

Noise Impact Assessment

Land North of Solent Road,
Havant

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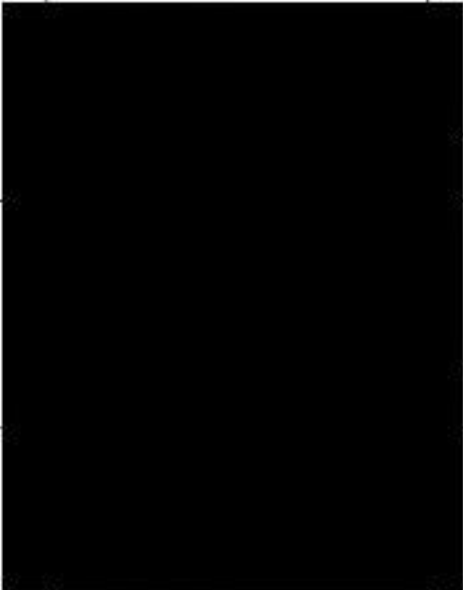
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Executive Summary

TRC Companies Ltd, (TRC), was commissioned by Chancerygate (Erdington) Limited (the Client), to undertake a noise impact assessment for the proposed development of industrial and office units at Solent Road, Havant, PO9 1DQ (the Site).

The purpose of this report is to support the Client's planning application for the construction of said units.

This assessment demonstrates that the construction and operation of the proposed units will not create noise impacts at adjacent residential receptors.

This Executive Summary is part of this complete report; any findings, opinions, or conclusions in this Executive Summary are made in context with the complete report. TRC recommends that the user reads the entire report for all supporting information related to findings, opinions, and conclusions.

1.0 Introduction

TRC Companies Ltd. (TRC), was commissioned by Chancerygate (Erdington) Limited (the Client), to undertake a noise impact assessment for the proposed development of industrial and office units at Solent Road, Havant, PO9 1DQ (the Site).

1.1 Current Site and Proposed Development

The Site is centred at national grid reference (471090,106155) and consists of a vacant single plot with an area of 14,250m². The Site lies within the administrative area of Havant Borough Council and it is located in an area of the borough which is predominantly mixed-used commercial and residential.

The Site is situated in a predominantly industrial area and is bounded:

- To the north by Portsmouth Water offices;
- To the east by the Bosmere Medical Practice and residential properties off Brockhampton Lane;
- To the south by Solent Road and A27;
- To the west by residential properties off Manor Court.

The nearest sensitive residential receptors are located on Manor Court to the west at approximately 5m away from the site boundary and off Brockhampton Lane to the east, at a similar distance from site boundaries.

The proposal is to construct four two storey light-industrial units (combination of B1c, B2 and B8 use) and an office building. The light industrial units are of speculative nature and the warehouse elements will be left as shells for fitting out by occupiers to suit their particular needs.

Figures 1.1a and 1.1b show the Site location and 1.2 shows the proposed Site plan.



Figure 1.1a: Site Location (1:2000)



- Construction Noise Assessment;
- Operational Noise Assessment; and
- Conclusions.

1.3 Significant Assumptions

This report presents TRC's observations, findings, and conclusions as they existed on the date that this report was issued. This report is subject to modification if TRC becomes aware of additional information after the date of this report that is material to its findings and conclusions.

The report has been prepared in line with the policy and guidance which is discussed within Section 2 of this report.

The reliability of information provided by others to TRC cannot be guaranteed to be accurate or complete. Performance of this assessment is intended to reduce, but not eliminate, uncertainty regarding environmental conditions associated with the subject site; therefore, the findings and conclusions made in this report should not be construed to warrant or guarantee the subject site, or express or imply, including without limitation, warranties as to its marketability for a particular use. TRC found no reason to question the validity of information received unless explicitly noted elsewhere in this report.

2.0 Planning Policy and Standards

This assessment takes account of the following national, regional and local planning and industry standard design guidance.

2.1 National Policy

National Planning Policy Framework, (NPPF, 2019)

The “National Planning Policy Framework” (NPPF) sets out the Government’s requirements for the planning system. Paragraph 170 of the NPPF advises:

“Planning policies and decisions should contribute to and enhance the natural and local environment by;... preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of... noise pollution... Development should, wherever possible, help to improve local environmental conditions...”

With specific regard to noise, paragraph 180 of the NPPF states that:

“Planning policies and decisions should aim to...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;

With regard to the ‘adverse impacts’ referred to above, the NPPF directs the reader to the advice contained in DEFRA’s “Noise Policy Statement for England” (NPSE). This policy statement introduces the concept of a “Significant Observed Adverse Effect Level” (SOAEL), “Lowest Observed Adverse Effect Level” (LOAEL) and “No Observed Adverse Effect Level” (NOAEL). However, whilst the intent of the NPSE in relation to the NPPF is clear, the NPSE does not, at this time, provide any quantitative threshold values for each identified level of “effect.” Indeed, the NPSE carefully highlights that:

“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.”

National Planning Practice Guidance (NPPG, 2014)

In February 2014 National Planning Practice Guidance (NPPG) was published. The overall aim of this guidance is to tie together the principles of the NPPF and the Explanatory Note of the Noise Policy Statement for England. The main objective is to:

“Identify whether the overall effect of noise exposure is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.”

A summary of the effects of noise exposure associated with both noise generating Proposed Developments and noise sensitive developments is presented within the NPPG and repeated as follows:

Table 2.1: NPSE Guidance

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

In light of the above, it can be seen that whilst the NPPF and associated planning practice guidance sets out stringent imperatives to ensure the satisfactory development of land in relation to possible noise impacts, the NPPF does not generally provide any detailed technical guidance defining what may be considered to constitute a 'significant' or 'other' adverse impact. In the absence of such technical guidance, reference needs to be made to sustainable development standards set out in local planning policy and/or relevant industry standard guidance documents.

In order to utilise the NPPG guidance for noise, criteria have been derived based upon the noise levels provided within the appropriate guidance document. These criteria are outlined in Table 2.2.

Table 2.2: Derived Noise Criteria

Effect Level	Assessment	Noise Level Criteria	Justification
No Observed Adverse Effect Level (NOAEL)	Residential	Internal noise levels less than: - Bedrooms (night-time): 30 dBLAeq,8hours / 45 dBLAmax - Living Rooms (daytime): 30 dBLAeq,16hours - External Amenity Space (daytime): 50 dBLAeq,16hours	No Action Required Within BS8233 / WHO
	Change in Noise	Increase in noise is Less than 1dB	Magnitude of Change is Negligible (DMRB)
Lowest Observed Adverse Effect Level (LOAEL)	Residential	Internal noise levels achieve: - Bedrooms (night-time): 30 dBLAeq,8hours / 45 dBLAmax - Living Rooms (daytime): 30 dBLAeq,16hours - External Amenity Space (daytime): 50 dBLAeq,16hours	None Within BS8233 / WHO
	Change in Noise	Increase in noise is between 1 – 3 dB	Magnitude of Change is Minor (DMRB)
Significant Observed Adverse Effect Level (SOAEL)	Residential	Internal noise levels exceed: - Bedrooms (night-time): 35 dBLAeq,8hours / 45 dBLAmax - Living Rooms (daytime): 40 dBLAeq,16hours - External Amenity Space (daytime): 55 dBLAeq,16hours	Mitigate to achieve: - Bedrooms: 35 dBLAeq,8hours / 45 dBLAmax - Living Rooms: 40 dBLAeq,16hours - External Amenity Space: 55 dBLAeq,16hours Within BS8233 / WHO Reasonable Criteria
	Change in Noise	Increase in noise is between 3 – 5 dB	Magnitude of Change is Moderate (DMRB)
Unacceptable Observed Adverse Effect Level (UOAEL)	Residential	Internal noise levels exceed: - Bedrooms (night-time): 51 dBLAeq,8hours / 67 dBLAmax - Living Rooms (daytime): 57 dBLAeq,16hours	Avoid - Values correspond with PPG24 Category D (mixed sources), planning permission should normally be refused. - LAmx noise levels based on PPG24 regular exceedance of 82 dB LAmx less 15 dB for an open window.
	Change in Noise	Increase in noise 5 dB+	Magnitude of Change is Major (DMRB)

