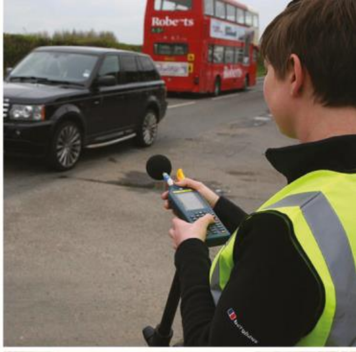

SATCHELL LANE,
HAMBLE

NOISE & AIR QUALITY ASSESSMENT

DECEMBER 2020

REPORT REF: 26148-04-NAQ-01

Noise, Vibration, Air Quality and Odour

SATCHELL LANE,
HAMBLE

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CONTENTS

APPENDICES

1.0 INTRODUCTION

1.1 Mewies Engineering Consultants Ltd (M-EC AcousticAir) has been commissioned by Foreman Homes Ltd to re-present the findings of AcousticAir's noise and air quality assessment, to support a planning application for the proposed residential development at Satchell Lane, Hamble. A site location plan is presented in Appendix A.

1.2 Section 2 of this report provides details of relevant national guidance on traffic noise, which is the principal source of noise affecting the site. Section 3 presents the results of the noise surveys undertaken for the site, and the assessment of noise on the proposed residential development is considered in Section 4 together with our recommendations for mitigation.

1.3 The scope of the studies for the air quality assessment comprises a review of the Local Planning Authority's (LPA) Air Quality Review and Assessment reports, and appropriate screening modelling of air pollutants due to motorway traffic.

1.4 Air quality standards are summarised in Section 5 and a review of the LPA's Air Quality Review and Assessment findings is presented in Section 6. The air quality assessment for the proposed development is presented in Section 7, and overall conclusions for noise and air quality are presented in Section 8.

1.5 M-EC has completed this report for the benefit of the individuals referred to in paragraph 1.1 and any relevant statutory authority which may require reference in relation to approvals for the proposed development. Other third parties should not use or rely upon the contents of this report unless explicit written approval has been gained from M-EC.

1.6 M-EC accepts no responsibility or liability for:

a) The consequence of this documentation being used for any purpose or project other than that for which it was commissioned;

b) The issue of this document to any third party with whom approval for use has not been agreed.

2.0 NOISE CRITERIA

Noise Terms and Units

2.1 Noise levels are measured and assessed using the decibel scale (dB), which provides a measure of the air pressure changes due to vibrating sources such as vehicle engines or machinery. Due to the vast range of air pressures that the human ear is capable of detecting, the decibel measurement uses a logarithmic scale that compresses the data into a more manageable scale for assessment purposes. A detailed explanation of the derivation of the decibel scale is presented in Appendix B.

2.2 Due to the logarithmic nature of the dB scale, the addition of two or more noise levels has to be done logarithmically rather than arithmetically. For example, two equal sound sources each producing 50 dB, when operated simultaneously, do not result in a noise level of 100 dB but instead produce a combined level of 53 dB, i.e. a rise of 3 dB for each doubling of sound energy. Subjectively, a 3 dB change does not represent a doubling or halving of loudness; to make a sound appear twice or half as loud requires a change of 10 dB.

2.3 The subjective loudness of noise can be measured by applying a filter or weighting that equates to the frequency response of the human ear. This is referred to as an A-weighting and when applied results in noise levels expressed as dB(A). dB(A) noise levels reflect the human perception of loudness.

National Planning Policy Framework

2.4 The latest National Planning Policy Framework (NPPF), issued by the Ministry of Housing, Communities and Local Government in 2019, sets out the Government's planning policies for England and how these are to be expected to be applied. The NPPF must be taken into account in the preparation of local and neighbourhood plans, and is to be a material consideration in planning decisions.

2.5 Paragraph 170 of the NPPF advises that, with respect to noise, planning policies and decisions should contribute to and enhance the natural and local environment by *"...preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution ...*".

2.6 Further, paragraph 180 advises that "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; and

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.

2.7 The NPPF's footnote to point a) above explicitly refers to the Explanatory Note to the *Noise Policy Statement for England* (Department for Environment, Food & Rural Affairs, 2010).

Noise Policy Statement for England

2.8 The guidance of the Noise Policy Statement for England (NPSE) applies to all forms of noise including environmental noise, neighbour noise and neighbourhood noise, but does not apply to noise in the workplace (occupational noise). It introduces the concepts of 'No Observed Effect Level' (NOEL), which is the level below which there is no detectable effect on health and quality of life due to the noise; the 'Lowest Observed Adverse Effect Level' (LOAEL), which is the level above which adverse effects on health and quality of life can be detected; and the 'Significant Observed Adverse Effect Level' (SOAEL), which is the level above which significant adverse effects on health and quality of life occur.

2.9 In March 2014 the Department for Communities & Local Government updated its on-line planning guidance to assist with interpretation of the original NPPF and the NPSE. The guidance covers general matters such as relevance of noise issues, noise concerns and factors, how to determine impacts, and mitigation. To assist with recognising when noise could be a concern, the guidance summarises the noise exposure hierarchy as follows, based on the likely average response.

Table 3.1: Noise Exposure Hierarchy Based on Likely Average Response

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

Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

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

2.10 For steady external noise sources, BS8233:2014 states that it is generally desirable that the internal ambient noise level does not exceed the guideline values in Table 3.2.

Table 3.2: Indoor ambient noise levels for dwellings

Activity	Location	Daytime 07:00 to 23:00	Night-time 23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

NOTE 1 *Table 3.2 provides recommended levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Groundborne noise is assessed separately and is not included as part of these targets, as human response to groundborne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.*

NOTE 2 *The levels shown in Table 3.2 are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the levels recommended in Table 3.2.*

NOTE 3 *These levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Years Eve.*

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 $L_{Amax,P}$ 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 6 *Attention is drawn to the building regulations (30, 31, 32).*

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.*

2.11 For traditional external areas that are used for amenity space, such as gardens and patios, the BS says it is desirable that "*the external noise does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$*."

2.12 However, due to the nationwide difficulty in satisfying an external noise criterion of 55 dB $L_{Aeq,T}$ in urban areas where transportation noise is prevalent, BS8233:2014 provides an over-arching consideration of how to treat outdoor garden areas in the following way:

"… 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.

Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses."

World Health Organisation Guidelines

2.13 The noise guidance from the World Health Organisation (Community Noise, WHO Vol. 2, Issue 1, 1995, and Guidelines for Community Noise, 2000) is that in order to avoid sleep disturbance the period noise level (L_{Aeq}) should not exceed 30 dB internally and individual noise events should not normally exceed 45 dB L_{Amax}. To preserve speech intelligibility during the daytime and evening, the recommended internal noise level for living rooms is 35 dB $L_{Aeq,T}$. These L_{Aeq} values are consistent with the latest guidance of BS8233.

2.14 The WHO noise criteria for dwellings are summarised in Table 3.3 together with the desirable noise levels for outdoor living areas, which are likewise equal to those referenced in BS8233.

Table 3.3: WHO Guideline Noise Levels for Dwellings

Location	Critical Health Effect(s)	L_{Aeq} dB	Time base	L_{Amax} fast dB
Outdoor living area	Serious annoyance, daytime and evening	55	16 hours	-
	Moderate annoyance, daytime and evening	50	16 hours	-
Dwelling, indoors	Speech intelligibility & moderate annoyance, daytime & evening	35	16 hours	
Inside bedrooms	Sleep disturbance, night-time	30	8 hours	45
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8 hours	60

2.15 Section 3.4 of the WHO Guidelines states that for good sleep, indoor noise levels should not exceed approximately 45 dB L_{Amax} more than 10-15 times/night. On the basis of the WHO's 15 dB façade insulation for windows partly open, this equates to external L_{Amax} of 60 dB that should not be exceeded more than 10-15 times/night.

2.16 As for the comments in BS8233 relating to the ability to achieve the outdoor noise criterion in many locations, in considering the application of an outdoor criterion of 55 dB L_{Aeq} or less, it is again 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 L_{Aeq} and that around 65% are exposed to night-time noise levels exceeding 45 L_{Aeq} (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."

2.17 The latest WHO guidelines (Night Noise Guidelines for Europe, 2009) are applicable to Member States of the European Region and represent an extension to, as well as an update of, the previous WHO Guidelines for Community Noise. Based on the scientific evidence on thresholds of night noise exposure indicated by $L_{night,outside}$ as defined in the Environmental Noise Directive (2002/49/EC), the latest WHO guidance recommends an $L_{night,outside}$ of 40 dB as a target for the night noise guideline (NNG) to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly. An $L_{night,outside}$ value of 55 dB is recommended as an interim target for countries where the NNG cannot be achieved in the short term for various reasons, and where policy-makers choose to adopt a stepwise approach.

2.18 The $L_{night,outside}$ is the A-weighted long-term average sound level determined over all nights of the year, where the night is the 8-hour period between 2300-0700 hours. The target noise level excludes sound reflected from a building façade, therefore, a 3 dB façade correction must also be allowed in the case of measurements or predictions at building facades. The receptor height is typically 3.8 to 4.2m above ground level, i.e. as applicable first floor bedrooms, but in the case of rural areas with single storey dwellings a height of not less than 1.5m is applicable.

Road Traffic

2.19 Road traffic noise levels, which have been determined to be the dominant source of noise for the site, are typically measured and predicted in units of $L_{A10\ (18\ hour)}$ dB in accordance with the Department of Transport's 'Calculation of Road Traffic Noise, 1988' (CRTN). The L_{A10} is the A-weighted sound level in decibels exceeded for 10% of the measurement period, which in this case is the 18 hour period between 0600 and 2400 hours. This noise index has been shown to correlate best with people's subjective annoyance due to road traffic noise. L_{A10} noise levels measured over any three hours between 1000-1700 hours are typically 1 dB(A) higher than the L_{A10} over the 18-hour period (CRTN paragraph 43).

2.20 With respect to the planning of new residential development in the vicinity of existing road traffic, previous guidance was provided by Planning Policy Guidance PPG24:Planning and Noise. This document provided guidance in terms of Noise Exposure Categories (NEC) for residential development. For comparison with the $L_{A10\ (18\ hour)}$ traffic noise index, it is important to note that the noise index used by the previous planning guidance and also by design guidance such as BS8233 and the WHO guidelines use the $L_{Aeq,T}$ dB noise index, which is a measure of the total sound energy present in a time period, T, expressed as an equivalent continuous noise level.

