Planning Noise Assessment for a proposed Residential Development and Aldi Food Store at the former Walton Hospital Site, Rice Lane, Liverpool

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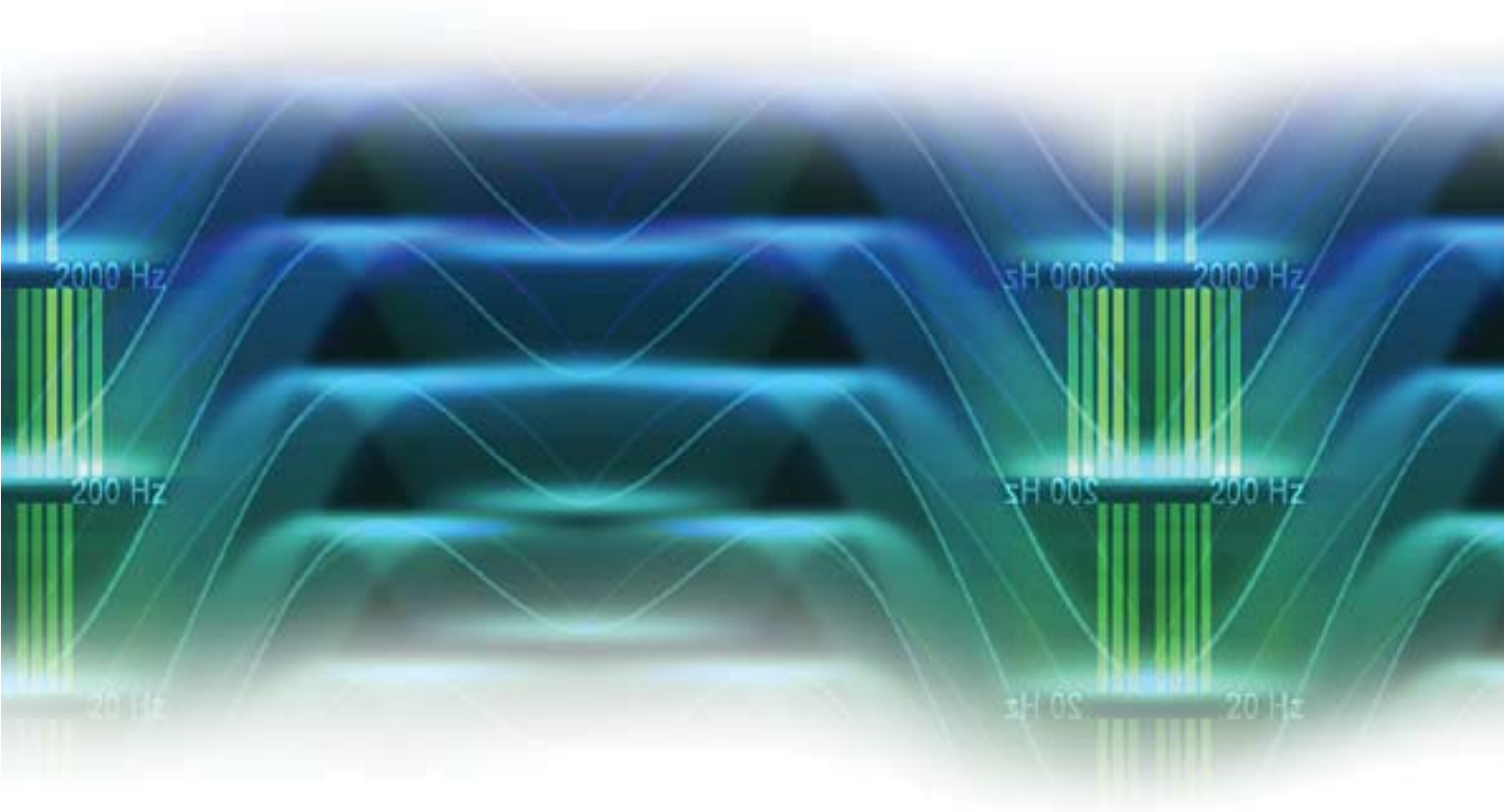

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1. INTRODUCTION

Mulbury Homes, as a joint applicant with Derwent Lodge Estates Limited, The Riverside Group Limited and Aldi Stores Limited, is seeking planning permission for a new mixed use development consisting of one hundred and ninety five residential properties and 1,804m^2 Aldi food store on land at the former Walton Hospital Site, Rice Lane in Liverpool. The proposed development site is located in a sensitive area. Consequently, the Local Planning Authority requires a noise assessment covering the new residential properties and Aldi food store.