2.2 Local Planning Policy

Havant Borough Core Strategy (March 2011)

With regards to noise, from policy CS16:

“Policy CS16 High Quality Design:

Planning permission will be granted for development that is designed to a high standard, which helps to create places where people want to live, work and relax. All development should demonstrate that its design:

- 1. Responds to, draws inspiration from and respects local context and:
[...]*

e) The development does not cause unacceptable harm to the amenity of neighbours through smell, the loss of privacy, outlook, noise and overlooking.”

The core strategy notes that *“the borough’s dominant roads can also be a source of noise, pollution and congestion”*, as it is the case for this site.

It also states in Policy DM10 – Pollution:

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

- 1. The health and safety of existing and future users of the site, or nearby occupiers and residents is not put at risk.
[...].”*

Lastly, Policy DM12 – Mitigating the Impacts of Travel states that:

“New developments will be required to mitigate their travel impact, including the environmental impacts of travel (such as noise, air and visual pollution) and impacts on amenity, health and climate change by ensuring that, where relevant, the following criteria are met:

- 1. Adequate provision is made for integrated and improved transport infrastructure or appropriate mitigation measures, through direct improvements and S106 contributions in accordance with the Hampshire County Council Transport Contributions Policy.*
- 2. The submission of a transport assessment and travel plan alongside any planning application on proposals for major development or where a proposal is likely to have significant transport implications.*
- 3. The submission of a transport statement must accompany planning applications to explain changes to travel demand.*
- 4. A bond is provided which will be used to mitigate negative travel impacts of the development, should the travel plan fail to achieve its targets. This bond will be held by the relevant local transport authority.*
- 5. In relation to outline planning applications, a framework for the preparation of travel assessments and travel plans will be submitted with the planning application proposals.”*

2.3 British Standards

BS4142:2014: “Methods for Rating and Assessing Industrial and Commercial Sound”

BS 4142 provide a rating and assessment methodology for assessing the potential adverse impact of industrial and commercial noise sources on neighbouring dwellings.

The assessment procedure initially compares the ‘Rating Level’ of the source with the ‘Background Noise Level’ when the source is not present.

The ‘Rating Level’ (L_Ar) referred to is the specific noise level of the noise source under investigation (in terms of the L_Aeq noise index), to which corrections are applied if the noise has certain audible characteristics. The following corrections (based on a subjective assessment of noise source characteristics) is given:

Table 2.3: BS4142:2014 Character Correction for Rating Level Calculation.

Character Correction				
Feature / Perception	Tonality	Impulsivity	Intermittency	Other Acoustic Characteristics
Just Perceptible	+2dB	+3dB	When the specific sound has identifiable On/Off conditions that are readily distinctive. +3dB	+3dB
Clearly Perceptible	+4dB	+6dB		
Highly Perceptible	+6dB	+9dB		

The ‘Background Noise Level’ (L_A90) represents the noise level that is exceeded for 90% of the stated measurement period. For assessment purposes, the background noise level needs to be determined without the noise source under investigation operating.

The time of operation needs to be taken into account. During the day (normally taken to be 07.00 to 23.00 hours) a one-hour measurement period is considered appropriate. During the night (normally taken to be 23.00 – 07.00 hours) a 15-minute time period is normally used.

The following guidance is then based on the outcome of this initial assessment:

- 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 standard states that: “Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.”
- 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.

A note accompanying the above guidance states:

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

The initial estimate of the impact should then be modified to account for its context. Such considerations include:

- The absolute level of the sound - the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low. Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.
- Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.
- The character and level of the residual sound compared to the character and level of the specific sound.
- The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.

BS8233:2014: Guidance on sound insulation and noise reduction for buildings

BS8233:2014 "Sound Insulation and Noise Reduction for Buildings" offers the following design guidance for indoor ambient noise levels within dwellings:

Table 2.4: BS8233:2014 Indoor Ambient Noise Level Design Guidance.

Activity	Location	07.00 to 23.00 hours	23.00 to 07.00 hours
Resting	Living Room	35dB LAeq,16hour	--
Dining	Dining Room/Area	40dB LAeq,16hour	--
Sleeping (daytime resting)	Bedroom	35dB LAeq,16hour	30dB LAeq,8hour

Note 4 to the above Table states:

"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."

Despite identifying that maximum values 'may' be set, guidance values for differing types of noise/frequency of events is not given. It can, however, be noted that the recommendations of BS8233 are aligned with guidance set out in the World Health Organisation's "Guidelines for Community Noise." On that basis, it would seem appropriate to seek to limit night-time noise intrusion such that maximum noise levels do not normally exceed a maximum internal value of 45dB LAmax, fast. Section 3.4 of the WHO guidelines implies that 'not normally' would be an occurrence of more than 10-15 times per night.

Note 7 to the above Table indicates that where "development is considered necessary or desirable", the above guideline values can be relaxed by 5dB and "reasonable" internal conditions still be achieved.

With regard to external amenity spaces, Section 7.7.3.2 of BS 8233: 2014 states:

“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 LAeq,T, with an upper guideline value of 55 dB LAeq,T which would be acceptable in noisier environments.

However, it is also recognised 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.”

WHO “Guidelines for Community Noise” (World Health Organisation, 1999)

The criteria outlined in this document provide a summary of research regarding the effects of noise on the community. Section 2 of the Guidelines presents a general discussion regarding the types of noise affecting communities and their measurement. The guidelines promote the use of the LAeq,T noise index. However, where there are distinct events to the noise, such as with aircraft or railway noise, the guidelines recommend that measures of the individual events should be obtained (using, for example, L_{Amax} or LAE), in addition to LAeq,T measurements.

The guidelines identify three critical effects of noise on residential dwellings – annoyance and sleep disturbance.

With regard to ‘**annoyance**’, section 3.8 of the Guidelines states:

“Annoyance in populations exposed to environmental noise varies not only with the acoustical characteristics of the noise (source, exposure), but also with many non-acoustical factors of social, psychological, or economic nature. These factors include fear associated with the noise source, conviction that the noise could be reduced by third parties, individual noise sensitivity, the degree to which an individual feels able to control the noise (coping strategies) and whether the noise originates from important economic activity.”

Section 4.2.7 of the Guidelines further states that:

“The annoyance response to noise is affected by several factors, including the equivalent sound pressure level and the highest sound pressure level of the noise, the number of such events, and the time of day. Methods for combining these effects have been extensively studied. The results are not inconsistent with the simple, physically based energy equivalent energy theory, which is represented by the LAeq noise index.

During the daytime, few people are seriously annoyed by activities with LAeq levels below 55dB; or moderately annoyed with LAeq levels below 50dB.”