2.21 For environmental noise sources such as road traffic, the $L_{Aeq,T}$ noise level over the daytime assessment period of 16 hours used by planning guidance is typically, 2 dB lower than $L_{A10\ (18\ hour)}$ noise level. In addition, planning criteria are often expressed as free-field noise levels, i.e. away from the reflecting effects of building facades, whereas noise levels predicted at specific buildings by CRTN normally include a facade reflection factor. $L_{A10\ (18\ hour)}$ noise levels will be higher than equivalent free-field values by a further 3 dB(A) due to these reflection effects. Therefore, for any direct comparison between predicted noise levels and $L_{Aeq,T}$ criteria, $L_{A10\ (18\ hour)}$ noise levels will need to be corrected by -2 dB(A) in the case of free-field noise measurements or predictions and by -5 dB(A) in the case of facade noise levels.

Traffic Noise Change

2.22 With regard to the potential noise change due to traffic generated by development, the previous definitions in PPG24 stated "*A change of 3 dB(A) is the minimum perceptible under normal conditions*". Para 3.42 of the latest DMRB (Appendix II of DMRB) likewise states "*A change of 1 dB(A) in the short-term (e.g. when a project is opened) is the smallest that is considered perceptible. In the long-term, a 3 dB(A) change is considered perceptible, and such an increase should be mitigated if possible*." Therefore, for broadband environmental noises such as road traffic, 3 dB(A) has historically been used as a threshold to denote perceptible noise effects.

2.23 The $L_{night,outside}$ is the A-weighted long-term average sound level determined over all nights of the year, where the night is the 8-hour period between 2300-0700 hours. The target noise level excludes sound reflected from a building façade; therefore, a 3 dB façade correction must also be allowed in the case of measurements or predictions at building facades. The receptor height is typically 3.8 to 4.2m above ground level, i.e. as applicable first floor bedrooms, but in the case of rural areas with single storey dwellings a height of not less than 1.5m is applicable.

Table 3.4: Noise Impact Assessment Bands

Noise Change Band	Descriptor	Significance Criteria
<1 dB(A)	Not discernible	No impact
1 to <3 dB(A)	Marginal	Minor significance
3 to <5 dB(A)	Noticeable	Moderate significance
5 to10 dB(A) or more	Considerable	Major significance

3.0 NOISE SURVEY

3.1 Ambient noise levels affecting the site during the day and night-time were monitored during Wednesday 15th and Thursday 16th February 2017. Road traffic noise levels were measured in accordance with the shortened measurement procedures of the Calculation of Road Traffic Noise (CRTN) at 5.5m from the carriageway edge of Satchell Lane. The short-term noise survey is endorsed and approved by central government guidance. Indeed, the latest Design Manual for Roads and Bridges (DMRB) provides analysis of data from the National Noise Survey carried out by the Building Research establishment in 2000 and confirms that the CRTN shortened measurement procedure is still a valid method for evaluating the $L_{A10\ (18\ hour)}$ (Annex 4: A4.44- A4.50, DMRB Vol 11, Section 3, Part 7 HD 213/11). Further sample measurements were undertaken along the southern site boundary (Position 2), and in the centre of the site (Position 3). All noise monitoring positions are identified in Appendix C.

3.2 Noise levels were recorded using the following equipment, which was calibrated to a reference signal of 94 dB immediately prior to and after the survey and exhibited zero drift.

- SVAN 971 Sound level meter;
- Norsonic Type 131 Sound level meter; and
- Larson Davies CA200 acoustic calibrator.

3.3 The microphone was positioned at a height of 1.2m in a free-field location, i.e. excluding the effect of reflections from buildings or structures. The weather conditions were cold, with damp roads and no wind during the night, and cool and sunny, with southerly winds of 2 m/s during the day. The damp roads during the night-time monitoring periods will have increased the noise exposure at this time.

3.4 During the survey periods the predominant noise source for the site was at all times road traffic using Satchell Lane.

3.5 All noise measurements are presented in Appendix D and summarised in Table 3.1.

Table 3.1: Measured Noise Levels at 5.5m from Satchell Lane, dB

Noise Level, dB	
L_{A10} 3-hour	64.5
Correction for 18-hour L_{A10}	-1
Correction for 16-hour L_{Aeq}	-2
L_{Aeq} 16-hour	**61.5**
L_{Aeq} 8-hour(1)	**51.5**

Note: (1) based either on difference between day and night-time L_{Aeq} measurements or DMRB's quoted 10 dB difference, whichever gives the greater noise level.

3.6 The derived daytime $L_{Aeq\ (16\ hour)}$ monitored at 5.5m from the carriageway edge of Satchell Lane was 58 dB (rounding to the nearest whole number for assessment purposes).

3.7 There is normally a reduction in traffic flows during the night-time period between 2300-0700 hours, which will in turn reduce the noise exposure. Volume 11 Section 3 Part 7 of the Design Manual for Roads and Bridges (DMRB) states that "measurements of noise from roads indicate that on average night-time traffic noise (i.e. noise between 23:00 and 07:00 on the following day) is approximately 10 dB(A) less than daytime levels". Adjacent to Satchell Lane, the measured difference between the day and night L_{Aeq} was 8 dB, therefore, this lesser level difference has been applied to derive the $L_{Aeq\ (8\ hour)}$ at night, resulting in a night-time L_{Aeq} of 50 dB at 5.5m from Satchell Lane.

3.8 Analysis of the L_{Amax} noise levels show that individual road traffic noise events during the day typically fall below 77 dB, but with some occasional peaks due to loud vehicles causing peaks between 77-80 dB. Analysis of the night-time L_{Amax} noise levels shows that the individual road traffic noise events all fall below 82 dB. Therefore, for night-time assessment purposes it has been assumed that L_{Amax} noise events due to vehicles will typically be 82 dB or less at 5.5m from Satchell Lane.

3.9 The sample measurements undertaken at Positions 2 and 3 showed a daytime L_{Aeq} of 42 dB and 40 dB respectively.

4.0 NOISE IMPACT ASSESSMENT

4.1 The noise levels affecting the site were not particularly high, with a day and night-time L_{Aeq} at Position 1 of 58 and 50 dB respectively. The noise levels at Positions 2 and 3 were lower, with a daytime L_{Aeq} of 42 dB and 40 dB respectively.

4.2 None of the noise levels were high, and they were all lower than levels that are commonly encountered at approved developments adjacent to transportation routes. Consequently, acceptable noise standards will be readily achieved using practicable forms of noise mitigation as discussed below.

4.3 The traffic growth over a 15 year design period from 2017 to 2032 would amount to a noise increase of less than 1 dB(A) using the traffic growth forecasts provided by CRTN, which would be represented by only a small and insignificant shift in the noise exposure levels across the site. Therefore, essentially the same comments and noise exposure levels relating to the noise measurements in 2017 can be applied to the site to account for future traffic growth by the year 2032.

4.4 External and internal noise levels for new dwellings closest to Satchell Lane, e.g. at an indicative distance of 15m from the carriageway edge, would be as shown in Table 4.1. The Table also shows the outdoor-to-indoor level difference (L_A) that windows to habitable rooms must provide in order to achieve BS8233's noise limits, e.g. an internal noise level of 35 dB L_{Aeq} during the day for living rooms and 30 dB LAeq during the night for bedrooms. The window's required sound reduction index (R) can be calculated from the following equation:

Sound reduction index, $R = L_1 - L_2 + 10\log(S/A)$

Where,	L_1	=	facade noise level;
	L_2	=	internal noise level, e.g. noise standard to be met;
	S	=	surface area of relevant portion of the building envelope, i.e. the window (m^2); and
	A	=	absorption in the room (m^2).

4.5 For a typical example of window area $S = 2\ m^2$ and room absorption $A = 10\ m^2$, and assuming these factors remain constant over the whole frequency range used for sound reduction purposes, the correction to be added to the level difference L_A to derive the sound reduction index R (or R_{TRA} where this is specific to road traffic or other transportation noise) is –7 dB. The sound reduction index may also be presented in terms of the weighted sound reduction index R_W, which is typically between 3 to 7 (average 5) dB higher than R_{TRA}. Therefore, for design purposes, the R_{TRA} will be 7 dB lower than the L_A, and the R_W can be estimated by adding 5 dB to the calculated R_{TRA}. Indicative sound insulation performances of different window designs are presented in Appendix E; however, window manufacturers will be able to provide test certificates showing precisely which of their designs are capable of achieving the minimum requirements.

4.6 The above approach takes account of the sound reduction requirements needed to satisfy the internal noise standards within occupied dwellings, i.e. taking account of the window area and including the absorption that will be present from normal occupation, e.g. with carpets, curtains and furnishings etc. Any compliance monitoring that could take place prior to dwellings being occupied and furnished would need to take account of the loss of room absorption at this stage. That is to say, internal measurements within empty rooms would need to allow 7 dB to compensate for the lack of sound absorption and the reverberations from hard internal surfaces.

Table 4.1: External and Internal Noise Levels of New Dwellings facing Satchell Lane, dB

Day L_{Aeq}							Night L_{Aeq}					
Facade	Internal		L_A	R_{TRA}	Vent[n]	Garden	Facade	Internal		L_A	R_{TRA}	Vent[n]
	Windows closed	Windows partly open						Windows closed	Windows partly open			
56	23	41	21	14	Yes	41	48	15	33	18	11	No
							Night L_{Amax}					
							76	43	61	31	24	Yes

Notes:
1. Façade noise level includes +3 dB correction for façade reflection effects.
2. Internal noise level with windows closed assumes 33 dB(A) reduction for thermal double glazed windows as per old PPG24.
3. Internal noise level with windows partly open assumes 15 dB(A) reduction as per WHO guidelines.
4. The minimum required sound level difference L_A is derived from the façade noise level minus the internal noise limit, i.e. BS8233's noise levels.
5. The minimum required sound reduction index, R_{TRA} is derived from the level difference L_A minus 7.
6. The need for ventilation is determined by whether the internal noise level can be met with windows partly open for ventilation.

4.7 Table 4.1 shows that in order to achieve BS8233's internal L_{Aeq} and L_{Amax} noise levels, windows facing the road will need to provide a minimum sound reduction (R_{TRA}) of no more than 24 dB R_{TRA}. Normal thermal double glazing having a configuration of 4/12/4 or 4/16/4, where the information is presented in terms of the thickness of one pane of glass in mm, followed by the size of the air gap, followed by the thickness of the second pane of glass, typically provides a sound reduction of 25 dB R_{TRA} as indicated by the data in Appendix E, which would be more than sufficient to enable all internal noise standards to be met.

