following:

"Perhaps the main weaknesses of both WHO-inspired documents is that they fail to consider the practicality of actually being able to achieve any of the stated guideline values. We know from the most recent national survey of noise exposure carried out in England and Wales (Sargent 93) that around 56% of the population are exposed to daytime noise levels exceeding 55 LAeq and that around 65% are exposed to night-time noise levels exceeding 45 LAeq (as measured outside the house in each case). The percentages exposed above the WHO guideline values could not be significantly reduced without drastic action to virtually eliminate road traffic noise and other forms of transportation noise (including public transport) from the vicinity of houses. The social and economic consequences of such action would be likely to be far greater than any environmental advantages of reducing the proportion of the population annoyed by noise. In addition, there is no evidence that anything other than a small minority of the population exposed at such noise levels find them to be particularly onerous in the context of their daily lives."

- 7.32 The February 2018 Noise Report stated that:

"The WHO guidance provides daytime noise limits for outdoor living areas of between LAeq,16 hr 50 to 55 dB. The predicted noise levels indicate that at ground floor the

proposed residential properties overlooking the A27 will experience free-field noise levels of between 50 to 64 dB LAeq,16 hr during the day. At proposed residential properties overlooking Water Lane the predicted free-field noise level are between 60 to 69 dB LAeq,16 hr during the day.

The predicted noise levels at the nearest residential amenity areas to the A27 will exceed the free-field outdoor criterion of 50-55 dB LAeq. To reduce the noise effects to within the guidance provided by BS8233:2014 and the WHO guidance a noise reduction of at least 9 dB(A) is required. Acoustic barriers located on the northern perimeter of residential gardens with a height of 2m would reduce the noise levels in outdoor living areas to within the guideline values of 50-55 dB LAeq.

The predicted noise levels at the nearest residential amenity areas to Water Lane will exceed the outdoor criterion of 50-55 dB LAeq. To reduce the noise effects to within the guidance provided by BS8233:2014 and the WHO guidance a noise reduction of between 5 to 14dB(A) is required. Acoustic barriers located on the southern perimeter of residential gardens overlooking Water Lane with a height of 3m would reduce the noise levels in outdoor living areas to within the guideline values of 50-55 dB LAeq.

- 7.33 As shown from the extracts from the February 2018 Noise Report, the principal of using acoustic barriers to reduce the noise in gardens to within the range 50-55 dB LAeq has been established for the outline planning application. As discussed in Section 5, the IMMI noise model has considered a 3m high acoustic barrier at the perimeter of the gardens of plots 247 and 248 and a scheme of 1.8m high acoustic barriers, located between any remaining gaps between the buildings/garages facing the A27. These measures reduce the noise in gardens to within the range 50-55 dB LAeq as discussed in BS8233:2014.
- 7.34 The predicted daytime free-field noise levels at ground floor level in the gardens of Plots 25, 30 and 31 are up to 58 dB LAeq as shown in Appendix D. A 1.8m high acoustic barrier on the perimeter of the gardens of Plots 25, 30 and 31 that face towards Water Lane would reduce the noise in the gardens to within the range 50-55 dB LAeq.
- 7.35 In an email dated 8th September 2021 ADC stated that:

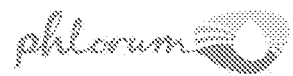
"As stated by you, gardens to the eastern and western blocks are at, or above the target level of 55dB(LAeq(16h)) i.e. the level at which serious annoyance can be anticipated and this is despite (high) acoustic barriers have been factored in and given that these areas will already be shielded from road noise by the buildings themselves. Of course, noise barriers could be increased in some of these areas to further reduce noise exposure but bearing in mind that this will also cause shading of south facing gardens. Ideally a 'moderate level of annoyance' should be achieved in gardens/amenity spaces of 50dB."

- 7.36 It is understood that it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$ and this is achieved in the majority of gardens in the development site. However, the principal of using acoustic barriers to reduce the noise in gardens that overlook the A27 and Water Lane to within the range 50-55 dB L_{Aeq} was established for the outline planning application.

8. Conclusion

- 8.1 Phlorum Ltd has been commissioned by CALA Management Ltd and Bellway Homes Ltd to provide a noise assessment report to support the Reserved Matters Application for 525 dwellings, S73 application for revision to associated Parameter Plans and discharge of Condition 9.
- 8.2 The report details a scheme of acoustic barriers and sound insulation measures for properties facing the A27 and Water Lane and a BS4142 noise assessment including appropriate noise mitigation measures to meet the ADC noise target at properties facing onto the existing light industrial/farm businesses in Dappers Lane and properties facing the A280, as required by Condition 9.
- 8.3 On the basis of this assessment, it is considered the scheme of noise mitigation measures details in the report discharges Condition 9.