*With regard to ‘**sleep disturbance**’, Section 3.4 of the guidelines states:*

“If negative effects on sleep are to be avoided the equivalent sound pressure level should not exceed 30dB(A) indoors for continuous noise. If the noise is not continuous, sleep disturbance correlates best with L_{Amax} and effects have been observed at 45dB or less. This is particularly true if the background noise level is low. Noise events exceeding 45dB(A) should therefore be limited if possible. For sensitive people an even lower limit would be

preferred. It should be noted that it should be possible to sleep with a bedroom window slightly open (a reduction of outside to inside of 15dB). To prevent sleep disturbance, one should thus consider the equivalent sound pressure level and the number and level of sound events. Mitigation targeted to the first part of the night is believed to be effective for the ability to fall asleep."

In section 4.3.1, the above guidelines are presented in terms of external noise levels incident on buildings:

"At night, sound pressure levels at the outside facades of the living spaces should not exceed 45dB LAeq and 60dB LAm_{ax}, so that people may sleep with windows open."

3.0 Acoustic Character of Site and Baseline Noise Data

3.1 Acoustic Character of Site

The site is situated in a mixed industrial-commercial estate, and is bound by Solent Road and the A27 to the south, Portsmouth Water offices to the north, Bosmere medical practice to the east, along with Brockhampton Lane and residential properties. Likewise, to the west, properties on Manor Court and Brockhampton Road are adjacent to the site. During the survey, road traffic noise was the dominant noise source, together with occasional wildlife noise.

3.2 Automated Noise Monitoring

The baseline measurement was taken over a 24-hour period from 13:30 on the 23rd of February to 13:30 on the 24th of February.

Figure 3.1: Noise Monitoring Location



Table 3.1: Noise Monitoring Equipment.

Position A	SLM	Preamplifier	Microphone
Manufacturer	Rion	Rion	Rion
Type	NL-52	NH-25	UC-59
Serial No.	00610175	10168	02515
Latest Calibration	27.08.19		
Certificate No.	UCRT19/1932		

The calibration of the above sound level meters complies with IEC 61672-1:2002 class 1; IEC 60651 type 1; IEC 60804 type 1 and IEC 61260 class 1.

The sound level meter was fixed to a tripod approximately 2m above ground level. This location is considered to be representative of noise levels at the nearest noise sensitive properties, which are a similar distance from the road, which is the dominant noise source.

The entire signal path was checked for calibration at the beginning and end of the survey. The calibration reference level used was 94dB. The calibration check meter reading before and after the survey was within 0.1 dB of 94dB.

Table 3.2 details the weather conditions for the survey period.

Table 3.2: Weather Conditions

Condition	Start	During (typical, from locally recorded data)	End
Wind Speed (m^{-1})	7	4-8	5
Precipitation	Nil	Sporadic	Sporadic

3.3 Noise Monitoring Results

A statistical analysis has been undertaken on the measured 24hr raw baseline noise data and the measured levels are presented below in Table 3.3. With regards to ascertaining representative background noise levels (dB LA,90,t), BS4142:2014 states that the objective is to ascertain typical background noise levels over a period. The typical background levels have been selected through a review of both modal and average values over the period, consistent with the informative guidance method presented in Section 1 of BS4142:2014.

The time history graphs showing the automated results can be found in Annex A. The below table provides a summary of the noise monitoring data, rounded to the nearest decibel (dB).

Table 3.3: Noise Monitoring Results

	Free field Sound Levels ref 2×10^{-5} Pa
L _{Aeq,16hr} Day	60 dB
L _{Aeq,8hr} Night	55 dB
L _{AFmax,16hr} Day	76 dB
L _{AFmax,8hr} Night	74 dB
Typical L _{AF90,16hr} Day	58 dB
Typical L _{AF90,8hr} Night	50 dB
Apparent Dominant Noise Sources	General and HGV road traffic noise, wildlife

4.0 Construction Noise

4.1 Construction Noise Assessment

Examples of possible sources of construction noise and vibration include:

- Increased noise levels on-site due to construction activities, plant and road haulage vehicles; and
- Increased noise levels off-site due to road haulage vehicles.

An assessment of specific construction noise impacts is dependent upon a number of construction design details, and construction programmes that are not available at this stage. The potential impact of any construction activity will be addressed through the preparation of a Construction Environmental Management Plan (CEMP). TRC has provided some guidance on suitable mitigation options to address potential noise impacts, which can be included within the CEMP to ensure that any amenity impacts, arising from the various construction activities, are considered and minimised.

The main contractor will refer to the guidance provided within BS 5228:2009 Code of practice for noise and vibration control on construction and open sites, (Parts 1 and 2), in order to minimise disruption during construction.

On Site Construction

Assumptions have been made in terms of the procedure for development which can be broken down into the following phases:

- Site Preparation (including earthworks);
- Construction; and
- Fit Out.

Construction Traffic

The construction of the Site will generate intermittent increases in HGV movements on the roads in the vicinity of the Site. The type and number of vehicles generated during the construction period will be dependent on the type and intensity of work being undertaken.

The number of construction vehicle movements will vary depending on the stage of construction of the development. Once the development reaches fit-out stage, the number of construction vehicles will be smaller than during the main construction phase and the proportion of HGV's will also be smaller.

Construction Noise Mitigation

Potentially significant impacts during the construction phase are associated with noise generating activities adjacent to potentially sensitive receptors. By employing appropriate site management practices, the potential for adverse noise impacts from construction vehicles and plant during the works will be minimised. A range of measures are suggested, which can form part of a site-specific Construction Environmental Management Plan (CEMP) within which all contractor activities will be undertaken.

Prior to any construction activity on site, a detailed CEMP will be drawn up and agreed with the contractor to set out the appropriate site management practices to be adhered to.

The Construction Environmental Management Plan will cover the following matters:

- Methods and materials that should be used to ensure that the generation of noise is minimised;
- The use of prefabricated materials wherever possible;
- Regarding optimum site layout, noise generating activities to be located away from sensitive receptors; and
- Good housekeeping and management, i.e.
 - Review of plant and activities to ensure noise minimisation measures are in place and operating;
 - Public relations, e.g. provision of telephone numbers for complaints, pre-warning of noisy activities, sensitive working hours;
 - Controlling of site traffic and setting up of access routes away from sensitive receptors; and
 - Provision of noise monitoring during activities likely to affect sensitive receptors.

The contractor will be responsible for the execution of the CEMP and will ensure that appropriate personnel understand their responsibilities in terms of the minimisation of noise and the appropriate reporting and dealing with incidents. The contractor will also be responsible for identifying and organising appropriate training.

Mitigation measures may include the following where possible:

- Regular monitoring where the potential for significant noise is identified;
- Where possible, 'silenced' plant and equipment to be used;
- Where vehicles are standing for a significant period of time, engines to be switched off;
- Screening around those parts of the Site at which activities are likely to generate noise;
- Location of noise generating plant at a low level and as distant as possible from sensitive receptor;
- Plant to operate at low speeds, where possible, and incorporate automatic low speed idling;
- Location of site haul roads, entrances and exits to prevent the need for vehicles to reverse and also minimise impacts upon sensitive receptors;
- The inclusion of the traffic route management plan;
- All plant to be properly maintained (greased, blown silencers replaced, saws kept sharpened, teeth set and blades flat, worn bearings replaced, etc.);
- Consideration to be given to temporary screening or enclosures for static noisy plant to reduce noise emissions and plant should be certified to meet any relevant EC Directive standards;
- All contractors to be made familiar with the guidance in BS 5228 (Parts 1 and 2) which should form a pre-requisite of their appointment; and
- Early and good public relations with the adjacent tenants and occupants of buildings will also reduce the likelihood of complaints.