4.8 Opening windows for ventilation purposes would reduce the insulation provided by the building façade and internal noise levels would then exceed the design standards, although this situation is not unusual for residential areas within the urban environment where transportation noise is prevalent. Passive acoustic ventilators, such as acoustic trickle vents in the window frames or acoustic airbrick type vents within the walls, can be used for habitable rooms that have windows having an unscreened view towards the road. These would enable occupiers to obtain natural ventilation with windows closed, without any loss of amenity due to noise intrusion.

4.9 For the assessment in Table 4.1, it has been assumed that dwellings will face the road at a distance of 15m, with private gardens used for amenity purposes located behind new dwellings, and thereby, experiencing additional distance attenuation as well as screening from the dwellings themselves. In this scenario, a conservative attenuation of 10 dB(A) would apply and, together with the additional distance attenuation, would result in an outdoor noise level of approximately 41 dB L_{Aeq} for garden areas, which would satisfy the BS8233/WHO outdoor criterion of 55 dB.

4.10 Any residual garden areas having a partial unscreened view to the road should have at least a 1.8m high close-boarded timber fence or equivalent structure along the garden boundary to minimise the traffic noise impacts. This would typically provide an attenuation of 7 dB(A) and would minimise the impact of traffic noise in accordance with the guidance of BS8233.

4.11 Dwellings further into the site will experience lower noise levels due to the additional distance attenuation and the screening provided by dwellings located adjacent to Satchell Lane. As a consequence, acceptable internal noise levels will be achieved using normal thermal double glazing, and the outdoor noise criterion will be met at all locations.

4.12 The noise assessment demonstrates that acceptable external and internal noise levels will be achieved for residents subject to appropriate noise mitigation, which is a matter that can be dealt with by way of planning conditions. For example, conditions can require a scheme for protecting the proposed residential development from road traffic noise to be submitted and approved by the local planning authority, and for all works that form part of the scheme to be completed before any part of the development is occupied. If required, specific noise standards to be achieved inside dwellings can be specified within a planning condition, and these would be attained by way of appropriate window designs. With relevant noise standards met, the proposed development would satisfy the requirements of the NPPF.

Traffic Generated By Development

4.13 Annual average traffic flows for the Satchell Lane with and without development traffic have been obtained from the project’s traffic engineers (C&A Consulting Engineers Ltd) and the flows, % heavy goods vehicle (HGV) and average speeds with and without development are presented in Appendix F.

4.14 A road's basic noise level (BNL) represents the free–field noise level at a distance of 10m from the carriageway edge based on the traffic flow, the percentage heavy vehicle composition and the average vehicle speeds. Where other factors such as screening or distance between buildings and the road remain constant between each situation under consideration, the difference between the BNLs reflects the actual noise change at any receptor adjacent to the road. Therefore, calculation of the BNLs will provide an indication of the noise level changes due to traffic flow changes associated with the development.

4.15 The calculated BNLs and noise change are also presented in Appendix F. For all existing receptors adjacent to Satchell Lane, the noise changes due to development traffic are 0.1 dB or less.

Therefore, applying the significance criteria in Table 2.4, the development would have no impact upon existing dwellings adjacent to Satchell Lane.

5.0 AIR QUALITY STANDARDS

5.1 The principal air quality standards applied within the UK are the standards and objectives that were initially formulated within the Air Quality (England) Regulations 2000 (AQR) as amended in 2002. These were enacted as part of the UK National Air Quality Strategy (AQS) under Section 80 of the Environment Act 1995, and implement relevant directives of the European Union (EU). The latest version of the UK AQS was published in 2007.

5.2 It is important to note the distinction between standards and objectives. Although the AQS standards define concentration levels that will avoid or minimise risks to health, they do not necessarily reflect levels that are presently technically feasible or economically efficient. In contrast, the AQS objectives have been set with regard to what is realistically achievable within a specified timetable. The approach adopted by the Strategy is to apply the objectives, where members of the public, in a non-occupational capacity and at locations close to ground level, are likely to be exposed over the averaging time of the objective, for example, over 1-hour, 24-hour or annual periods as appropriate.

5.3 Under the Environment Act 1995, Local Authorities must review and document local air quality within their areas by way of a staged appraisal and respond accordingly, with the aim of meeting the air quality objectives by the years defined in the Regulations. Where the objectives of the Regulations are not likely to be achieved by the objective year, an authority is required to designate an Air Quality Management Area (AQMA). For each AQMA the local authority is required to draw up an Air Quality Action Plan (AQAP) to secure improvements in air quality and show how it will try to meet air quality standards in future.

5.4 The Air Quality Strategy is an ongoing mechanism that will be regularly reviewed and updated to take account of evolving European Union (EU) legislation, technical and policy developments and the latest research on health effects of air pollution.

5.5 The Strategy's objectives for particles (PM_{10}), benzene and carbon monoxide were reviewed in 2000/2001 and in February 2003, in the light of more recent scientific knowledge and policy changes, the Government updated the Air Quality Strategy (AQS) by way of an Addendum. The revisions provide alterations or extensions to four of the eight existing pollutant objectives, and the addition of a ninth pollutant, polycyclic aromatic hydrocarbons (PAHs). Further revisions to the objectives were promulgated in the 2007 version of the AQR and the current air quality objectives for the protection of human health are summarised in Table 5.1 below. Definitions of units and terms used to quantify air pollutant concentrations are provided in Appendix G.

Table 5.1: UK Air Quality Objectives for Protection of Human Health

Pollutant	Concentration	Measured as *
Benzene		
All authorities	16.25 μg/m^3	Running annual mean
England and Wales only	5 μg/m^3	Annual mean
Scotland and N. Ireland	3.25 μg/m^3	Running annual mean
1,3 Butadiene	2.25 μg/m^3	Running annual mean
Carbon Monoxide		
England, Wales and N. Ireland	10 mg/m^3	Maximum daily running 8-hour mean
Scotland only	10 mg/m^3	Running 8-hour mean
Lead	0.5 μg/m^3	Annual mean
	0.25 μg/m^3	Annual mean
Nitrogen dioxide	200 μg/m^3	1 hour mean not to be exceeded more than 18 times per year
	40 μg/m^3	Annual mean
Particles (PM_{10} gravimetric)		
All authorities	50 μg/m^3	Daily mean not to be exceeded more than 35 times a year
	40 μg/m^3	Annual mean
Scotland only	50 μg/m^3	Daily mean not to be exceeded more than 7 times a year
	18 μg/m^3	Annual mean
Particles ($PM_{2.5}$ gravimetric)	25 μg/m^3 (target)	Annual mean
England only	Work towards reducing emissions/concentrations of fine particulate matter ($PM_{2.5}$)	Annual mean
Scotland only	10 μg/m^3 (limit)	Annual mean
Sulphur dioxide	350 μg/m^3	1-hour mean not to be exceeded more than 24 times a year
	125 μg/m^3	24-hour mean not to be exceeded more than 3 times a year
	266 μg/m^3	15-minute mean not to be exceeded more than 35 times a year
Objectives not yet Prescribed in Regulations for the Purposes of Local Air Quality Management		
Polycyclic aromatic hydrocarbons	0.25 ng/m^3	Annual mean

Ozone	100 µg/m^3	8 hourly running or hourly mean, not to be exceeded more than 10 times a year

Notes: * how the objectives are to be measured is set out in the UK Air Quality (England) Regulations (2000 and 2002)

5.6 The EU has also set NO_2 objectives for 2010 that must be met by all member states, although these 2010 EU NO_2 objectives are equal to the UK Air Quality Strategy NO_2 2005 objectives.

5.7 Of the pollutants mentioned above, the majority of the UK SO_2 emissions derive from stationary combustion plant rather than traffic emissions. Therefore, this pollutant is not significant for this assessment. Similarly, the concentration of lead in vehicle fuels has been reduced to negligible levels in the past 10 to 15 years, particularly since the introduction of unleaded fuel, and this pollutant is also no longer of concern for this study. Of the remaining pollutants, the standards for carbon monoxide, benzene and 1,3 butadiene are generally met in urban areas. The pollutants of most concern to planning authorities in urban areas, due to the high concentrations presently encountered (of which local road traffic makes a large contribution) are NO_2 and PM_{10}.

London Council's Air Quality Planning Guidance, January 2007

5.8 This guidance updates and replaces the Association of London Government's Planning Technical Guidance issued on 20th March 2001 and Circular TEC 01/03, and aims to help reduce exposure to air pollution across the whole of London. The technical guidance was produced by the APPLE (Air Pollution Planning and the Local Environment) working group and provides useful guidance for assessing the significance of air quality issues at other sites throughout the UK.

5.9 In determining both the significance of exposure to air pollution and the levels of mitigation required, the guidance recommends that consideration should be given to the Air Pollution Exposure Criteria (APEC) as presented in Table 5.2.

Table 5.2: Air Pollution Exposure Criteria

	Applicable Range Nitrogen Dioxide Annual Mean	**Applicable Range PM_{10}**	**Recommendation**
APEC – A	> 5% below national objective	**Annual Mean:** > 5% below national objective **24 hr:** > 1-day less than national objective	No air quality grounds for refusal; however mitigation of any emissions should be considered.
APEC – B	Between 5% below or above national objective	**Annual Mean:** Between 5% above or below national objective **24 hr:** Between 1-day above or below national objective.	May not be sufficient air quality grounds for refusal, however appropriate mitigation must be considered e.g., Maximise distance from pollutant source, proven ventilation systems, parking considerations, winter gardens, internal layout

			considered and internal pollutant emissions minimised.
APEC – C	> 5% above national objective	**Annual Mean:** > 5% above national objective **24 hr:** > 1-day more than national objective.	Refusal on air quality grounds should be anticipated, unless the Local Authority has a specific policy enabling such land use and ensure best endeavours to reduce exposure are incorporated. Worker exposure in commercial/industrial land uses should be considered further. Mitigation measures must be presented with air quality assessment, detailing anticipated outcomes of mitigation measures.

5.10 The London Councils' guidance also provides a diagram for assisting in determining whether an application is significant in terms of air quality, and the flow chart is reproduced in Appendix H. The matter of significance is based on the professional judgement of the Local Authority officer, and it is advised that even where air quality is deemed not to be a significant consideration, mitigation measures may still be required.

National Planning Policy Framework

5.11 The latest National Planning Policy Framework (NPPF), issued by the Ministry of Housing, Communities and Local Government in 2019, sets out the Government's planning policies for England and how these are to be expected to be applied. The NPPF must be taken into account in the preparation of local and neighbourhood plans, and is to be a material consideration in planning decisions.