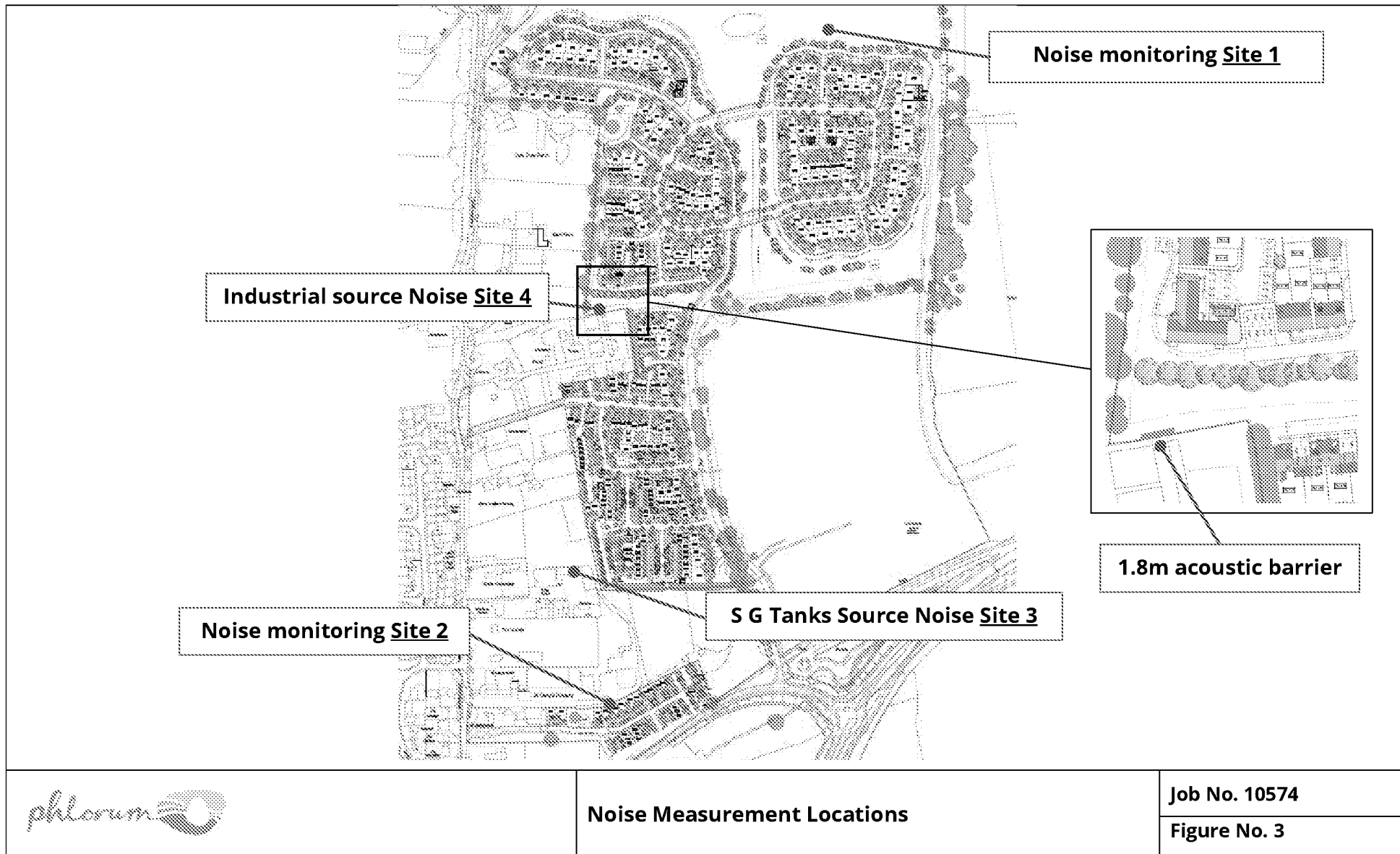
Figures

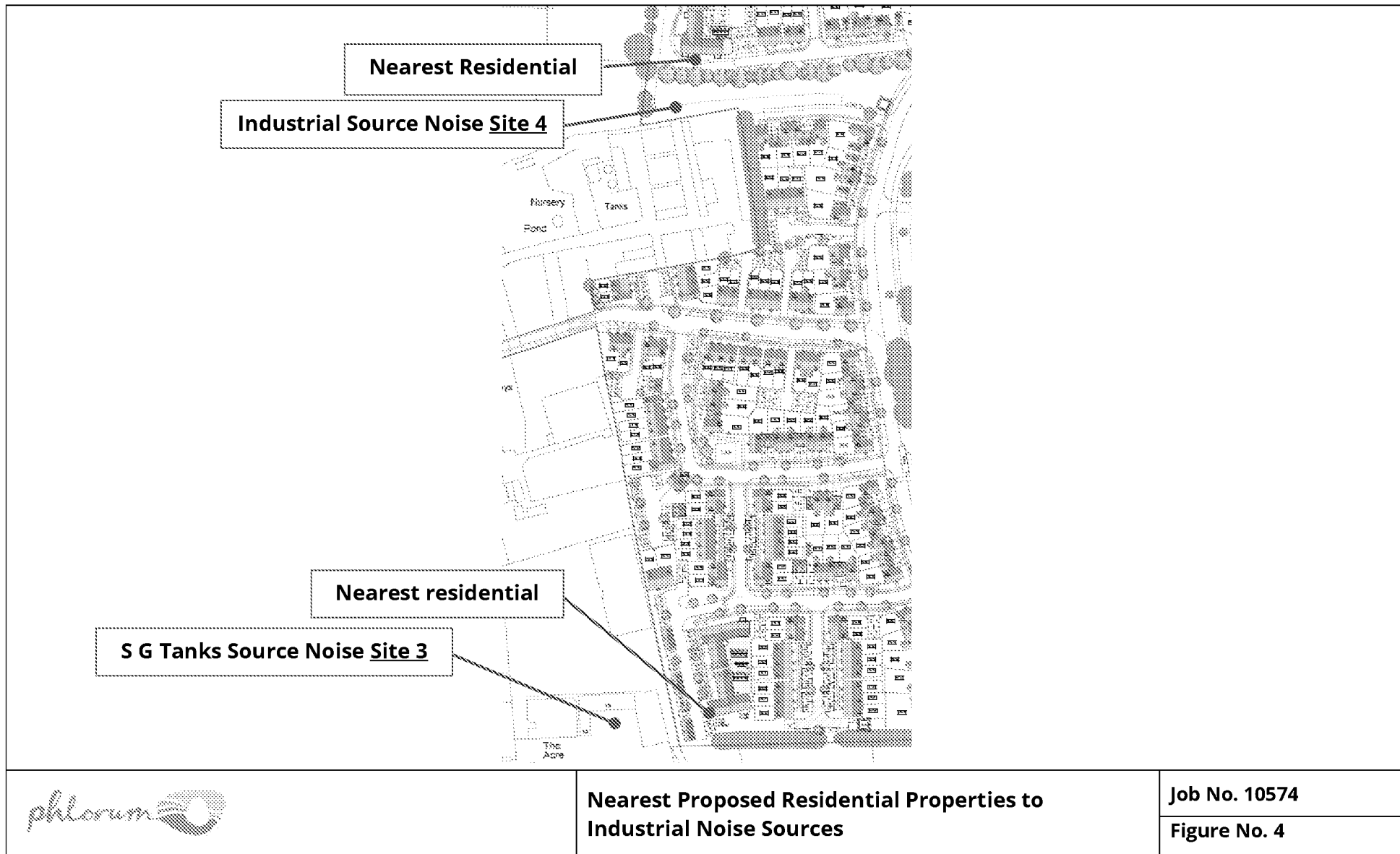


Site Layout Plan

Job No. 10574

Figure No. 1





Appendix A

Introduction to Noise and Glossary of Terminology

Noise is defined as unwanted sound. The human ear is able to respond to sound in the frequency range 18Hz (deep bass) to 18,000Hz (high treble) and over the audible range of 0dB (the threshold of perception) to 140dB (the onset of pain). The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting (filtering) mechanism is used. This reduces the importance of lower and higher frequencies, approximating the response of the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. Noise can be perceived to be louder or more noticeable if the source of the noise is observed; e.g. roads, trains, factories, building sites etc. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source. Various noise indices have been derived to describe the fluctuation of noise levels that vary over time. Usually, these noise indices relate to specific types of noise, and as such different noise indices are used to describe road traffic noise, background noise, construction noise, etc.

The weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement and the levels are denoted as dB(A) or L_{Aeq} , L_{A10} , etc, according to the parameter being measured.

Noise is measured on the decibel scale, which is logarithmic rather than linear. As a result of this, a 3dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3dB(A) is generally regarded as the minimum difference needed to perceive a change. Table A.1 sets out examples of noise levels typically experienced during everyday activities. Table A.2 sets out an explanation of the terminology used in this report.

Table A1: Typical sound levels found in the environment

Sound Level	Location
0 to 10dB(A)	Threshold of hearing
10 to 20dB(A)	Broadcasting studio
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside a factory or noisy pub
100 to 110dB(A)	Burglar Alarm at 1m
110 to 130dB(A)	Pneumatic drill at 1m away
140dB(A)	Threshold of Pain

Table A2: Terminology relating to noise

Term	Description
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20 μ Pa (20x10 ⁻⁶ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10} (s_1/s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20 μ Pa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$ or Background Noise Level	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5 metres
Façade	At a distance of 1 metre in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS EN 61672.