Accordingly, Spectrum Acoustic Consultants has been commissioned by Mulbury Homes to carry out a noise assessment for the purpose of establishing the existing and future noise environment impacting on the proposed residential properties, as well as the potential noise impacts associated with the proposed food store. This report provides the information required to inform and satisfy the requirements of the Local Planning Authority, for the purpose of determining the application.

2. SITE DESCRIPTION AND PROPOSALS

The proposed development would comprise of one hundred and ninety five residential properties and an Aldi food store spread across three parcels of land. The site is currently disused and surrounds the recently completed Clock View Mental Health facility. For information on the proposed scheme, the existing site location plans are included in Appendix A, with the proposed scheme layout plans included in Appendix B.

The site is located in a mixed commercial and residential area on the north side of Liverpool. Rice Lane bounds the site to the east. A railway line situated in cutting bounds the site to the west. To the north and south of the site are a number of existing residential properties.

The proposed Aldi food store would trade between 08:00 and 23:00, Monday to Saturday and between 10:00 and 16:00 on Sundays. Service deliveries to the store are proposed between 07:00 and 23:00.

3. ASSESSMENT METHODOLOGY

The assessment of noise associated with the proposed residential aspect of the development uses ambient noise levels measured at the proposed development site to provide a comparison of the predicted noise levels inside habitable rooms and the gardens against the target noise levels specified in BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings* and Guidelines for Community Noise - World Health Organization, 1999 (WHO).

To assess the environmental noise impact of a new commercial development, such as the proposed food store, it is generally accepted that the predicted noise levels from the use need to be compared with the existing background noise levels at the nearest noise sensitive receptor locations to the site. The potential noise impacts associated with the Aldi food store include continuous noise from mechanical services plant, together with intermittent noise from deliveries.

The noise impact assessment associated with the proposed food store adopts the assessment methodology set out in BS 4142[1] by comparing the predicted noise levels from both mechanical plant and deliveries, with the existing background noise levels, as measured at the nearby existing and proposed residential receptor locations, during a site noise measurement survey. Further detail on the BS 4142 assessment procedure is provided in Section 5 of this report.

Spectrum has previously carried out a detailed noise survey at an existing Aldi food store, to measure and evaluate noise produced through the delivery process, involving vehicle movements on site and unloading activity. The results from this survey have been used to inform the BS 4142 assessment, relating to the potential noise impact from deliveries at the proposed Aldi food store on Rice Lane.

4. AMBIENT NOISE MEASUREMENT SURVEY

4.1 COMMUNITY RECEPTOR LOCATIONS

For the purpose of the assessment, the following residential receptor positions have been identified as being representative of the most sensitive in terms of proximity to the new Aldi food store. They are also representative of the proposed residential aspect of the application. These positions are illustrated on the existing site location plan, included in Appendix A.

- Position 1 Representative of proposed Plot 24 overlooking the railway line
- Position 2 Representative of proposed Block A
- Position 3 Representative of proposed Block B overlooking Rice Lane
- Position 4 Representative of proposed Plot 110 overlooking the railway line
- Position 5 Representative of proposed Plot 90 adjacent to the proposed Aldi store
- Position 6 Representative of proposed Plot 144 opposite to the proposed Aldi store

4.2 NOISE SURVEY DETAILS AND INSTRUMENTATION

Noise measurements were completed over the period Tuesday 3 to Wednesday 4 February 2015. These were typical working weekdays. Throughout the survey, weather conditions were mild and dry, with low wind speeds.

Attended sample measurements of noise were carried out at all of the measurement positions throughout the critical daytime and night time periods. Measurements of noise were recorded at 1.5m height above ground and in accordance with the procedures outlined in BS 4142, with 15-minute noise samples recorded to fit in to the night time assessment period.