5.12 Paragraph 170 of the NPPF advises that, with respect to noise, planning policies and decisions should contribute to and enhance the natural and local environment by *"...preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans*".

5.13 Further, paragraph 181 advises that "*Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new* *development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan*."

Planning Practice Guidance

5.14 In March 2014 the Department for Communities & Local Government updated its on-line planning guidance to assist with interpretation of the NPPF. The guidance covers general matters such as relevance of air quality issues, role of the Local Plan, information sources, assessment approaches and mitigation. How considerations about air quality fit into the development management process is summarised by the guidance in a flowchart, which is included here in Appendix I with other relevant flow charts.

Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) – Land-Use Planning & Development Control: Planning For Air Quality 2017

5.15 Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) have produced this guidance to ensure that air quality is adequately considered in the land-use planning and development control processes.

5.16 The guidance clarifies when an air quality assessment is required and what it should contain. It sets out how impacts should be described and assessed. Importantly it sets out a recommended approach that can be used to assess the significance of the air quality impacts, taking account of the advice issued by IAQM. An important focus of this guidance is on minimising the air quality impacts of all developments for which air quality assessments have been requested by the planning authority; this will be through good design and application of appropriate mitigation measures.

5.17 Stage 1 of the assessment in the local area seeks to screen out smaller development and/or developments where impacts can be considered to have insignificant effects. The Stage 1 criteria are set out in Table 5.3 and require any of the criteria in row A, coupled with any of the criteria in row B, to apply before an assessment proceeds to Stage 2. If none of the criteria are met then the impacts can be considered to be insignificant and there is no requirement to carry out an air quality assessment.

Table 5.3: Stage 1 Criteria

	Criteria to Proceed to Stage 2
A.	If any of the following apply: • 10 or more residential units or a site of more than 0.5 ha • more than 1,000 m^2 of floor space for all other uses or a site area greater than 1 ha
B.	Coupled with any of the following: • the development has more than 10 parking spaces • the development will have a centralised energy facility or other centralised combustion process
Note: Consideration should still be given to the potential impacts of neighbouring sources on the site, even if an assessment of impacts of the development on the surrounding area is screened out.	

5.18 The criteria in Table 5.4 provide more specific guidance as to when an air quality assessment is likely to be required to assess the impacts of the proposed development on the local area.

Table 5.4: Indicative Criteria for Requiring an Air Quality Assessment

The development will:	Indicative Criteria to Proceed to an Air Quality Assessment
1. Cause a significant change in Light Duty Vehicle (LDV) traffic flows on local roads with relevant receptors. (LDV = cars and small vans<3.5t gross vehicle weight)	A change of LDV flows of: - more than 100 AADT within or adjacent to an AQMA - more than 500 AADT elsewhere
2. Cause a significant change in Heavy Duty Vehicle (HDV) flows on local roads with relevant receptors. (HDV = goods vehicles + buses >3.5t gross vehicle weight)	A change of HDV flows of: - more than 25 AADT within or adjacent to an AQMA - more than 100 AADT elsewhere
3. Realign roads, i.e. changing the proximity of receptors to traffic lanes.	Where the change is 5m or more and the road is within an AQMA.
4. Introduce a new junction or remove an existing junction near to relevant receptors.	Applies to junctions that cause traffic to significantly change vehicle accelerate/decelerate, e.g. traffic lights, or roundabouts.
5. Introduce or change a bus station.	Where bus flows will change by: - more than 25 AADT within or adjacent to an AQMA - more than 100 AADT elsewhere.
6. Have an underground car park with extraction system.	The ventilation extract for the car park will be within 20m of a relevant receptor Coupled with the car park having more than 100 movements per day (total in and out)
7. Have one or more substantial combustion processes.	Where the combustion unit is: - any centralised plant using bio fuel - any combustion plant with single or combined thermal input >300kW - a standby emergency generator associated with a centralised energy centre (if likely to be tested/used >18 hours a year)
8. Have a combustion process of any size.	Where the pollutants are exhausted from a vent or stack in a location and at a height that may give rise to impacts at receptors through insufficient dispersion. This criterion is intended to address those situations where a new development may be close to other buildings that could be residential and/or which could adversely affect the plume's dispersion by way of their size and/or height.

5.19 Where an air quality assessment is identified as being required, this may be either a Simple or a Detailed Assessment. A Simple Assessment is one relying on already published information and without quantification of impacts, in contrast to a Detailed Assessment that is completed with the aid of a predictive technique, such as a dispersion model. Passing a criterion in Table 5.4 does not automatically lead to the requirement for a Detailed Assessment. Once again, where none of the criteria are met the impacts can be considered to be insignificant and there is no requirement to carry out an air quality assessment.

5.20 The purpose of the air quality assessment is to define the likely quantitative or qualitative changes in air quality or exposure to air pollution as a result of the proposed development.

5.21 The suggested framework for describing the impacts on the basis set out above is set out in Table 5.5. The term Air Quality Assessment Level (AQAL) is used to include air quality objectives or limit values, where these exist. The Table is only intended to be used with annual mean concentrations, and all % changes are rounded up or down to whole numbers. At exposures less than 75% of the AQAL, the degree of harm is described as likely to be small. As the exposure encroaches and exceeds the AQAL the degree of harm increases, and the change becomes more important when the result is an exposure that is approximately equal to or greater than the AQAL.

Table 5.5: Impact Descriptors for Individual Receptors

Long term average Concentration at receptor in assessment year	**% Change in concentration relative to Air Quality Assessment Level (AQAL)**			
	1	**2-5**	**6-10**	**>10**
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

5.22 A judgement of the significance of the impacts is to be made by a competent professional who is suitably qualified, and the reasons for reaching the conclusions should be transparent and set out logically. Whilst the starting point for the assessment of significance is the degree of impact, as defined by Table 5.5, this should be seen as only one of the factors for consideration, not least because the outcome of this assessment procedure applies to a receptor and not the overall impact of the scheme on the locality.

5.23 The guidance also makes it clear that the presence of an AQMA should not halt all development, but where development is permitted, the planning system should ensure that any impacts are minimised as far as is practicable. Even where developments are proposed outside of AQMAs, and where pollutant concentrations are predicted to be below the objectives/limit values, it remains important that the proposed development incorporates good design principles and best practice measures and that emissions are fully minimized.

6.0 EASTLEIGH BOROUGH COUNCIL'S AIR QUALITY REVIEW AND ASSESSMENT

6.1 The First Updating and Screening Assessment (USA) was completed in 2003. The outcome was that a Detailed Assessment would be required for the following locations:

- Southampton Road, Eastleigh;
- Leigh Road, Eastleigh, close to junction 13 of the M3;
- Properties close to the M3, Chandlers Ford;
- Hamble Lane, Bursledon.

6.2 Since this time two detailed assessments have been carried out. The first Detailed Assessment was carried out in 2004 and considered all of the above areas and concluded that an Air Quality Management Area (AQMA) was required for Leigh Road and Southampton Road.

6.3 The second Detailed Assessment was carried out in 2005 following submission of the Progress Report. The assessment concluded that a further two AQMAs were required to cover the M3 motorway between junctions 12 and 14 and small areas of Hamble Lane between Jurd Way and Portsmouth Road junctions.

6.4 A 2006 USA concluded that there was no need for a Detailed Assessment of any pollutant. However, High Street, Botley was to be kept under review as the predicted nitrogen dioxide (NO_2) annual mean was close to exceeding the 2004 annual mean objective.

6.5 An annual Progress Report carried out in 2007 concluded that a Detailed Assessment would be required at High Street, Botley, to determine whether an AQMA would be required, along with further assessment just to the north of the existing Hamble Lane AQMA, with consideration given to extending this AQMA.

6.6 In March 2011, Eastleigh Borough Council (EBC) declared its fourth AQMA within the borough for exceedences of NO_2 covering High Street, Botley. The current AQMAs within the borough are as follows:

- A335 – Leigh Road (from the junction with Bournemouth Road, Chandlers Ford to the junction with Romsey Road, Eastleigh) Romsey Road, Southampton Road and Wide Lane (to the junction with the motorway spur road/Southampton Parkway railway station);
- M3 – junctions 12-14;
- Hamble Lane, Burledon – between the junctions with Portsmouth Road and Jurd Way;

- A335 – From the borough boundary, east of junction with the B3354, Winchester Street, to junction with Woodhouse Lane incorporating Broad Oak and a 5m corridor either side of it.

6.7 Eastleigh Borough Council's most recently published 2020 Annual Status Report (ASR) states that *"Considering trends in NO_2 levels at monitoring stations over the last eight years, concentrations are decreasing at the majority of sites, although fluctuations are seen from year to year which are often caused by meteorological conditions. However, exceedances of the annual average were measured at four locations in 2019. One of these was within the Eastleigh AQMA No.1 (A335) and three were within the newly extended Hamble Lane Area AQMA. In both of these AQMAs there is evidence that the fall in concentrations is slowing in more recent years and at some sites the decreasing trend cannot be identified. The fall in NO_2 concentrations is generally clearer at sites in the Eastleigh AQMA No.2 (M3) and High Street Botley AQMA and no recent exceedances have been measured in these areas."*

6.8 In conclusion, air quality within the Borough of Eastleigh is generally good and, with the exception of the AQMAs, air quality objectives are met throughout the Borough. The closest AQMA (Hamble Lane) is approximately 2km from the proposed development site and will, therefore, have no direct effect on the proposed development at Satchell Lane. Since 'relevant exposure' is already present adjacent to the site, i.e. existing residential dwellings are present adjacent to the site and local roads, and these have already been considered within EBC's reviews and assessments, the same conclusions will apply for new dwellings on the application site. Namely, all air quality objectives will be satisfied on the site and at dwellings adjacent to the routes to the proposed development site.

6.9 Nevertheless, it will be important that the air quality assessment for the proposed development looks at the potential effects of traffic generated by development upon existing dwellings adjacent to local roads to establish that there will be no adverse effects upon their existing standards of air quality. This matter is covered in the following section.

7.0 AIR QUALITY ASSESSMENT

7.1 The number of new dwellings within the proposed development exceeds the threshold of 10 in the EPUK/IAQM guidance (Table 5.3), therefore, the assessment proceeds to Stage 2, which considers the number of vehicles generated by development.