Appendix B

Full Noise Survey Results

Figure B1: Measured Free-Field Noise Levels, Site 1

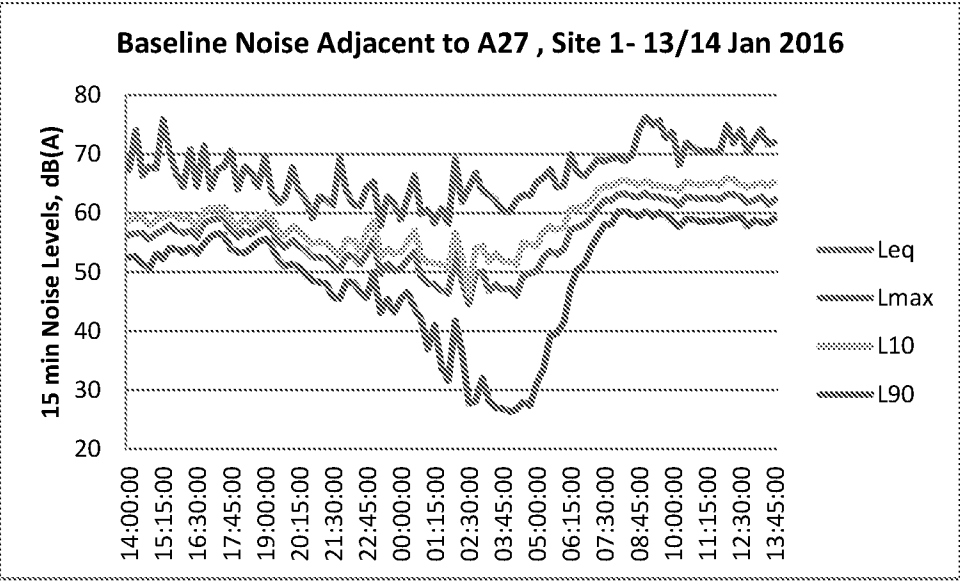
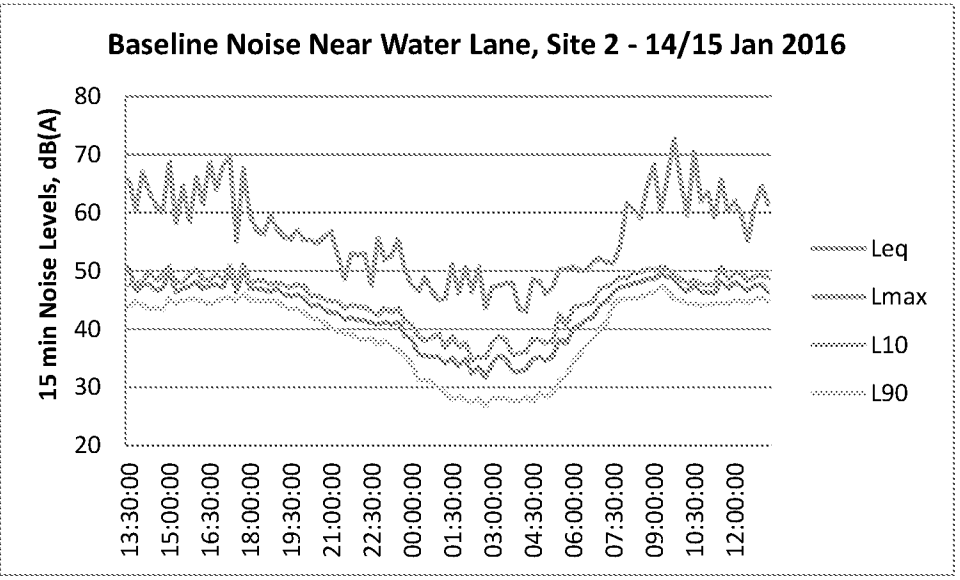