During the daytime and night time periods, ambient noise levels in the environment around the proposed development are controlled by road traffic movements. During the night time, road traffic movements reduce. However, whilst mechanical services plant at the hospital is audible during the night time, noise associated road traffic movements is still dominant.

[1] *BS 4142:2014 Methods for rating and assessing industrial and commercial sound*

The parameters recorded during the measurement survey included L_{Aeq}, L_{A90} and L_{AFmax}. In accordance with BS4142 guidance, L_{A90} is used for describing background level and, as such, will be used for the purpose of the noise impact assessment. L_{Aeq} is the measure of ambient noise, with this descriptor also used (in accordance with BS4142) to describe the specific level relating to the source being assessed. L_{Amax} represents the maximum noise level over the sample period.

The following instrumentation was used during the noise measurement survey:

- Bruel & Kjaer Type 2260 Sound Level Meter s/n 1772229
- Bruel & Kjaer Type 4189 Microphone s/n 2199530
- Bruel & Kjaer Type 4231 Acoustic Calibrator s/n 2229957

- Bruel & Kjaer Type 2260 Sound Level Meter s/n 2311704
- Bruel & Kjaer Type 4189 Microphone s/n 2733049
- Bruel & Kjaer Type 4231 Acoustic Calibrator s/n 2688672

Before and after the survey, the sound level meters were field-calibrated in accordance with the manufacturer's guidelines, and no significant drift was observed. The meters, microphones and field calibrators are laboratory calibrated biennially in accordance with UKAS procedures or to traceable National Standards.

4.3 NOISE SURVEY RESULTS

Environmental noise record sheets detailing the full breakdown of results from the attended noise measurement survey are included in Appendix C.

Guideline noise levels listed in BS8233, apply to overall daytime $L_{Aeq,(16hours)}$: (07:00-23:00) and night time $L_{Aeq,(8\ hours)}$: (23:00-07:00) periods. Consequently measurements recorded over shorter periods need to be adjusted to reflect the average 16-hour and 8-hour values.

The correction formula provided in the 'shortened measurement procedure' section in the Department of Transport Welsh Office 'Calculation of Road Traffic Noise', indicates that measurement of $L_{A10,18h}$ levels may be taken from shorter $L_{A10,3h}$ data with an adjustment of –1dB(A). BS8233 indicates that L_{A10} to L_{Aeq} conversion can be achieved by the relationship $L_{Aeq,16h} = L_{A10,18h}$ -2dB. Hence the $L_{Aeq,16h}$ level may be taken from $L_{A10,3h}$, with an adjustment of –3dB(A).

There is no such correction process available for the calculation of the night time $L_{Aeq,8hr}$. However, a drop in noise levels during the night time period 0100-0500 would be expected to reduce the mean night time level by at least 1dB(A) from the measured average level over the early night time period 23:00 to 01:00 and consequently this correction has been applied to the measured data.

Table 1 shows the ambient noise measurements with the shorter daytime and early night time measured values corrected by –3dB(A) and –1dB(A) respectively, to estimate the 16-hour daytime and 8-hour night time levels. The typical background noise levels during the daytime and night time periods are also summarised in Table 1.

Location	Date	Time Period	Noise level over period (dB) LAeq	Typical LA90	LAFmax [1]
Position 1 Representative of proposed Plot 24 overlooking the railway line	03/02/2015 04/02/2015	Daytime 07:00-23:00 Night time 2300-07:00	45 42	42 39	- 61
Position 2 Representative of proposed Block A	03/02/2015 04/02/2015	Daytime 07:00-23:00 Night time 2300-07:00	46 44	40 38	- 68
Position 3 Representative of proposed Block B overlooking Rice Lane	03/02/2015 04/02/2015	Daytime 07:00-23:00 Night time 2300-07:00	63 58	57 42	- 72
Position 4 Representative of proposed Plot 110 overlooking the railway line	03/02/2015 04/02/2015	Daytime 07:00-23:00 Night time 2300-07:00	43 43	41 39	- 59
Position 5 Representative of proposed Plot 90 adjacent to the proposed Aldi store	03/02/2015 04/02/2015	Daytime 07:00-23:00 Night time 2300-07:00	45 44	43 39	- 62
Position 6 Representative of proposed Plot 144 opposite to the proposed Aldi store	03/02/2015 04/02/2015	Daytime 07:00-23:00 Night time 2300-07:00	47 41	43 39	- 64