4.2 Construction Noise Residual Effects

Potential noise impacts during the construction phase are associated with noise generating activities adjacent to sensitive receptors. By employing appropriate site management practices, including limiting working hours, the potential for adverse noise impacts from construction vehicles and plant during the construction (which is temporary in nature) can be suitably controlled, as has been demonstrated on numerous similar sites, and significant adverse effects can be avoided.

5.0 Operational Noise

The operational noise assessment considers two aspects:

- Operational traffic noise – i.e. vehicle movements and operations on site, in particular HGV movements, and
- Fixed plant noise – i.e. noise from any fixed mechanical or industrial plant on site.

The Site layout has been designed in such a way as to minimize the potential impacts at nearby residential receptors, with the noise shielding effect of the proposed units significantly reducing the noise generated on-site.

5.1 Operational Traffic Activity Noise Assessment

In order to aid the assessment of operational HGV noise, a 3-D noise model has been built using CadnaA noise modelling software. Noise source data was taken from BS5228:2009.

Modelling Assumptions and Inputs

The general horizontal plan information of the area surrounding and including the proposed development site was imported from Google Earth. Building height information was based on proposed building heights and site observation of existing buildings.

The following parameters were assigned to the model:

- Default ground absorption, G=0 hard ground areas included;
- Two orders of reflection;
- Buildings are reflecting (smooth, non-structured facade);
- 2 no simultaneous HGV (one at warehouse closest to the noise sensitive receptors) have been assumed as a worst-case scenario;
- Noise levels calculated at first floor window level;
- 15dB attenuation external to internal, for an open window;
- The proposed site is intended to operate 24 hours and therefore both a daytime and night-time assessment has been carried out. The predicted noise levels are free-field A-weighted sound pressure levels;

The existing acoustic character of the area includes industrial noise from the adjacent industrial estate. It is therefore proposed that primary consideration, in terms of assessing the potential noise impact of HGV use, should be given to BS8233, as per the guidance in BS4142 regarding context and absolute levels.

It is proposed that BS4142 be used for the assessment of noise from fixed plant or machinery to be used on site.

Modelling Results

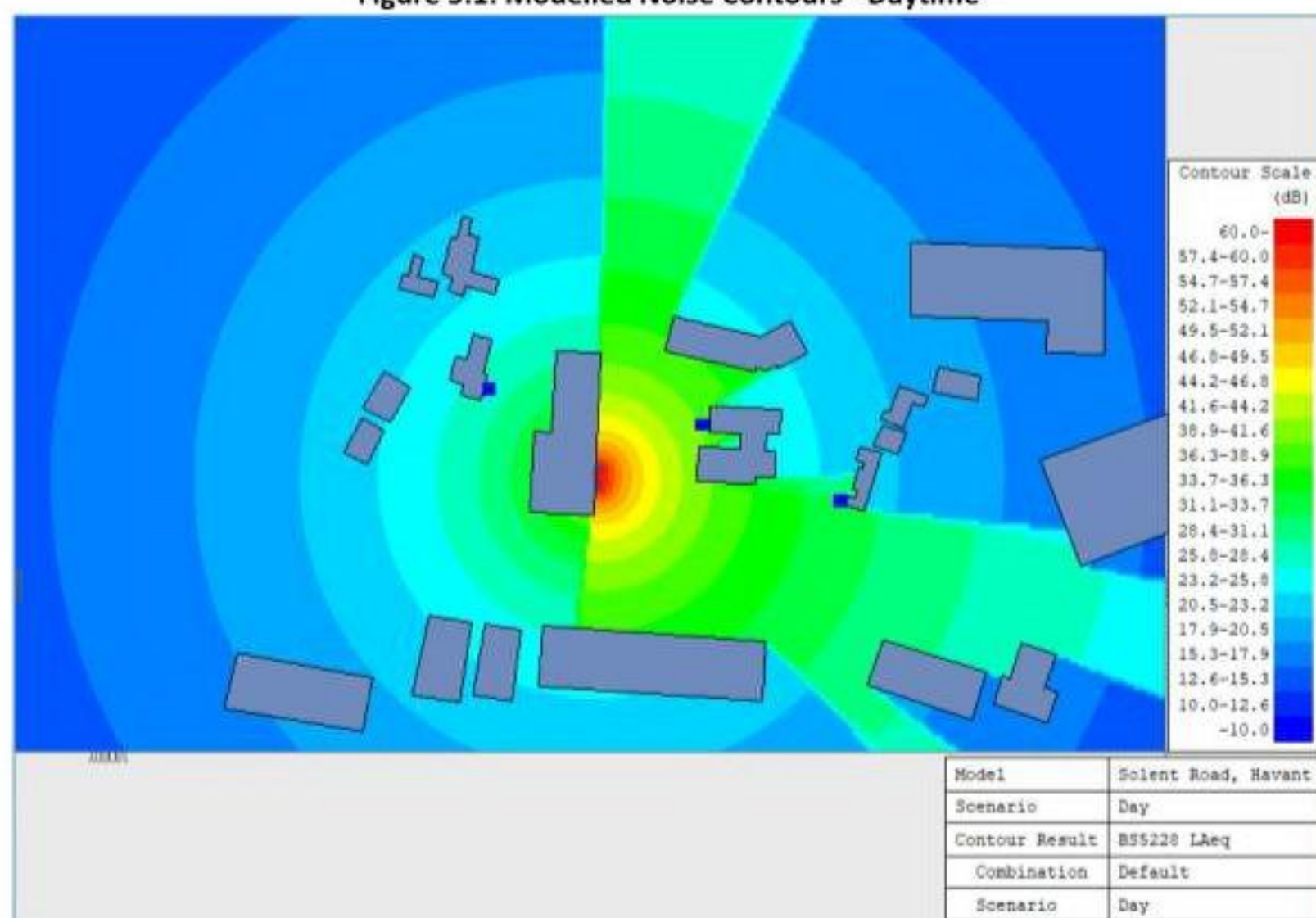
Noise model screenshots, along with worst case effected receptors is presented below in Figure 5.1 and 5.2 day and night-time operations.

The predicted noise levels, for the relevant worst affected receptor, are presented in Tables 5.1 and 5.2 below against BS8223 criteria and existing noise levels.