Figure B2: Measured Free-Field Noise Levels, Site 2



Appendix C

Noise Mapping

Figure C1: Daytime Noise Contours



Figure C2: Night-time Noise Contours



Figure C3: Daytime Noise Contours with 3m Acoustic Barrier



Appendix D

Noise Predictions at Plots Overlooking A27 and Water Lane

Plot No	Floor	Elevation	Noise Levels, $L_{Aeq,T}$ dB				Window Requirement		Minimum	Ventilation Required?	
			Free-field		Façade		Rw dB	Rw dB	Rw dB	Day	Night
			Day	Night	Day	Night	Day	Night	Window		
Plots Overlooking A27											
247	Ground Fl	S/W	43.9	35.0	46.4	37.5	11	8	11	N	N
247	First Fl	S/W	49.6	40.5	52.1	43.0	17	13	17	Y	N
247	Ground Fl	West	53.3	44.1	55.8	46.6	21	17	21	Y	Y
247	First Fl	West	59.6	50.5	62.1	53.0	27	23	27	Y	Y
247	Ground Fl	N/E	50.6	41.5	53.1	44.0	18	14	18	Y	N
247	First Fl	N/E	54.1	44.9	56.6	47.4	22	17	22	Y	Y
247	Ground Fl	East	52.5	43.3	55.0	45.8	20	16	20	Y	Y
247	First Fl	East	54.3	45.1	56.8	47.6	22	18	22	Y	Y
248	Ground Fl	South	45.5	36.4	48.0	38.9	13	9	13	N	N
248	First Fl	South	52.6	43.4	55.1	45.9	20	16	20	Y	Y
248	Ground Fl	N/W	52.6	43.5	55.1	46.0	20	16	20	Y	Y
248	First Fl	N/W	63.6	54.5	66.1	57.0	31	27	31	Y	Y
248	Ground Fl	N/E	64.1	54.9	66.6	57.4	32	27	32	Y	Y
248	First Fl	N/E	64.7	55.6	67.2	58.1	32	28	32	Y	Y
248	Ground Fl	S/E	55.3	46.1	57.8	48.6	23	19	23	Y	Y
248	First Fl	S/E	58.1	49.0	60.6	51.5	26	21	26	Y	Y
254	Ground Fl	West	53.9	44.8	56.4	47.3	21	17	21	Y	Y
254	First Fl	West	59.8	50.7	62.3	53.2	27	23	27	Y	Y
254	Ground Fl	North	62.0	52.8	64.5	55.3	29	25	29	Y	Y
254	First Fl	North	64.6	55.4	67.1	57.9	32	28	32	Y	Y
254	Ground Fl	East	58.7	49.6	61.2	52.1	26	22	26	Y	Y
254	First Fl	East	60.3	51.2	62.8	53.7	28	24	28	Y	Y
254	Ground Fl	South	42.9	33.8	45.4	36.3	10	6	10	N	N
254	First Fl	South	46.4	37.3	48.9	39.8	14	10	14	N	N
255	Ground Fl	S/W	43.0	33.9	45.5	36.4	11	6	11	N	N
255	First Fl	S/W	46.7	37.6	49.2	40.1	14	10	14	N	N
255	Ground Fl	West	55.5	46.3	58.0	48.8	23	19	23	Y	Y
255	First Fl	West	61.6	52.5	64.1	55.0	29	25	29	Y	Y
255	Ground Fl	N/E	62.2	53.1	64.7	55.6	30	26	30	Y	Y
255	First Fl	N/E	65.0	55.8	67.5	58.3	32	28	32	Y	Y
255	Ground Fl	East	53.3	44.2	55.8	46.7	21	17	21	Y	Y
255	First Fl	East	59.1	50.0	61.6	52.5	27	22	27	Y	Y
256	Ground Fl	S/W	57.3	48.2	59.8	50.7	25	21	25	Y	Y
256	First Fl	S/W	60.7	51.5	63.2	54.0	28	24	28	Y	Y
256	Ground Fl	N/W	62.4	53.3	64.9	55.8	30	26	30	Y	Y
256	First Fl	N/W	65.1	56.0	67.6	58.5	33	28	33	Y	Y
256	Ground Fl	N/E	60.9	51.8	63.4	54.3	28	24	28	Y	Y
256	First Fl	N/E	63.5	54.3	66.0	56.8	31	27	31	Y	Y
256	Ground Fl	S/E	43.2	34.1	45.7	36.6	11	7	11	N	N
256	First Fl	S/E	47.0	37.9	49.5	40.4	14	10	14	N	N

257	Ground Fl	S/W	55.6	46.5	58.1	49.0	23	19	23	Y	Y
257	First Fl	S/W	58.5	49.4	61.0	51.9	26	22	26	Y	Y
257	Ground Fl	North	61.8	52.6	64.3	55.1	29	25	29	Y	Y
257	First Fl	North	64.5	55.3	67.0	57.8	32	28	32	Y	Y
257	Ground Fl	N/E	58.4	49.3	60.9	51.8	26	22	26	Y	Y
257	First Fl	N/E	61.2	52.1	63.7	54.6	29	25	29	Y	Y
257	Ground Fl	S/E	44.2	35.1	46.7	37.6	12	8	12	N	N
257	First Fl	S/E	48.1	39.0	50.6	41.5	16	11	16	Y	N
270	Ground Fl	S/W	44.0	34.9	46.5	37.4	11	7	11	N	N
270	First Fl	S/W	47.7	38.5	50.2	41.0	15	11	15	Y	N
270	Ground Fl	N/W	54.0	44.8	56.5	47.3	21	17	21	Y	Y
270	First Fl	N/W	59.6	50.5	62.1	53.0	27	23	27	Y	Y
270	Ground Fl	N/E	61.1	51.9	63.6	54.4	29	24	29	Y	Y
270	First Fl	N/E	62.3	53.2	64.8	55.7	30	26	30	Y	Y
270	Ground Fl	S/E	55.6	46.4	58.1	48.9	23	19	23	Y	Y
270	First Fl	S/E	56.7	47.5	59.2	50.0	24	20	24	Y	Y
271	Ground Fl	West	54.5	45.4	57.0	47.9	22	18	22	Y	Y
271	First Fl	West	61.1	51.9	63.6	54.4	29	24	29	Y	Y
271	Ground Fl	North	61.8	52.7	64.3	55.2	29	25	29	Y	Y
271	First Fl	North	63.7	54.6	66.2	57.1	31	27	31	Y	Y
271	Ground Fl	East	53.7	44.5	56.2	47.0	21	17	21	Y	Y
271	First Fl	East	59.0	49.9	61.5	52.4	27	22	27	Y	Y
271	Ground Fl	South	42.9	33.8	45.4	36.3	10	6	10	N	N
271	First Fl	South	46.6	37.5	49.1	40.0	14	10	14	N	N
272	Ground Fl	West	49.4	40.2	51.9	42.7	17	13	17	Y	N
272	First Fl	West	55.4	46.3	57.9	48.8	23	19	23	Y	Y
272	Ground Fl	North	62.0	52.8	64.5	55.3	29	25	29	Y	Y
272	First Fl	North	64.1	55.0	66.6	57.5	32	27	32	Y	Y
272	Ground Fl	East	59.9	50.8	62.4	53.3	27	23	27	Y	Y
272	First Fl	East	61.5	52.4	64.0	54.9	29	25	29	Y	Y
272	Ground Fl	South	43.0	33.9	45.5	36.4	10	6	10	N	N
272	First Fl	South	46.7	37.6	49.2	40.1	14	10	14	N	N
278	Ground Fl	West	57.2	48.1	59.7	50.6	25	21	25	Y	Y
278	First Fl	West	58.7	49.6	61.2	52.1	26	22	26	Y	Y
278	Ground Fl	North	61.0	51.9	63.5	54.4	29	24	29	Y	Y
278	First Fl	North	62.2	53.1	64.7	55.6	30	26	30	Y	Y
278	Ground Fl	East	59.2	50.0	61.7	52.5	27	22	27	Y	Y
278	First Fl	East	61.3	52.1	63.8	54.6	29	25	29	Y	Y
278	Ground Fl	South	41.8	32.7	44.3	35.2	9	5	9	N	N
278	First Fl	South	45.4	36.3	47.9	38.8	13	9	13	N	N
279	Ground Fl	S/W	54.5	45.3	57.0	47.8	22	18	22	Y	Y
279	First Fl	S/W	59.6	50.5	62.1	53.0	27	23	27	Y	Y
279	Ground Fl	North	61.5	52.4	64.0	54.9	29	25	29	Y	Y
279	First Fl	North	63.7	54.5	66.2	57.0	31	27	31	Y	Y
279	Ground Fl	East	58.9	49.8	61.4	52.3	26	22	26	Y	Y