Table 1: Summary of noise data at the proposed development site
Note: 1 The L_{Amax} data is only relevant to the night time period

5. ASSESSMENT CRITERIA

5.1 NOISE CRITERIA RELEVANT TO THE PROPOSED RESIDENTIAL DEVELOPMENT

5.1.1 National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) was published on 27 March 2012 and came into force with immediate effect. It replaced the previous government policy, Planning Policy Guidance Note (PPG) 24. The NPPF states that:

"The planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability" (Para 109)"

In addition, paragraph 123 states that planning policies and decisions should aim to:

- *"Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*

- *Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
- *Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."*

5.1.2 Planning Practice Guidance – Noise

In March, 2014, new government guidance on the role of noise in the planning process was released. This provides advice on issues such as when noise is relevant to planning, how to determine noise impact, discussion on the context of noise and how the impact of noise can be mitigated.

As this is a relatively new document, the way that this guidance will be implemented is likely to be developed over time. In the short-term, it is probable that existing noise standards will be relied upon to assess the acceptability of noise in its various forms and contexts. In particular, there is good evidence within existing standards and guidance, based on social surveys, of the subjective response of people to noise of various types and levels and therefore this will continue to be referred to.

5.1.3 WHO – Guidelines for Community Noise

The NPPF requires that significant adverse impacts do not arise as a result of new development. Guidelines for Community Noise - World Health Organization, 1999 (WHO) gives guidance on suitable noise levels for sleeping and resting conditions in dwellings. It sets out these values as table 4.1, and lists them as being guideline values for community noise. WHO recommends internal noise levels of 30dB(A) at night for bedrooms, and 35dB(A) during the day for living-rooms. The guideline levels are based on annual average data.

To avoid sleep disturbance in bedrooms during the night time period, it also recommends that noise levels from single sound events should not regularly exceed L_{Amax} 45dB(A). WHO defines 'regular' as not more than 10-15 events per night.

WHO also gives guidance on suitable noise levels for outdoor living areas such as gardens. The WHO guidelines state that "*to protect the majority of people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 55 dB L_{Aeq} for a steady continuous noise. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound pressure level should not exceed 50 dB L_{Aeq}".*

The preface to WHO states that community noise includes road, rail and air traffic, industries, construction and public work, and the neighbourhood. Therefore, although these noise levels are usually used to determine acceptability from steady continuous noise from anonymous sources, such as road traffic or rail, they provide helpful guidance when considering noise from industrial sources.

5.1.4 BS 8233:2014 Guidance on sound insulation and noise reduction for buildings

BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings* gives guidance on indoor ambient noise levels to be achieved in dwellings for reasonable resting and sleeping conditions. The guidance in BS8233:2014 is based on guidelines issued by the WHO, Guidelines for Community Noise (1999). The guideline levels are shown in Table 2, copied from BS8233:2014.

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

Table 2: BS8233 guideline noise level limits in dwellings for resting and sleeping

BS8233 advises that "*If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the facade insulation or the resulting noise level. If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment."*

It also advises that *"Where development is considered necessary or desirable…the internal target levels may be relaxed by up to 5 dB and reasonable conditions still achieved."*

The standard also advises that *"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_{AFmax} depending on the character and number of events per night. Sporadic noise events could require separate values."* It does not give guidance on what might constitute a guideline value. However, as the standard does cross reference Guidelines for Community Noise - World Health Organization, 1999 (WHO), we suggest that the guideline value of L_{AFmax} 45 dB, inside bedrooms, should not be exceeded during the night more than 10-15 times, which reflects the WHO position.