Table 5.1: Noise Predictions Daytime

Receptor	Predicted		Existing	BS8233 criteria
	External L _{Aeq,day}	Internal ¹ L _{Aeq,day}		
NSR 1 – Manor Court	30 dB	15 dB	60 dB	35 dB
NSR 2 – Brockhampton Lane	35 dB	20 dB	60 dB	35 dB
NSR 3 – Medical Practice	42 dB	27 dB	60 dB	40 dB*

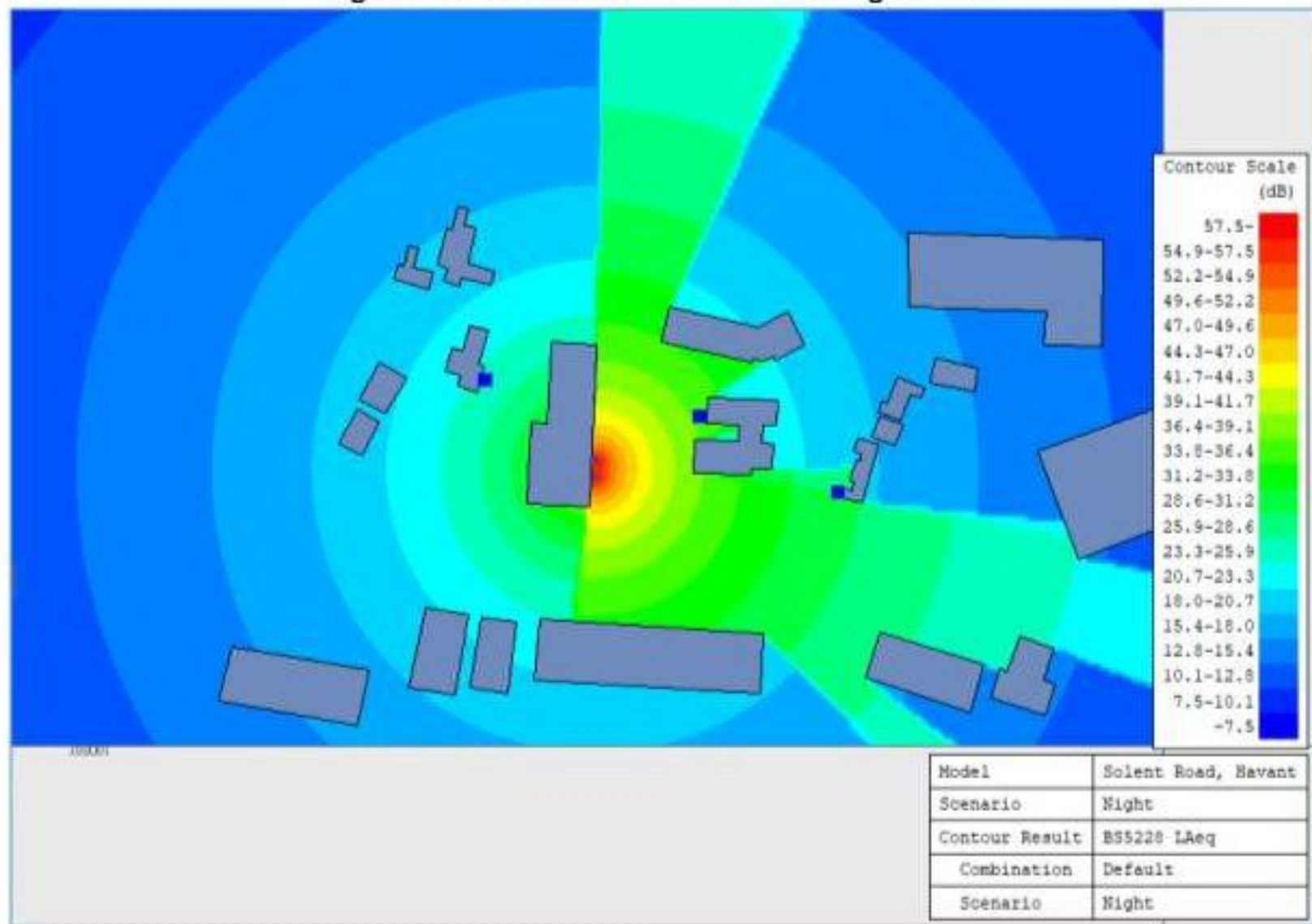
* levels taken from Department of Health Technical Memorandum 08-01: Acoustics

Figure 5.1: Modelled Noise Contours - Daytime

Table 5.2: Noise Predictions Night-time

Receptor	Predicted		Existing	BS8233 criteria
	External L _{Aeq,night}	Internal ¹ L _{Aeq,night}		
NSR 1 – Manor Court	27 dB	12 dB	55 dB	30 dB
NSR 2 – Brockhampton Lane	32 dB	17 dB	55 dB	30 dB
NSR 3 – Medical Practice	39 dB	24 dB	55 dB	35 dB*

* levels taken from Department of Health Technical Memorandum 08-01: Acoustics

Figure 5.2: Modelled Noise Contours – Night-time.



As demonstrated above, the predicted noise levels at all locations are below the BS8233 criteria for both day and night-time operations.

Internal levels have been calculated by subtracting 15dB from external levels (for an open window). This represents a worst case as the windows are likely to be closed for the majority of the year, offering significantly higher noise insulation and levels considerably below the BS8233 suggested internal levels.

5.2 Fixed Plant Noise

The same methodology has been applied to the modelling of fixed plant units to be located on the roof of the proposed office building.

Non-acoustic screening has been modelled around the proposed plant. This screening would have mostly an aesthetic purpose rather than mitigate noise from these units. The screening is proposed to consist of a louvred system of 80-100mm panels, a steel frame support with top and bottom rails, and framing out of doors.

To calculate the operational level of the proposed fixed plant units, a 100% on-time during daytime hours only was assumed and sound power level (SWL) data was taken from the client, which provided noise levels for each plant item as shown on Table 5.3.

Table 5.3 – Received Input Data

CG		
Plant Type	SPL (dB)	Distance (m)
AHU (Air Handling Unit)	55	1
Condenser	68	1
Fans	50	10
Portsmouth Water		
Plant Type	SPL (dB)	Distance (m)
Main AHU (Air Handling Unit)	49	10
Main Laboratory Condenser	57	1
Main AHU Condenser	54	1
Microbiology Laboratory Condenser	54	1
Heat Pumps	53	10
Extraction Fans	59	1
Main Laboratory Supply Air Fan	52	10
Microbiology Laboratory Supply Air Fan	48	10

Noise levels at 10m were calculated in order to ease the calculation of Sound Power Levels to be inputted in the model. The formula used to calculate sound pressure level at 10m from a given value at 1m is:

$$L_2 = L_1 - |20 \cdot \log(r_1/r_2)|$$

Where L2 is the sound pressure level to be found at the second distance, L1 is the level at the reference distance (1m), r1 is the reference distance (1m) and r2 is the second distance (10m).

The following data has been input in the model:

Table 5.4 – Model Input Data

CG				
Plant Type	SWL (dB)	SPL @10m (dBA)	% On Time	Qty.
AHU (Air Handling Unit)	63	35	100 (daytime only)	1
Condenser	76	48		8
Fans	78	50		1
Portsmouth Water				
Plant Type	SWL (dB)	SPL @10m (dBA)	% On Time	Qty.
Main AHU (Air Handling Unit)	77	49	100 (daytime only)	1
Main Laboratory Condenser	65	37		1
Main AHU Condenser	62	34		1
Microbiology Laboratory Condenser	62	34		1
Heat Pumps	81	53		2
Extraction Fans	67	39		4
Main Laboratory Supply Air Fan	80	52		1
Microbiology Laboratory Supply Air Fan	76	48		1

The location of the proposed plant has been modelled in accordance to the received plan, shown in figure 5.3 below