279	First Fl	East	60.9	51.8	63.4	54.3	28	24	28	Y	Y
279	Ground Fl	South	41.7	32.6	44.2	35.1	9	5	9	N	N
279	First Fl	South	45.0	36.0	47.5	38.5	13	8	13	N	N
280	Ground Fl	S/W	44.5	35.4	47.0	37.9	12	8	12	N	N
280	First Fl	S/W	49.8	40.6	52.3	43.1	17	13	17	Y	N
280	Ground Fl	N/W	53.9	44.8	56.4	47.3	21	17	21	Y	Y
280	First Fl	N/W	59.8	50.6	62.3	53.1	27	23	27	Y	Y
280	Ground Fl	North	53.7	44.5	56.2	47.0	21	17	21	Y	Y
280	First Fl	North	60.1	51.0	62.6	53.5	28	23	28	Y	Y
280	Ground Fl	East	44.0	34.9	46.5	37.4	11	7	11	N	N
280	First Fl	East	47.4	38.3	49.9	40.8	15	11	15	N	N
285	Ground Fl	West	58.0	48.8	60.5	51.3	25	21	25	Y	Y
285	First Fl	West	59.8	50.7	62.3	53.2	27	23	27	Y	Y
285	Ground Fl	N/W	61.8	52.6	64.3	55.1	29	25	29	Y	Y
285	First Fl	N/W	63.7	54.5	66.2	57.0	31	27	31	Y	Y
285	Ground Fl	East	58.9	49.7	61.4	52.2	26	22	26	Y	Y
285	First Fl	East	60.7	51.5	63.2	54.0	28	24	28	Y	Y
285	Ground Fl	South	42.4	33.4	44.9	35.9	10	6	10	N	N
285	First Fl	South	46.0	36.9	48.5	39.4	13	9	13	N	N
286	Ground Fl	West	46.7	37.5	49.2	40.0	14	10	14	N	N
286	First Fl	West	53.2	44.0	55.7	46.5	21	17	21	Y	Y
286	Ground Fl	North	61.5	52.3	64.0	54.8	29	25	29	Y	Y
286	First Fl	North	63.0	53.8	65.5	56.3	30	26	30	Y	Y
286	Ground Fl	East	46.2	37.0	48.7	39.5	14	10	14	N	N
286	First Fl	East	51.6	42.4	54.1	44.9	19	15	19	Y	N
286	Ground Fl	South	41.6	32.5	44.1	35.0	9	5	9	N	N
286	First Fl	South	45.2	36.1	47.7	38.6	13	9	13	N	N
287	Ground Fl	West	46.8	37.7	49.3	40.2	14	10	14	N	N
287	First Fl	West	52.9	43.8	55.4	46.3	20	16	20	Y	Y
287	Ground Fl	North	61.2	52.0	63.7	54.5	29	25	29	Y	Y
287	First Fl	North	63.2	54.0	65.7	56.5	31	27	31	Y	Y
287	Ground Fl	East	46.7	37.5	49.2	40.0	14	10	14	N	N
287	First Fl	East	53.2	44.0	55.7	46.5	21	17	21	Y	Y
287	Ground Fl	South	41.4	32.2	43.9	34.7	9	5	9	N	N
287	First Fl	South	44.7	35.6	47.2	38.1	12	8	12	N	N
288	Ground Fl	West	59.1	50.0	61.6	52.5	27	22	27	Y	Y
288	First Fl	West	60.6	51.5	63.1	54.0	28	24	28	Y	Y
288	Ground Fl	N/E	61.0	51.9	63.5	54.4	29	24	29	Y	Y
288	First Fl	N/E	62.4	53.3	64.9	55.8	30	26	30	Y	Y
288	Ground Fl	N/E	59.1	49.9	61.6	52.4	27	22	27	Y	Y
288	First Fl	N/E	61.3	52.1	63.8	54.6	29	25	29	Y	Y
288	Ground Fl	S/W	41.7	32.5	44.2	35.0	9	5	9	N	N
288	First Fl	S/W	45.2	36.1	47.7	38.6	13	9	13	N	N
298	Ground Fl	West	51.6	42.5	54.1	45.0	19	15	19	Y	N
298	First Fl	West	58.2	49.0	60.7	51.5	26	22	26	Y	Y