Traffic Data

7.2 Baseline two-way Annual Average Daytime Traffic (AADT) flows for local roads have been obtained from the project's traffic engineers (C&A Consulting Engineers Ltd), and are summarised below in Table 7.1.

Table 7.1: Daily Traffic Flows

Road/Situation	Year	AADT	%HGV	kph	Receptor Distance (m)
Satchell Lane (east of access) Base	2019	18386	8	48	6
Satchell Lane (east of access) Base	2022	19672	8		
Satchell Lane (east of access) Base+Dev.	2022	20015	7		
Satchell Lane (west of access) Base	2019	17972	8		10
Satchell Lane (west of access) Base	2022	19229	8		
Satchell Lane (west of access) Base+Dev.	2022	19398	7		

7.3 The traffic flows have been used to calculate ambient concentrations of air pollution at selected receptors representing existing and/or new dwellings adjacent to the road, i.e. at a distance of approximately 6m from the road centreline of Satchell Lane (east of the site access), and 10m from the road centreline of Satchell Lane (west of the site access).

7.4 For determining compliance with air quality objectives, it is important that the contribution of emissions from baseline and with development traffic is added to background concentrations already present in the area; these are defined in the following section.

Background Air Quality

7.5 There are no automatic monitoring sites in the immediate vicinity of the development site from which background concentrations can be obtained. Therefore, suitable estimates of background air quality have been derived in accordance with LAQM.TG(16) using the air pollution background concentration maps published by Defra. The maps are updated by Defra periodically to reflect changes to underlying data including emissions factors. In recent years there have been annual updates due to new information on NO_x emissions from diesel vehicles, and fleet and vehicle activity data have also been updated. Average background pollutant concentrations for local 1 x 1 km grid squares are available for all future years, and Table 7.2 shows the background concentrations that were used in this assessment. Background values for NO_x are presented, as they are required in the conversion of modelled NO_x concentrations to total NO_2. Only those pollutants of real concern to the local authority, namely NO_2 and PM_{10}, are considered.

Table 7.2: Background Concentrations of Air Pollution, Annual Mean µg/m^3

Year	NO_x	NO_2	PM_{10}
2017	39.50	26.13	17.42
2022	37.94	25.27	16.87

Impact Assessment

7.6 The above information relating to traffic flows and background concentrations has been input to the DMRB screening model along with the distance representing the shortest distance between the centreline of the road and dwellings closest to the road. The results of the DMRB assessment are presented in Appendix I.

7.7 The results indicate that for a baseline traffic situation in 2017 and 2022, receptors adjacent to Satchell Lane have values below the current annual mean air quality objectives for NO_2 and PM_{10}, which is consistent with EBC's air quality review and assessments.

7.8 With traffic generated by development in 2022, the absolute concentrations still remain below the current air quality objectives and the level of change due to traffic generated by development is very small (0.1 µg/m^3 or less, to annual mean concentrations of NO_2 and PM_{10}), which would not have a significant impact upon local air quality.

7.9 The ambient concentrations of local traffic emissions are predicted to be 75% or less of the Air Quality Assessment Level (AQAL) (see Table 5.5), and the % change in concentration relative to the AQAL due to development traffic is calculated to be less than 1%. On this basis, the development's impact on local air quality will be negligible.

7.10 If one considers the air quality effects against the London Councils guidance, the local air pollution exposure as a consequence of the proposals would fall within the category APEC-A, for which there would be no air quality grounds for refusal. Likewise, using the significance flowcharts in Appendix VI, the development would not contribute to air quality exceedences or lead to the designation of a new AQMA, nor would it significantly increase emissions or lead to new exposure to emissions considered to be significant. Therefore, the air quality issues for the proposed development are not deemed to be a significant consideration.

7.11 Therefore, since the air quality assessment indicates that annual mean air quality objectives will be met at the most exposed receptor locations, and since the actual changes due to traffic generated by development are small and insignificant, it can be concluded that the air quality over the site is acceptable for residential development and that baseline plus development traffic will not have any adverse impacts on ambient air quality for existing dwellings. The results do not indicate a requirement for more detailed dispersion modelling.

8.0 CONCLUSIONS

Noise

8.1 During the survey periods the predominant noise source for the site was at all times road traffic using Satchell Lane.

8.2 None of the noise levels were high, and they were all lower than levels that are commonly encountered at approved developments adjacent to transportation routes. Consequently, acceptable noise standards will be readily achieved using practicable forms of noise mitigation as discussed below.

8.3 For new dwellings facing Satchell Lane, windows facing the road will need to provide a minimum sound reduction (R_{TRA}) of no more than 24 dB R_{TRA} in order to achieve BS8233's internal L_{Aeq} and L_{Amax} noise levels. Normal thermal double glazing having a configuration of 4/12/4 or 4/16/4, where the information is presented in terms of the thickness of one pane of glass in mm, followed by the size of the air gap, followed by the thickness of the second pane of glass, typically provides a sound reduction of 25 dB R_{TRA}, which would be more than sufficient to enable all internal noise standards to be met.

8.4 Opening windows for ventilation purposes would reduce the insulation provided by the building façade and internal noise levels would then exceed the design standards, although this situation is not unusual for residential areas within the urban environment where transportation noise is prevalent. Passive acoustic ventilators, such as acoustic trickle vents in the window frames or acoustic airbrick type vents within the walls, can be used for habitable rooms that have windows having an unscreened view towards Satchell Lane. These would enable occupiers to obtain natural ventilation with windows closed, without any loss of amenity due to noise intrusion.

8.5 It has been assumed that dwellings will face the road at a distance of 15m, with private gardens used for amenity purposes located behind new dwellings, and thereby, experiencing additional distance attenuation as well as screening from the dwellings themselves. In this scenario, a conservative attenuation of 10 dB(A) would apply and, together with the additional distance attenuation, would result in an outdoor noise level of approximately 41 dB L_{Aeq} for garden areas, which would satisfy the BS8233/WHO outdoor criterion of 55 dB.

8.6 Any residual garden areas having a partial unscreened view to the road should have at least a 1.8m high close-boarded timber fence or equivalent structure along the garden boundary to minimise the traffic noise impacts. This would typically provide an attenuation of 7 dB(A) and would minimise the impact of traffic noise in accordance with the guidance of BS8233.

8.7 Dwellings further into the site will experience lower noise levels due to the additional distance attenuation and the screening provided by dwellings located adjacent to Satchell Lane. As a consequence, acceptable internal noise levels will be achieved using normal thermal double glazing, and the outdoor noise criterion will be met at all locations.

8.8 For all existing receptors adjacent to Satchell Lane, the noise changes due to development traffic are 0.1 dB or less. Therefore, the development would have no impact upon existing dwellings adjacent to Satchell Lane.

8.9 The noise assessment demonstrates that acceptable external and internal noise levels will be readily achieved for residents using reasonable and practicable forms of noise mitigation, consequently this is a matter that can be dealt with by way of a routine planning condition. If required, specific noise standards to be achieved inside dwellings can be specified within a planning condition, and these would be attained by way of appropriate window designs. With relevant noise standards met, the proposed development would satisfy the requirements of the NPPF, and internal and external noise levels would be similar to or better than those for the consented scheme.

Air Quality

8.10 Assessments in accordance with Local Air Quality Management guidance indicate for a baseline traffic situation in 2017 and 2022, receptors adjacent to Satchell Lane have values below the current annual mean air quality objectives for NO_2 and PM_{10}, which is consistent with EBC's air quality review and assessments.

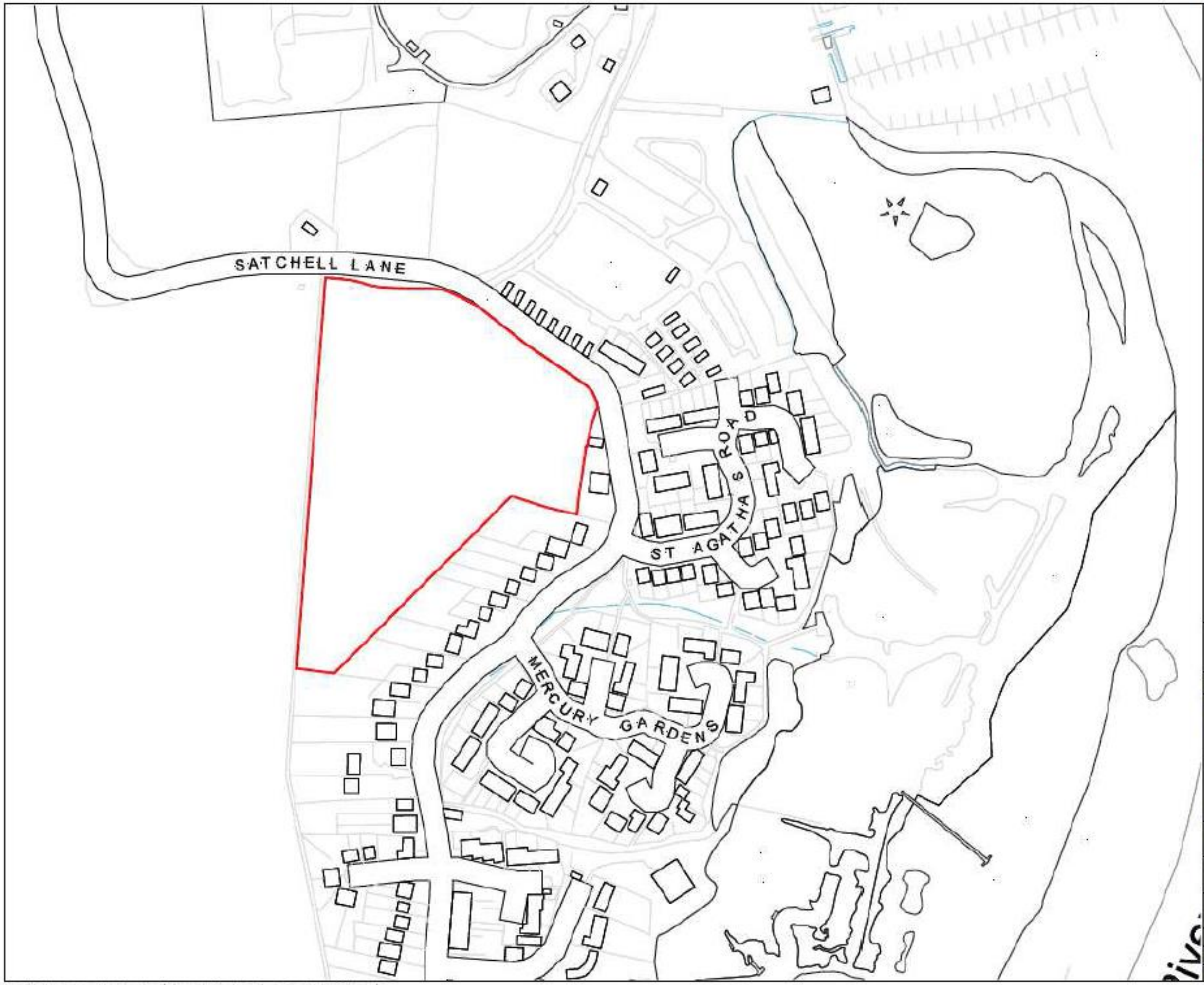
8.11 With traffic generated by development in 2022, the absolute concentrations still remain below the current air quality objectives and the level of change due to traffic generated by development is very small (0.1 $\mu g/m^3$ or less, to annual mean concentrations of NO_2 and PM_{10}), which would not have a significant impact upon local air quality.