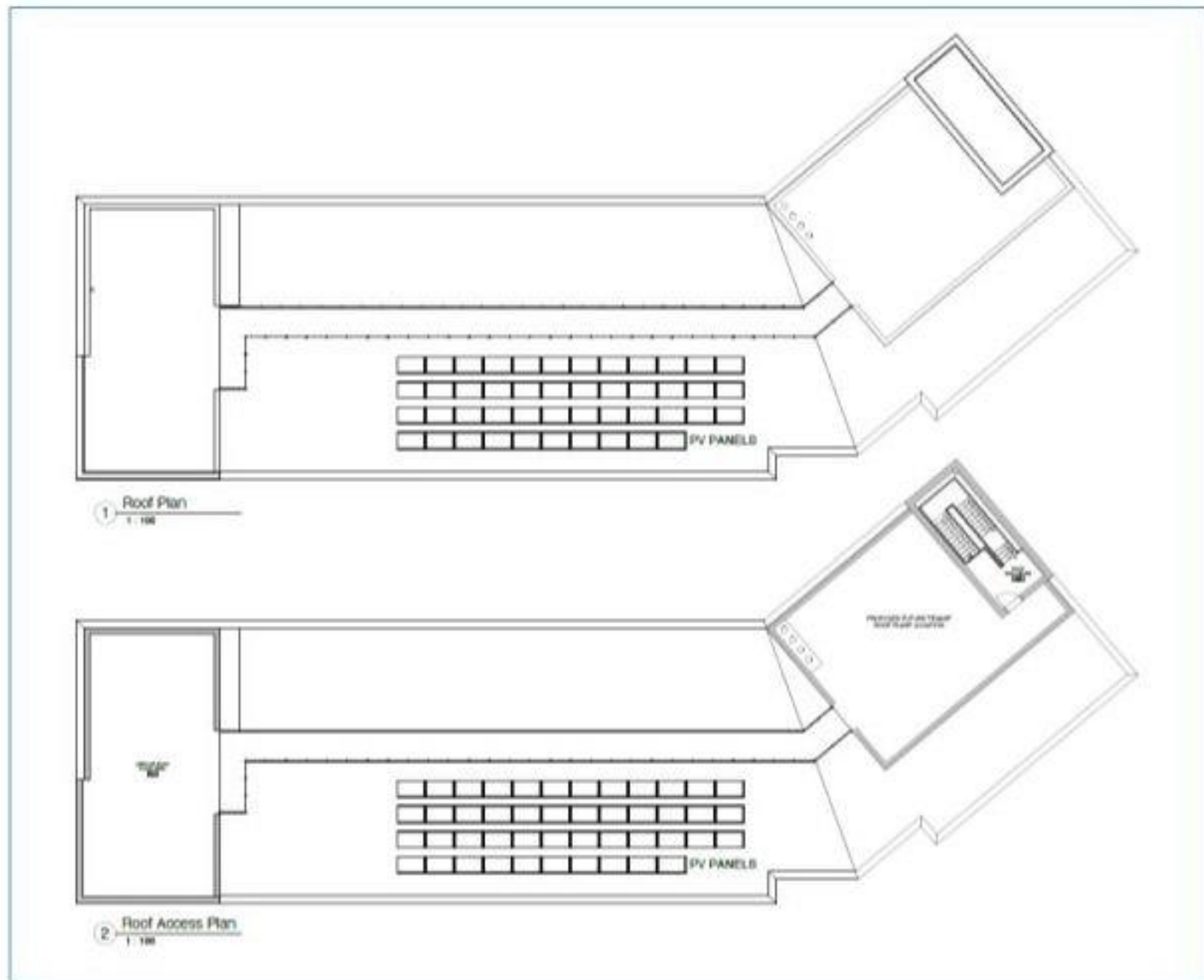


Figure 5.3: Modelled Fixed Plant Locations

To undertake the noise assessment, the closest of the residential receptors mentioned above were considered. No correction for tonality or impulsivity was required/implemented. A façade correction of 3dB was applied.

New fixed plant items should be selected and/or attenuated such that they meet the plant noise emission requirements of BS4142. It is suggested that additional plant installed by the office tenants (not currently modelled) or tenants from nearby industrial units should be selected in accordance with BS4142 and with the design criteria that L_{Aeq} Rating Level associated with the operational noise from the fixed plant should not exceed the measured typical background noise levels:

- 58 dB & 50 dB ($L_{A90,1}$) for day & night respectively

Noise from the majority of fixed plant items (e.g. condensers, AC units, CHP) is relatively easy to attenuate, should this be required, and the proposed noise limit values are considered achievable.

These fixed plant noise limit values can be controlled through planning conditions.

5.3 Fixed Plant Noise Calculations

Noise model screenshots, along with worst case effected receptors is presented below in Figure 5. for day-time operations.

The predicted noise levels, for the relevant worst affected receptor, are presented in Table 5.5. Table 5.6 below shows that the fixed plant units would have no adverse effects to the nearest residential receptors in accordance with BS4142.