298	Ground Fl	North	61.8	52.6	64.3	55.1	29	25	29	Y	Y
298	First Fl	North	63.9	54.7	66.4	57.2	31	27	31	Y	Y
298	Ground Fl	East	54.7	45.5	57.2	48.0	22	18	22	Y	Y
298	First Fl	East	61.4	52.2	63.9	54.7	29	25	29	Y	Y
298	Ground Fl	South	41.9	32.7	44.4	35.2	9	5	9	N	N
298	First Fl	South	45.5	36.4	48.0	38.9	13	9	13	N	N
299	Ground Fl	West	56.4	47.3	58.9	49.8	24	20	24	Y	Y
299	First Fl	West	58.8	49.7	61.3	52.2	26	22	26	Y	Y
299	Ground Fl	N/E	62.8	53.6	65.3	56.1	30	26	30	Y	Y
299	First Fl	N/E	64.3	55.1	66.8	57.6	32	28	32	Y	Y
299	Ground Fl	East	49.7	40.6	52.2	43.1	17	13	17	Y	N
299	First Fl	East	58.8	49.6	61.3	52.1	26	22	26	Y	Y
299	Ground Fl	South	41.8	32.7	44.3	35.2	9	5	9	N	N
299	First Fl	South	45.4	36.3	47.9	38.8	13	9	13	N	N

Plot No	Floor	Elevation	Noise Levels, LAeq,T dB				Window Requirement		Minimum	Ventilation Required?	
			Free-field		Façade		Rw dB	Rw dB	Rw dB		
			Day	Night	Day	Night	Day	Night	Window	Day	Night
Plots Overlooking Water Lane											
1_2	Ground Fl	North	40.3	31.7	42.8	34.2	8	4	8	N	N
1_2	First Fl	North	42.6	34.0	45.1	36.5	10	6	10	N	N
1_2	Ground Fl	East	50.8	42.3	53.3	44.8	18	15	18	Y	N
1_2	First Fl	East	51.7	43.3	54.2	45.8	19	16	19	Y	Y
1_2	Ground Fl	South	51.8	43.4	54.3	45.9	19	16	19	Y	Y
1_2	First Fl	South	53.3	44.9	55.8	47.4	21	17	21	Y	Y
1_2	Ground Fl	West	46.6	38.0	49.1	40.5	14	11	14	N	N
1_2	First Fl	West	48.3	39.7	50.8	42.2	16	12	16	Y	N
25_27	Ground Fl	N/E	52.6	44.2	55.1	46.7	20	17	20	Y	Y
25_27	First Fl	N/E	59.6	51.1	62.1	53.6	27	24	27	Y	Y
25_27	Ground Fl	S/E	64.4	55.8	66.9	58.3	32	28	32	Y	Y
25_27	First Fl	S/E	64.8	56.3	67.3	58.8	32	29	32	Y	Y
25_27	Ground Fl	S/W	57.9	49.3	60.4	51.8	25	22	25	Y	Y
25_27	First Fl	S/W	58.7	50.2	61.2	52.7	26	23	26	Y	Y
25_27	Ground Fl	N/W	39.4	30.7	41.9	33.2	7	3	7	N	N
25_27	First Fl	N/W	42.7	34.0	45.2	36.5	10	7	10	N	N
28_30	Ground Fl	N/E	57.9	49.4	60.4	51.9	25	22	25	Y	Y
28_30	First Fl	N/E	58.6	50.1	61.1	52.6	26	23	26	Y	Y
28_30	Ground Fl	S/E	63.2	54.6	65.7	57.1	31	27	31	Y	Y
28_30	First Fl	S/E	63.7	55.2	66.2	57.7	31	28	31	Y	Y
28_30	Ground Fl	S/W	49.7	41.2	52.2	43.7	17	14	17	Y	N
28_30	First Fl	S/W	57.5	48.9	60.0	51.4	25	21	25	Y	Y
28_30	Ground Fl	N/W	39.0	30.4	41.5	32.9	7	3	7	N	N
28_30	First Fl	N/W	42.4	33.8	44.9	36.3	10	6	10	N	N
31_33	Gnd Fl	N/E	50.6	42.2	53.1	44.7	18	15	18	Y	N
31_33	First Fl	N/E	57.5	49.0	60.0	51.5	25	21	25	Y	Y
31_33	Gnd Fl	S/E	62.2	53.6	64.7	56.1	30	26	30	Y	Y
31_33	First Fl	S/E	62.9	54.4	65.4	56.9	30	27	30	Y	Y
31_33	Gnd Fl	S/W	56.5	47.9	59.0	50.4	24	20	24	Y	Y
31_33	First Fl	S/W	57.5	49.0	60.0	51.5	25	21	25	Y	Y
31_33	Gnd Fl	N/W	39.2	30.5	41.7	33.0	7	3	7	N	N
31_33	First Fl	N/W	42.4	33.7	44.9	36.2	10	6	10	N	N