8.12 Relative to the Air Quality Assessment Levels (AQAL) of the latest EPUK and IAQM guidance, the development's impact on local air quality is defined as negligible.

8.13 If one considers the air quality effects against the London Councils guidance, the local air pollution exposure as a consequence of the proposals would fall within the category APEC-A, for which there would be no air quality grounds for refusal. Likewise, using significance flowcharts, the development would not contribute to air quality exceedences or lead to the designation of a new AQMA, nor would it significantly increase emissions or lead to new exposure to emissions considered to be significant. Therefore, the air quality issues for the proposed development are not deemed to be a significant consideration.

8.14 Therefore, since the air quality assessment indicates that annual mean air quality objectives will be met at the most exposed receptor locations, and since the actual changes due to traffic generated by development are small and insignificant, it can be concluded that the air quality over the site is acceptable for residential development and that baseline plus development traffic will not have any adverse impacts on ambient air quality for existing dwellings. The results do not indicate a requirement for more detailed dispersion modelling.

APPENDIX A



N

0 50 100 metres

Site Application Boundary: **3.55ha**

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Rev	Date	By	Description
A	05.04.2017	AgB	Minor amendments

CSA environmental

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Project	Land west of Satchell Lane, Hamble		
Title	Site Location Plan		
Client	Mr R Jaraway & Mr S Bull		
Scale	1:2,500 @ A3	Drawn	SG
Date	March 2017	Checked	RR
Drawing No.	CSA/3212/104	Rev	A

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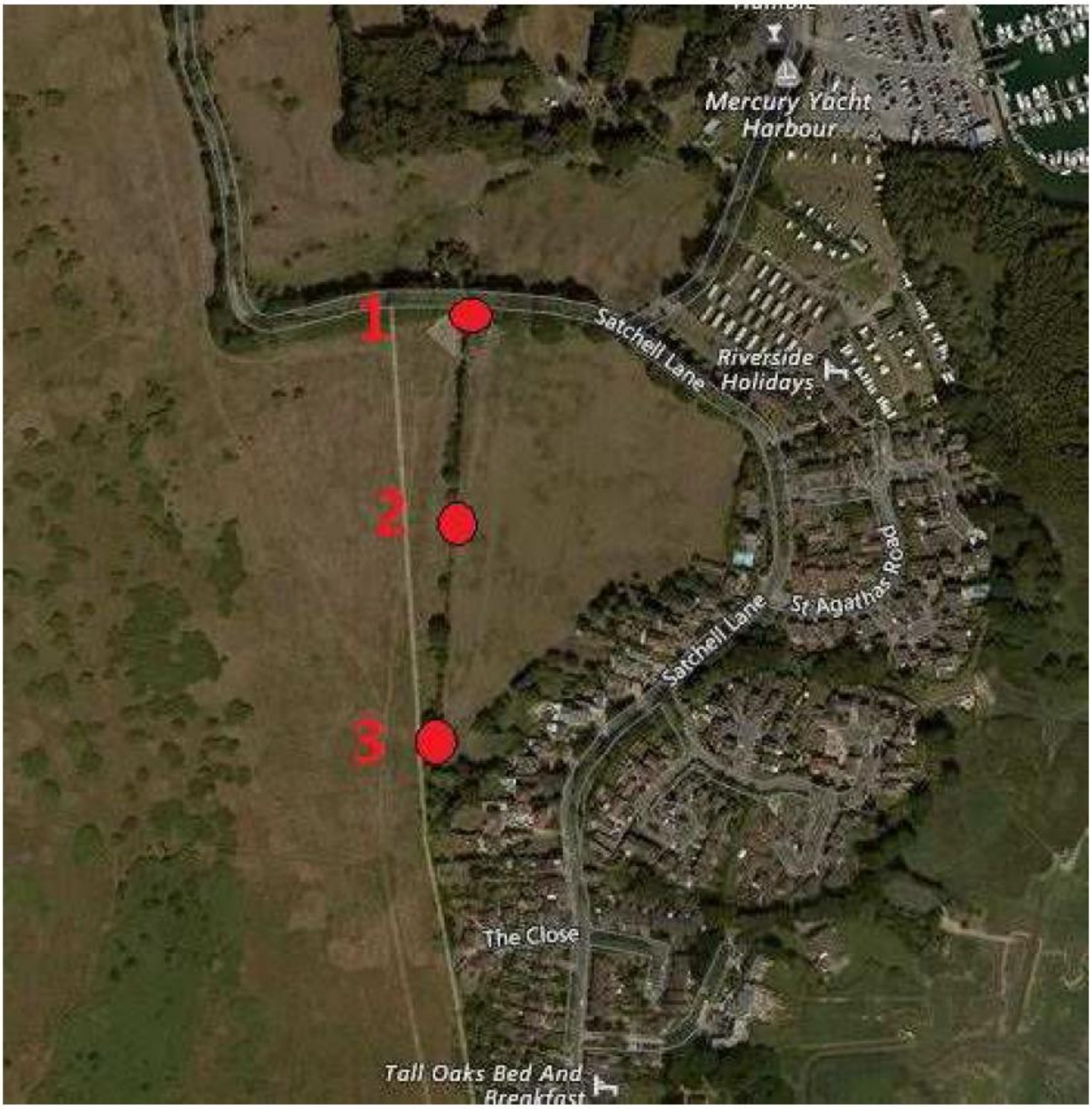
APPENDIX B

Noise Monitoring Positions



APPENDIX C

DESCRIPTION OF NOISE UNITS

- The sounds that we hear are a result of successive air pressure changes. These air pressure changes are generated by vibrating sources, such as motor vehicle engines, and they travel to a receiver, i.e. the human ear, as air pressure waves.

- The human ear is capable of detecting a vast range of air pressures, from the lowest sound intensity that the normal ear can detect (about 10^{-12} watts/m^2) to the highest that can be withstood without physical pain (about 10 watts/m^2). If we were to use a linear scale to represent this range of human sensitivity it would encompass a billion units. Clearly this would be an unmanageable scale yielding unwieldy numbers.

- The scale can be compressed by converting it to a logarithmic or Bel scale, the number of Bels being the logarithm to the base 10 of one value to another (as applied by Alexander Graham Bell to measure the intensity of electric currents). The Bel scale gives a compressed range of 0 to 12 units which in practice is a little too compressed. A change of 1 Bel represents a doubling or halving of loudness to the average listener. A more practical operating range of 0 to 120 is obtained by multiplying by 10, i.e. 10 x Bel, which produces the scale units known as decibels or dB.

- Examples of typical sound intensity levels within the decibel range of 0 to 120 dB are listed below:

Four engine jet aircraft at 100m	120 dB
Riveting of steel plate at 10m	105 dB
Pneumatic drill at 10m	90 dB
Circular wood saw at 10m	80 dB
Heavy road traffic at 10m	75 dB
Telephone bell at 10m	65 dB
Male speech, average at 10m	50 dB
Whisper at 10m	25 dB
Threshold of hearing, 1000 Hz	0 dB

- Due to this logarithmic scale noise levels have to be combined logarithmically rather than arithmetically. For example, two equal sound sources of 70 dB each, when operated simultaneously, do not produce a combined level of 140 dB but instead result in a level of 73 dB, i.e. a rise of 3 dB for each doubling of sound intensity. Subjectively, a 3 dB change does not represent a doubling or halving of loudness; to make a sound appear twice as loud requires an increase in sound pressure level of about 10 dB.

- The sensitivity of the human ear to different acoustic frequencies of sound can be taken into account when measuring or calculating noise by applying a filter or weighting which equates to the frequency response of the human ear. This is referred to as an A-weighting and when applied results in noise levels expressed as dB(A). dB(A) noise levels reflect the human perception of loudness.

- Due to the often broadband and variable nature of environmental noises such as traffic, people exposed to different levels of noise do not make consistently different judgements about the noise climate until the difference in average noise level is about 3 dB(A). This is equivalent to a doubling of sound energy or, for example, a doubling of traffic flow. However, individuals are able to detect much lesser changes in noise exposure in any given situation and under ideal conditions can detect differences of as little as 1dB.

- Noise levels that fluctuate over time can be measured using a variety of noise indices. One index that correlates fairly well with community annoyance due to road traffic noise is the $L_{A10\ (18\text{-hour})}$ noise index. The L_{A10} is the A-weighted sound level exceeded for 10% of the time, and the $L_{A10\ (18\text{-hour})}$ is the arithmetic mean of the 18 hourly L_{A10} values during the period 6am to midnight (0600 to 2400 hours).

- An alternative index used in the UK to characterise intermittent sources of noise such as railways or construction sites is the equivalent continuous noise level, L_{Aeq}. It is a measure of the total sound energy generated by a fluctuating sound signal within a given time period and can be derived by 'spreading' the total sound energy evenly over the same time period as the fluctuating signal, hence the term 'equivalent continuous noise level'.