Figure 5.4: Modelled Noise Contours – Daytime – Fixed Plant only

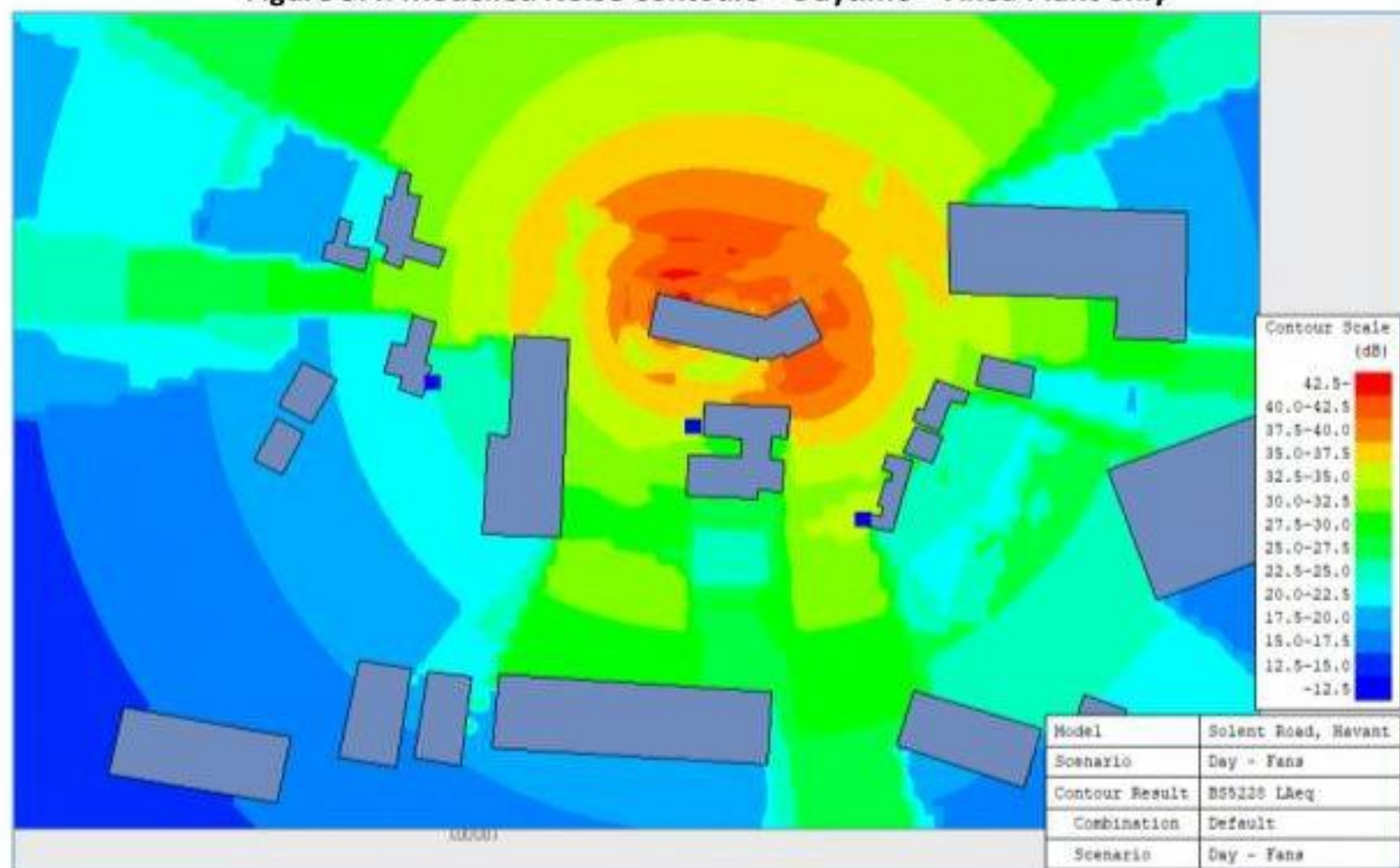


Table 5.5: Modelling Results – Daytime – Fixed Plant only

Receptor	Predicted		Existing
	External L _{Aeq,night}	Internal ¹ L _{Aeq,night}	External L _{Aeq,night}
NSR 1 – Manor Court	34 dB	19 dB	55 dB
NSR 2 – Brockhampton Lane	36 dB	21 dB	55 dB
NSR 3 – Medical Practice	42 dB	27 dB	55 dB

Table 5.6: BS4142 Assessment

Receptor	Predicted L _{Aeq} (from source)	Existing L _{A90}	Difference in Level	BS4142 Assessment
NSR 1 – Manor Court	34 dB	58 dB	-24 dB	No Observed Adverse Effect Level (NOAEL)
NSR 2 – Brockhampton Lane	36 dB	58 dB	-22 dB	No Observed Adverse Effect Level (NOAEL)
NSR 3 – Medical Practice	42 dB	58 dB	-16 dB	No Observed Adverse Effect Level (NOAEL)

5.3 Operational Noise Residual Effects

With the inherent mitigation provided by the layout of the units, no significant observable adverse noise affects are predicted as a result of the operation of the development.

6.0 Conclusions and Recommendations

The potential impacts as a result of the construction phase have been qualitatively assessed and this has considered the impacts upon existing receptors. A site-specific Construction Environmental Management Plan (CEMP) will be prepared and implemented to assist in reducing potential noise impacts. The residual construction noise impacts are expected to be local and temporary in nature.

The Site layout has been designed to minimise the potential noise impact, with the proposed new units providing significant noise-shielding at the nearby residential receptors. As such, the predicted noise levels at existing sensitive receptors from vehicle operations (HGVs) is lower than existing ambient noise levels (which consists of vehicle movements and exiting industrial noise) and meets the criteria for good living and resting conditions for dwellings, as defined by BS 8233.

With regards to fixed plant noise, noise impacts have been assessed at the closest receptor. These levels are significantly below existing background noise, therefore no impacts are predicted based on a BS4142 assessment.

No adverse noise effects are predicted as a result of the construction or operation of the development, either during the daytime or night-time periods.

7.0 Limitations and Exclusions

7.1 Reliance

The recommendations contained in this report represent TRC's professional opinions, based upon the currently available information, and are arrived at in accordance with currently acceptable professional standards. This report is based upon a specific scope of work requested by the Client. The contract between TRC and its Client outlines the scope of work, and only those tasks specifically authorised by that contract or outlined in this report were performed. This report is intended only for the use of TRC's Client and anyone else specifically identified in writing by TRC as a user of this report. TRC will not and cannot be liable for unauthorized reliance by any other third party. Other than as contained in this paragraph, TRC makes no express or implied warranty as to the contents of this report.

7.2 Third Party Information

TRC has been provided with information from third parties for information purposes only and without representation or warranty, express or implied as to its accuracy or completeness and without any liability on such third parties part to revise or update the information. Where reliance has been provided by third parties to potential purchasers, this is noted in our report.

In performing the services to which this report relates, TRC has relied upon the information obtained from third parties. TRC makes no representation or warranty, express or implied as to the accuracy or completeness of any statement or advice contained within this report that is based upon the information obtained from third parties and to the fullest extent permissible by law we hereby exclude any and all liability we may have in respect of the same, provided that nothing shall be taken as limiting TRC's liability in respect of personal injury (including death) caused by its negligence.

7.3 Interpretation of Findings

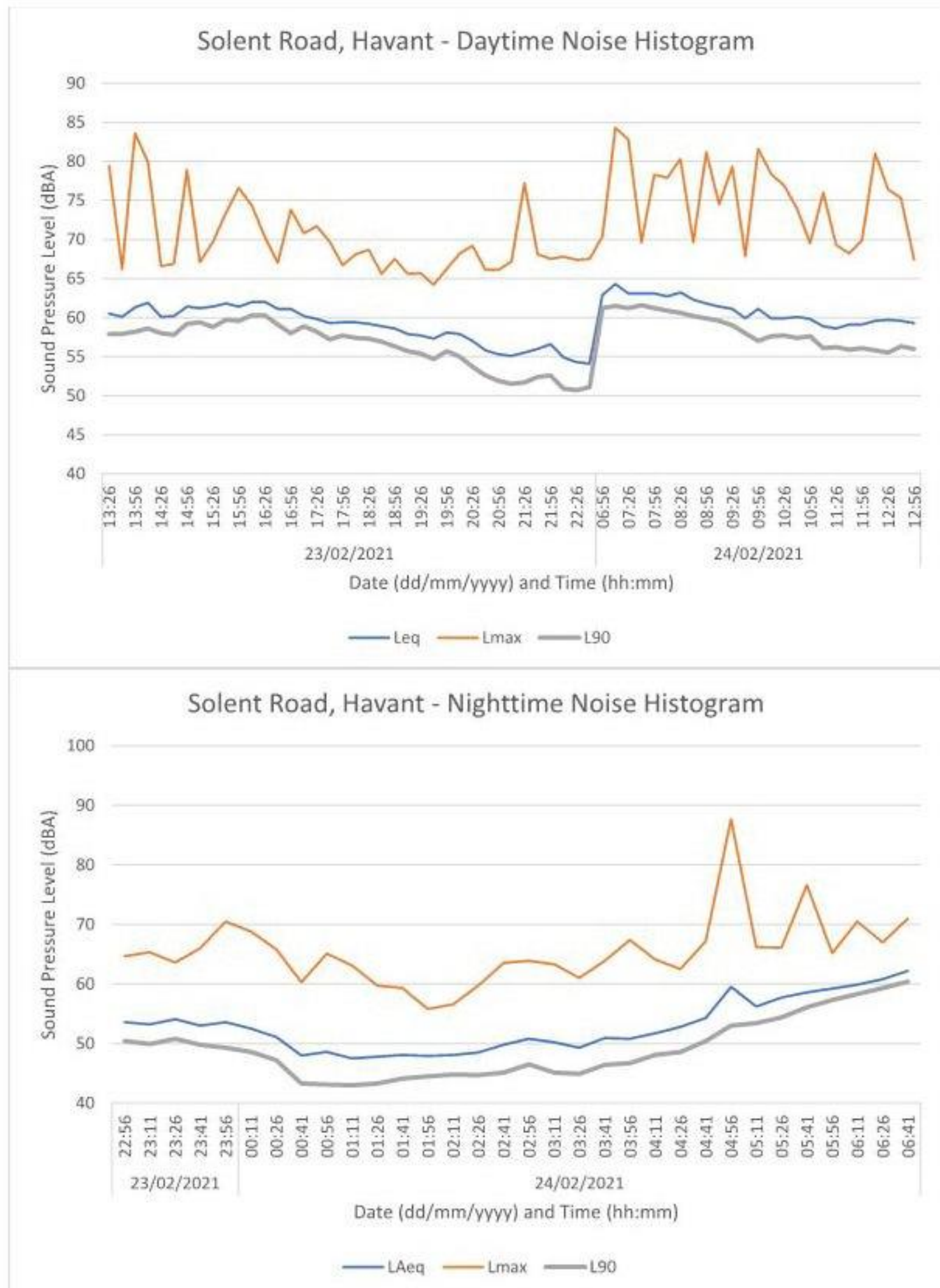
TRC's report is based upon the information provided to TRC and TRC's observations made during the subject property reconnaissance. Given the inherent limitations of environmental assessment work, TRC does not guarantee that the subject property is free of additional noise sources or considerations, or that latent or undiscovered conditions will not become evident in the future. TRC's report is prepared in accordance with the proposal and the standard terms and conditions agreed between the Client and TRC, and no other warranties, representations, or certifications are made.