Note: The predicted noise levels on the end elevations of plots 25, 30 and 31 have been included for completeness but there will be no habitable rooms on these elevations and so are not included in the noise calculations for sound insulation measures.

Appendix E
Email Correspondence with Adur DC

From: Carol Reynolds <Carol.Reynolds@arun.gov.uk>

Sent: 21 July 2021 07:32

To: Rob Peirce <rob.peirce@phlorum.com>; Michael Eastham <Michael.Eastham@arun.gov.uk>

Subject: RE: A/40/18/OUT: Land North of Water Lane, Angmering - Noise from S G Tanks

Dear Rob,

Apologies. Yes, this will be considered sufficient to discharge Condition 9.

Kind regards

Carol

Carol Reynolds

Senior Environmental Health Officer
Environmental Health Department

T: 01903 737678

E: carol.reynolds@arun.gov.uk

Please note my normal working days are Tuesday to Friday

Arun District Council, Civic Centre, Maltravers Rd, Littlehampton, West Sussex, BN17 5LF

www.arun.gov.uk



From: Rob Peirce <[REDACTED]>

Sent: 20 July 2021 10:27

To: Carol Reynolds <Carol.Reynolds@arun.gov.uk>; Michael Eastham
<Michael.Eastham@arun.gov.uk>

Subject: RE: A/40/18/OUT: Land North of Water Lane, Angmering - Noise from S G Tanks

Carol

Further to our recent email exchange regarding Land North of Water Lane, Angmering please can you confirm that you are happy with my clarification response in the email dated 9th July 2021, as shown below.

Best regards

Rob

Rob Peirce, **Phlorum Limited**, Unit 12, Hunns Mere Way, Brighton, BN2 6AH · Other offices in Manchester, Cardiff and Scotland · T: [REDACTED]

From: Rob Peirce

Sent: 09 July 2021 13:25

To: Carol Reynolds <Carol.Reynolds@arun.gov.uk>; Michael Eastham
<Michael.Eastham@arun.gov.uk>

Subject: RE: A/40/18/OUT: Land North of Water Lane, Angmering - Noise from S G Tanks

Dear Carol,

Thank you for your email.

I agree that the windows of the development should be openable if so desired by the future occupier. Should the occupier prefer to have the windows closed, an alternative means of ventilation (compliant with Approved Document F of the current Building Regulations) will be provided so that internal noise targets in BS8233:2014 are achieved.

This is confirmed in the noise report dated Feb 2018 which discusses the acoustic requirements when windows are closed:

5.4 *To enable the option for windows to be closed to meet the noise targets, acoustically treated ventilation should be provided to habitable rooms that overlook the A27 and Water Lane. The windows should be openable such that the choice of meeting the internal noise levels is with the occupants.*

This applies to any part of the site where windows need to be closed to meet the noise targets. My understanding was that the findings of the Feb 2018 noise assessment had been agreed with Arun DC and that from a noise point of view we are looking to discharge Condition 9. I trust the above is satisfactory for your purposes and please let me know if you have any queries with this response.

Regards
Rob

Rob Peirce, Phorum Limited, Unit 12, Hums Mere Way, Brighton, BN2 6AH - Other offices in Manchester, Cardiff and Scotland · T: [REDACTED]

From: Carol Reynolds <Carol.Reynolds@arun.gov.uk>
Sent: 09 July 2021 11:14
To: Michael Eastham <Michael.Eastham@arun.gov.uk>
Cc: Rob Peirce <[REDACTED]>
Subject: FW: A/40/18/OUT: Land North of Water Lane, Angmering - Noise from S G Tanks

From: Carol Reynolds
Sent: 09 July 2021 11:01
To: Rob Peirce <[REDACTED]>
Subject: RE: A/40/18/OUT: Land North of Water Lane, Angmering - Noise from S G Tanks

Dear Rob,
Thank you for your reply and comments therein. On the basis of supplementary information provided to the initial noise report and as below, Environmental Health accept the applicant's proposal to provide a new and detailed noise assessment.

You will have noted that Arun are not minded to accept fixed closed windows on residential rooms and the option of purge ventilation through openable windows should be retained. The only time when fixed windows may be reasonable is for example, where the windows are in a corridor.

Yours sincerely
Carol

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