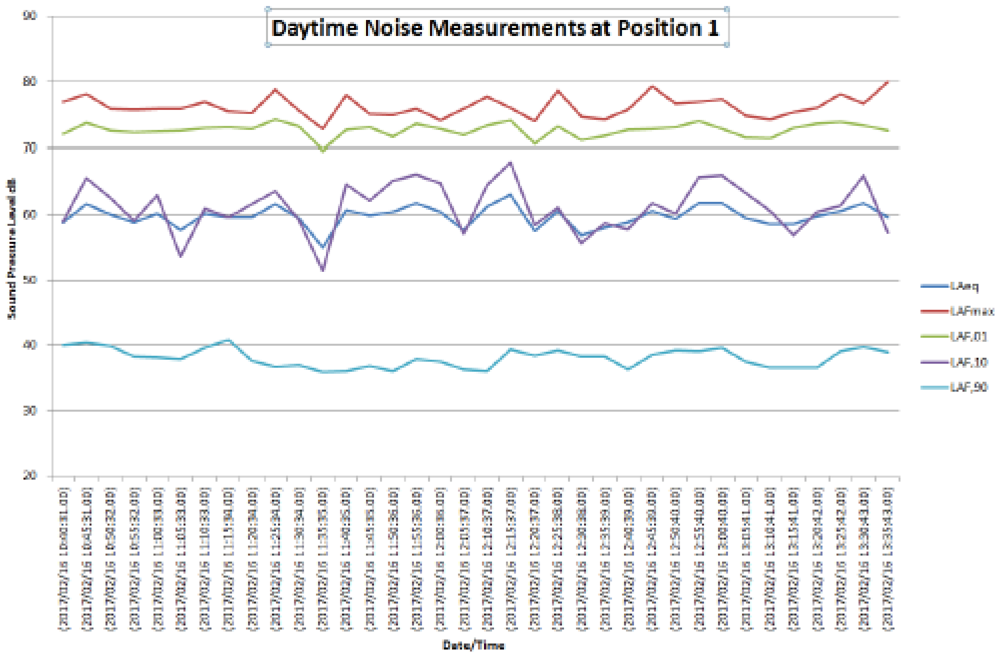
- Other useful noise units include the L_{Amax}, which is the maximum A-weighted sound level often used to characterise single events, and the L_{A90} which is the level of noise exceeded for 90% of the time and is an indicator of the background noise levels in the absence of specific sources such as traffic.

APPENDIX D

Noise Measurements

Date	LAeq	LAmax	LAF,01	LAF,10	LAF,90
Position 1 Night					
(2017/02/15 23:00:03.00)	56.1	76	72.3	45.4	36.9
(2017/02/15 23:05:03.00)	58	82.3	68.4	42	37.2
(2017/02/15 23:10:03.00)	37.8	42.7	41.4	38.9	36.6
(2017/02/15 23:15:04.00)	38.5	45.5	43.9	40.4	36.5
(2017/02/15 23:20:04.00)	54.2	75.7	68.3	40.3	36.1
(2017/02/15 23:25:04.00)	58.1	78.9	72.8	47.9	36.3
(2017/02/15 23:30:04.00)	54	76.8	67.2	40.6	35.3
(2017/02/15 23:35:05.00)	55.4	77.3	69.5	43.1	35
(2017/02/15 23:40:05.00)	56	76.8	70.4	46.6	35.5
(2017/02/15 23:45:05.00)	36.8	47.2	40.5	37.9	35.5
(2017/02/15 23:50:05.00)	36.5	47.1	40.6	37.6	35.1
(2017/02/15 23:55:06.00)	56.8	78.7	70	43.4	35.3
Average	49.9	67.1	60.4	42	35.9
Maximum	58.1	82.3	72.8	47.9	37.2
Position 1 Day					
(2017/02/16 10:40:19.00)	42.4	51.5	-	44	37.1
(2017/02/16 10:40:31.00)	58.8	76.9	72.1	59	40.1
(2017/02/16 10:45:31.00)	61.6	78.1	73.8	65.6	40.5
(2017/02/16 10:50:32.00)	60	75.9	72.6	62.6	39.9
(2017/02/16 10:55:32.00)	58.8	75.8	72.3	59.1	38.4
(2017/02/16 11:00:33.00)	60.1	75.9	72.5	63	38.2
(2017/02/16 11:05:33.00)	57.7	75.9	72.6	53.6	38
(2017/02/16 11:10:33.00)	60.2	76.9	73	60.9	39.7
(2017/02/16 11:15:34.00)	59.7	75.5	73.1	59.7	40.8
(2017/02/16 11:20:34.00)	59.7	75.2	72.9	61.6	37.7
(2017/02/16 11:25:34.00)	61.6	78.8	74.3	63.6	36.8
(2017/02/16 11:30:34.00)	59.5	75.6	73.3	59.3	37
(2017/02/16 11:35:35.00)	55	72.8	69.7	51.4	36
(2017/02/16 11:40:35.00)	60.7	78	72.7	64.6	36.1
(2017/02/16 11:45:35.00)	59.9	75.1	73.1	62.1	36.9
(2017/02/16 11:50:36.00)	60.4	75	71.7	65.2	36.1
(2017/02/16 11:55:36.00)	61.8	75.9	73.7	66.1	37.9
(2017/02/16 12:00:36.00)	60.4	74.2	72.9	64.8	37.5
(2017/02/16 12:05:37.00)	57.7	75.9	72	57.1	36.3
(2017/02/16 12:10:37.00)	61.2	77.8	73.4	64.5	36.1
(2017/02/16 12:15:37.00)	63.1	76.1	74.2	68	39.4
(2017/02/16 12:20:37.00)	57.5	74	70.6	58.4	38.5
(2017/02/16 12:25:38.00)	60.5	78.7	73.2	61.1	39.2
(2017/02/16 12:30:38.00)	56.9	74.7	71.1	55.7	38.3
(2017/02/16 12:35:39.00)	58.1	74.3	71.8	58.7	38.3
(2017/02/16 12:40:39.00)	58.9	75.8	72.7	57.8	36.3
(2017/02/16 12:45:39.00)	60.6	79.3	72.8	61.7	38.6
(2017/02/16 12:50:40.00)	59.4	76.7	73.1	60.2	39.3
(2017/02/16 12:55:40.00)	61.7	76.9	74	65.7	39.1
(2017/02/16 13:00:40.00)	61.7	77.4	72.9	66	39.7

(2017/02/16 13:05:41.00)	59.5	74.8	71.5	63.3	37.5
(2017/02/16 13:10:41.00)	58.6	74.3	71.4	60.5	36.6
(2017/02/16 13:15:41.00)	58.6	75.4	73	56.9	36.6
(2017/02/16 13:20:42.00)	59.8	76.1	73.6	60.4	36.6
(2017/02/16 13:25:42.00)	60.5	78.1	73.9	61.4	39.1
(2017/02/16 13:30:43.00)	61.8	76.7	73.4	66	39.8
(2017/02/16 13:35:43.00)	59.7	80	72.6	57.3	39
Average	59.3	75.6	72.7	60.7	38.1
Maximum	63.1	80	74.3	68	40.8
Position 2					
16/02/17 11:24	42.4	60.4	51.9	44.1	36.2
16/02/17 11:29	46.8	66.3	56.7	50.3	36.2
16/02/17 11:34	43.4	62.4	56.2	43	36.6
16/02/17 11:39	40.1	53.8	48.4	42.6	36.3
16/02/17 11:44	40.4	59.6	49.6	41.7	35.2
16/02/17 11:49	41.5	56.4	49.6	44.6	36.1
Average	42.4	59.8	52.1	44.4	36.1
Maximum	46.8	66.3	56.7	50.3	36.6
Position 3					
16/02/17 11:58	38.4	54.5	46.8	39.9	34.8
16/02/17 12:03	40.6	64.1	49	40.2	35
16/02/17 12:08	37.3	51.7	44.8	38.4	34.4
16/02/17 12:13	39.6	51	45.3	42.3	36.1
16/02/17 12:18	39.2	58	45.6	40.4	35.9
16/02/17 12:23	42.4	54.8	50.9	45.5	37.2
Average	39.6	55.7	47.1	41.1	35.6
Maximum	42.4	64.1	50.9	45.5	37.2



APPENDIX E

INDICATIVE SOUND INSULATION PERFORMANCE OF DIFFERENT WINDOW CONFIGURATIONS

Third octave band centre frequency Hz	Sound Insulation (dB) for Glass Thickness (mm)																					
	4/16/4 or 4/12/4		6/12/6		6/12/6.4 PVB		10/12/4		10/12/6		10/12/6.4 PVB		Acoustic Laminate									
													6/12/7		6/12/11		10/12/16		13/12/13		16/12/16	
100	25		17		19		23		27		27		25		26		26		30		31	
125	24	24	26	20	24	21	28	25	27	26	28	27	27	26	25	26	28	27	27	28	34	32
160	23		22		21		26		24		26		26		25		26		27		33	
200	21		18		19		19		24		26		23		25		24		31		34	
250	21	20	18	19	19	20	23	22	29	27	30	29	24	25	28	28	28	27	38	34	38	37
315	19		24		24		26		31		32		28		32		31		39		39	
400	22		27		28		31		33		34		30		35		34		41		43	
500	25	25	29	29	32	31	33	33	34	34	36	36	34	33	39	38	38	37	44	44	46	45
630	30		33		34		36		37		40		37		43		41		48		48	
800	33		37		38		39		39		41		42		46		44		51		50	
1000	36	35	39	38	40	39	41	40	41	40	42	41	45	44	47	47	45	45	53	52	48	46
1250	38		39		40		41		41		41		46		47		46		52		43	
1600	40		39		39		41		39		41		46		46		44		49		43	
2000	41	38	34	36	35	37	45	43	37	38	42	42	45	46	43	43	42	44	45	47	46	46
2500	35		37		39		45		40		44		48		42		44		48		50	
3150	31		42		44		42		43		49		51		47		51		52		53	
4000	40	35	47	45	49	47	44	44	47	46	53	52	52	52	54	51	56	54	57	55	59	57
R_m dB	29		30		31		34		34		36		36		37		39		42		42	
R_w dB	31		33		34		36		38		40		38		41		42		45		46	
R_{TRA} dBA	25		26		27		29		32		34		31		33		37		38		41	

Notes:
1. The glass thickness is presented in terms of the thickness of one pane of glass, followed by the size of the air gap, followed by the thickness of the second pane of glass, all dimensions in millimetres.
2. 6.4mm PVB glass denotes a laminated glass consisting of a tough plastic interlayer made of polyvinyl butyral (PVB) bonded together between two panes of glass.