8.0 References

The following documents/website were consulted in preparing this report:

- The National Planning Policy Framework (2019)
- The National Planning Practice Guidance – noise (December 2014)
- BS 4142:2014 – Method for rating and assessing industrial and commercial sound
- WHO (2009): World Health Organisation – Night noise guidelines for Europe
- British Standard Institution (2009+A1:2014) BS5228: Code of practice for noise and vibration control on construction and open sites – Part 1: Noise. BSI, London
- Department of Health – Specialists services: Health Technical Memorandum 08-01: Acoustics (2013).
- Havant Borough Council (2011) - Havant Borough Core Strategy

Annex A – Noise Histogram



Annex B – Raw Data

Date	Time	LAeq	LAmx	LA90
23/02/2021	13:26	60.5	79.4	57.9
	13:41	60.1	66.2	57.9
	13:56	61.3	83.6	58.2
	14:11	61.9	79.9	58.6
	14:26	60.1	66.6	58
	14:41	60.2	66.9	57.8
	14:56	61.4	78.9	59.2
	15:11	61.2	67.1	59.4
	15:26	61.4	69.7	58.8
	15:41	61.8	73.4	59.7
	15:56	61.4	76.6	59.6
	16:11	62	74.3	60.3
	16:26	62	70.3	60.3
	16:41	61.1	67	59.1
	16:56	61.1	73.8	58
	17:11	60.2	70.8	58.9
	17:26	59.8	71.7	58.2
	17:41	59.3	69.7	57.2
	17:56	59.4	66.7	57.7
	18:11	59.4	68.1	57.4
	18:26	59.2	68.7	57.3
	18:41	58.9	65.6	56.9
	18:56	58.6	67.5	56.3
	19:11	57.9	65.6	55.7
	19:26	57.7	65.7	55.4
	19:41	57.3	64.2	54.7
	19:56	58.1	66.2	55.7
	20:11	57.9	68.2	55
	20:26	57	69.2	53.7
	20:41	55.8	66.1	52.6
	20:56	55.3	66.1	51.9
	21:11	55.1	67.2	51.5
	21:26	55.5	77.2	51.7
	21:41	56	68.1	52.4
	21:56	56.6	67.5	52.6
	22:11	54.9	67.8	50.9
	22:26	54.3	67.4	50.7
	22:41	54.1	67.5	51.1

Date	Time	LAeq	LAmx	LA90
	22:56	53.6	64.7	50.4
	23:11	53.2	65.3	49.9
	23:26	54.1	63.6	50.8
	23:41	53	66	49.8
	23:56	53.6	70.5	49.3
24/02/2021	00:11	52.5	68.8	48.6
	00:26	51.1	65.8	47.2
	00:41	48	60.3	43.3
	00:56	48.6	65.1	43.1
	01:11	47.5	63.1	43
	01:26	47.8	59.7	43.3
	01:41	48.1	59.3	44.1
	01:56	47.9	55.8	44.5
	02:11	48.1	56.6	44.8
	02:26	48.5	59.7	44.7
	02:41	49.8	63.5	45.1
	02:56	50.8	63.9	46.5
	03:11	50.2	63.3	45.1
	03:26	49.3	61	44.9
	03:41	50.9	63.9	46.4
	03:56	50.8	67.4	46.7
	04:11	51.7	64.1	48.1
	04:26	52.8	62.5	48.6
	04:41	54.3	67.2	50.4
	04:56	59.5	87.7	53
	05:11	56.2	66.2	53.4
	05:26	57.7	66.1	54.4
	05:41	58.6	76.6	56.1
	05:56	59.2	65.2	57.3
	06:11	59.9	70.5	58.3
	06:26	60.8	67	59.3
	06:41	62.2	71	60.4
	06:56	62.9	70.4	61.2
	07:11	64.3	84.3	61.5
	07:26	63.1	82.8	61.2
	07:41	63.1	69.6	61.6
	07:56	63.1	78.3	61.2
	08:11	62.7	77.9	60.9
	08:26	63.2	80.3	60.6
	08:41	62.3	69.6	60.2
	08:56	61.8	81.2	59.9

Date	Time	LAeq	LAmx	LA90
	09:11	61.4	74.5	59.6
	09:26	61.1	79.3	59
	09:41	59.9	67.9	58
	09:56	61.1	81.6	57
	10:11	59.9	78.4	57.6
	10:26	59.9	76.9	57.7
	10:41	60.1	73.9	57.4
	10:56	59.8	69.5	57.6
	11:11	58.9	76	56.1
	11:26	58.6	69.3	56.2
	11:41	59.1	68.2	55.9
	11:56	59.1	69.9	56.1
	12:11	59.6	81	55.8
	12:26	59.7	76.4	55.5
	12:41	59.6	75.3	56.3
	12:56	59.3	67.4	56

Annex C – Acoustic Terminology

The acoustic terms used in this report are explained below:

Unit /Term	Definition
Decibel (dB)	Used as a measurement of sound pressure level. It is the logarithmic ratio of the noise being assessed to a standard reference level.
dB(A)	The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level. Because of being a logarithmic scale noise levels in dB(A) do not have a linear relationship to each other. For similar noises, a change in noise level of 10dB(A) represents a doubling or halving of subjective loudness. A change of 3dB(A) is just perceptible.
L10 and L90	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The Ln indices are used for this purpose, and the term refers to the level exceeded for n% of the time, hence L10 is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L90 is the average minimum level and is often used to describe the background noise. It is common practice to use the L10 index to describe traffic noise, as being a high average; it takes into account the increased annoyance that results from the non-steady nature of traffic noise.
Leq	The concept of Leq (equivalent continuous sound level) has up to recently been primarily used in assessing noise in industry but seems now to be finding use in defining many other types of noise, such as aircraft noise, environmental noise and construction noise. Leq is defined as a notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 1 hour). The use of digital technology in sound level meters now makes the measurement of Leq very straightforward.
Lmax	Lmax is the maximum sound pressure level recorded over the period stated. Lmax is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the Leq noise level.