APPENDIX F

Assessment of LA10 18-hour basic noise levels at 10m from road

	Base 2022			2022 With dev				BNL 18hr		
		Speed	18-hr		Speed	18-hr				
Road	%HGV	kph	Flow	%HGV	kph	Flow	%Change	Base	With dev	Change
Satchell Ln (east of access)	8	48	2270	7	48	2497	10	62.3	62.4	0.1
Satchell Ln (west of access)	8	48	2270	7	48	2483	9.4	62.3	62.4	0.1

APPENDIX G

DEFINITION OF AIR QUALITY TERMS AND UNITS

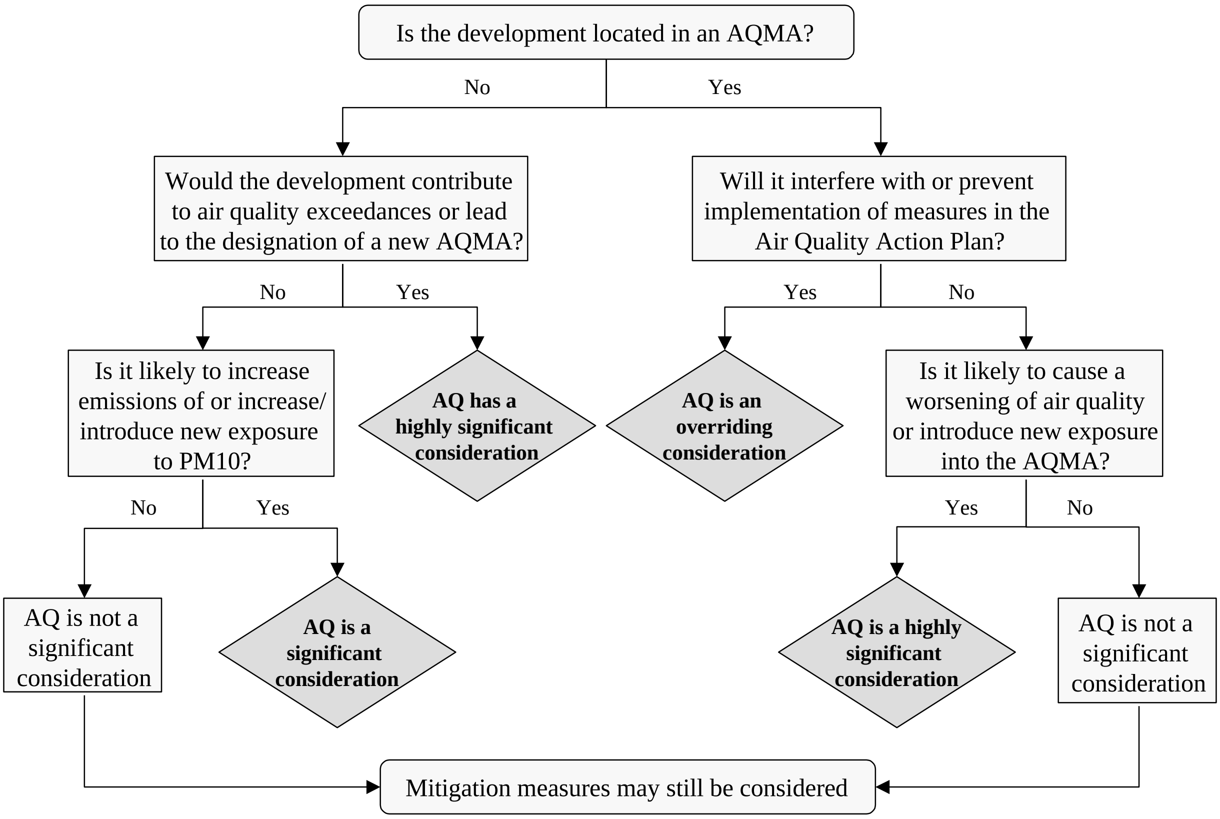
ppm	parts per million - defines the units of pollution in every million (10^6) units of air.
ppb	parts per billion - defines the units of pollution in every billion (10^9) units of air.
$\mu g/m^3$	microgrammes per cubic metre - one microgramme is one millionth of a gram.
ng/m^3	nanogrammes per cubic metre – one nanogramme is one milliardth (i.e. one thousand millionth of a gram (10^{-9}))

Annual mean	the average of the concentrations measured for one year.
1-hour mean	the average of the concentrations measured for one hour.
24-hour mean	the average of the concentrations measured for twenty four hours.
Running mean	the mean or series of means calculated for overlapping time periods. For example, an 8-hour running mean is calculated every hour and averages the values for eight hours. The period of averaging is stepped forward by one hour for each subsequent value so that a degree of overlap exists between successive values. Non-running means are calculated for consecutive time periods so that there is no overlap.
Percentile	a value that establishes a particular threshold in a collection of data. For example, the 90th percentile of yearly values is the value that 90% of all the data in the year fall below or equal.
Exceedance	a period of time when the concentration of a pollutant is greater than, or equal to, the relevant air quality standard.

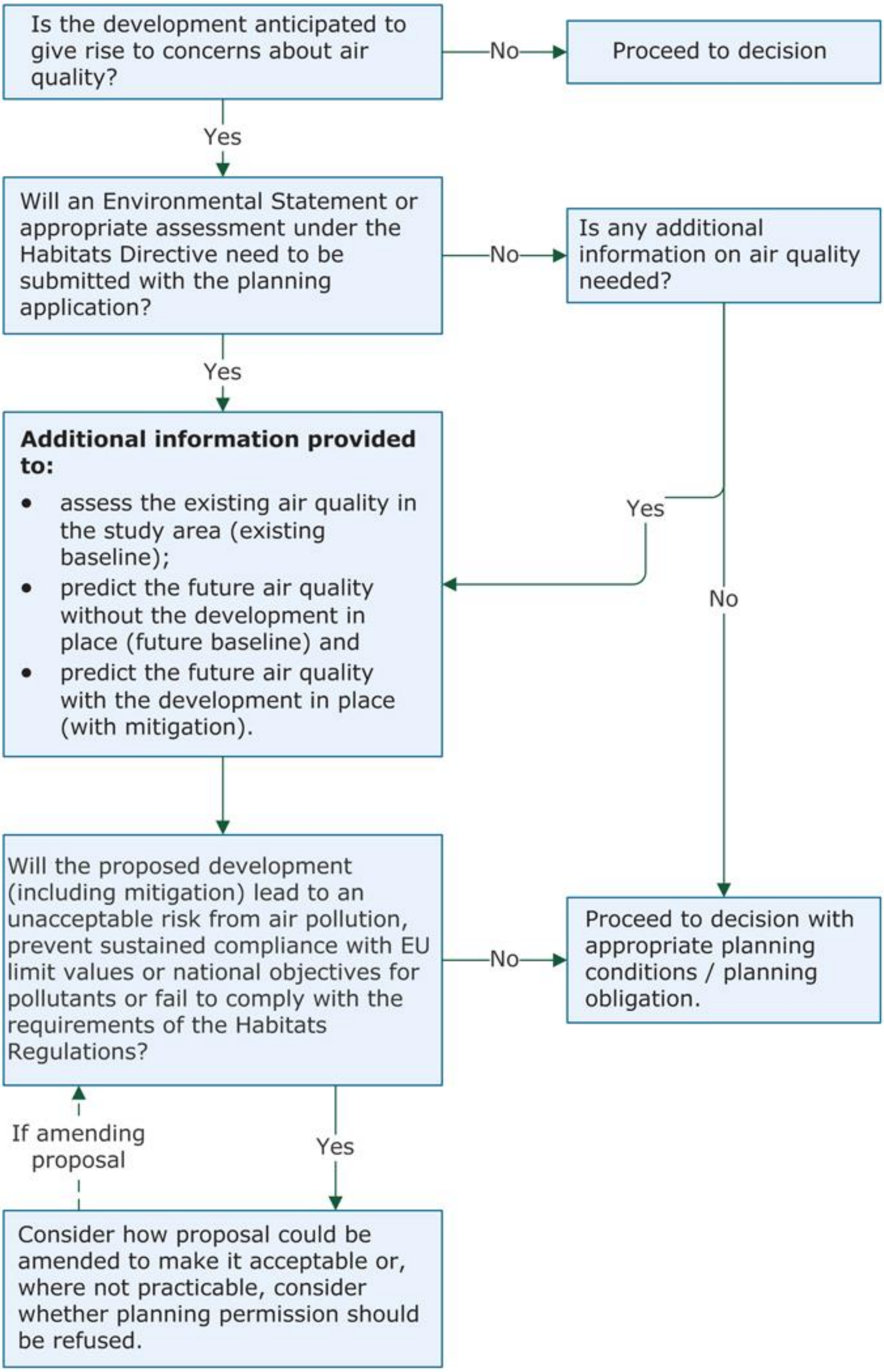
APPENDIX H

London Councils' Guidance

Determining significant impacts on air quality



Note: Where **significant** is used, it will be based on the professional judgement of the Local Authority officer.


Is the development anticipated to give rise to concerns about air quality?
No
Proceed to decision
Yes
Will an Environmental Statement or appropriate assessment under the Habitats Directive need to be submitted with the planning application?
No
Is any additional information on air quality needed?
Yes
Additional information provided to:
• assess the existing air quality in the study area (existing baseline);
• predict the future air quality without the development in place (future baseline) and
• predict the future air quality with the development in place (with mitigation).
Yes
No
Will the proposed development (including mitigation) lead to an unacceptable risk from air pollution, prevent sustained compliance with EU limit values or national objectives for pollutants or fail to comply with the requirements of the Habitats Regulations?
No
Proceed to decision with appropriate planning conditions / planning obligation.
If amending proposal
Yes
Consider how proposal could be amended to make it acceptable or, where not practicable, consider whether planning permission should be refused.

APPENDIX I

Forecast Concentrations of Air Pollution

Name	Year	NO_x	NO_2 *	PM_{10}	
		Annual mean µg/m^3	Annual mean µg/m^3	Annual mean µg/m^3	Days >50µg/m^3
Satchell Ln (east of access) Baseline	2017	41.81	26.77	17.63	1.13
Satchell Ln (east of access) Baseline	2022	40.31	25.93	17.09	0.79
Satchell Ln (east of access) Base+Dev.	2022	40.39	25.95	17.11	0.80
Change		0.08	0.02	0.02	0.01
Satchell Ln (west of access) Baseline	2017	41.61	26.71	17.62	1.12
Satchell Ln (west of access) Baseline	2022	40.11	25.87	17.07	0.78
Satchell Ln (west of access) Base+Dev.	2022	40.16	25.89	17.09	0.79
Change		0.05	0.02	0.02	0.01

Note: The NO_2 criteria are defined in terms of both the annual mean of 40 µg/m^3, and the number of exceedances of a 1-hour mean of 200 µg/m^3. Whilst the annual mean NO_2 value is calculated, the number of exceedances of the hourly standard cannot be calculated from the annual mean with a high degree of confidence. Therefore, only the annual mean NO_2 value is reported.

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