BS8233 also suggests guidelines for noise levels in external spaces that are used for amenity space, such as gardens and patios. *"It is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline of 55 dB $L_{Aeq,T}$, which would be acceptable in noisier environments. However, it is recognised that these guideline values are not achievable in all circumstances where development might be desirable…In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.*

5.2 NOISE CRITERIA RELEVANT TO THE PROPOSED ALDI FOOD STORE

5.2.1 BS 4142:2014 Methods for rating and assessing industrial and commercial sound

The noise impact assessment relating to both mechanical plant and deliveries at the proposed Aldi food store will be carried out in accordance with the procedures set out in BS 4142. This Standard provides a method for assessing whether industrial sound is likely to give rise to an adverse impact on people living in the locality of the site and uses the concept of a 'Rating Level', which is based on the 'Specific' sound from the new development, (measured in terms of L_{Aeq} at the defined assessment position), with corrections applied to account for any tonal or impulsive characteristics in the noise (as these can increase the likelihood of an adverse impact).

The assessment level is obtained by comparing the Rating Level with the existing Background Sound Level (measured in terms of L_{A90} at the assessment position). Where the Rating Level exceeds the Background Sound Level by 10dB(A) or more, an indication of a significant adverse impact is likely. Where this is reduced to 5dB(A), the impact would likely be adverse. 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 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.

Following consultation, the Senior Enforcement Officer of the Environmental Protection Unit at Liverpool City Council, advised that the appropriate noise assessment guideline would be for the BS4142 defined 'Rating Level' from the development to not exceed the existing background sound levels, as measured at the nearby proposed and existing noise sensitive residential receptor locations.

6. POTENTIAL NOISE IMPACTS

For the planned operation of the proposed Aldi food store, the following noise impacts have been identified for the assessment:

- Noise produced from mechanical services plant
- Noise produced from deliveries

In order to accurately assess the level of potential noise impact, a quantitative prediction for each of the above is provided.

6.1 PREDICTION OF MECHANICAL PLANT NOISE

The mechanical plant layout proposals are outlined on the plans included in Appendix B. All of the condensing units are located externally, close to the north west aspect of the store and these would run continuously throughout the daytime and night time periods. The ventilation system would only operate when staff would be working at the store, which could occur during the critical early morning hours.

The extraction fan system has been designed to discharge to atmosphere via a roof cowl located on the roof of the store. An air handling unit is proposed to be located inside a dedicated plant room within the store. However, noise levels from this unit are low and would be insignificant outside of the plant room, once the effects of the building attenuation have been accounted for. Therefore, the air handling unit has been omitted from the noise prediction.

Typical noise outputs (in terms of sound power levels) generated by of each item of mechanical plant to be included in the proposed scheme, are shown in Table 3. This noise detail is based upon information provided in specifications issued by the mechanical services contractor and equipment suppliers.

Plant Item	No. off	Sound Power Level Lw(A)[2]	Equivalent Sound Pressure Level at 10m (dB)
Arctic Circle Condensing Pack	1	73	45
Low Temperature Condensing Unit	2	63	35
High Temperature Condensing Unit	1	63	35
Extract Fan Unit	1	82	54

Table 3: Sound Power Levels of External Standard Mechanical Plant

Predictions of how the noise from each of the mechanical plant sources propagates to the sensitive community receptors, together with the cumulative effect of all of these noise sources, has been determined by noise modelling using proprietary software (Predictor[3]) which meets the requirement of ISO 9613 Part 2:1996[4]. The noise model takes account of the following in its calculations procedures:

- Source sound power level (for point, line and area sources)
- Reflection from nearby structures and source directivity
- Distance from noise source (geometric spreading)
- Atmospheric absorption
- Acoustic screening of intervening structures and topography
- Ground absorption
- Ground effects (which includes the height of ground relative to the noise source)

Detailed noise calculations, providing information on total specific noise at each receptor, together with the contributions from each individual noise source, at each receptor location, are computed. To illustrate the scheme, a diagram showing the distribution and locations of mechanical plant noise sources, superimposed on a 3D view of the site, is also included in Appendix D. A noise map, showing the noise contours produced by the mechanical services plant is also provided in Appendix D of this report.

Predicted specific noise levels at each of the nearby noise sensitive receptor locations are provided in Table 4 below.

Receptor	LAeq dB(A)	LAeq Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Hospital	31	5	17	21	27	27	23	15	4
Proposed Plot 140	30	-	10	13	25	26	25	17	3
Proposed Plot 75	30	-	11	15	24	26	24	18	8
Proposed Plot 88	32	-	14	19	26	28	26	20	9
Proposed Plot 90	35	2	18	23	28	31	30	25	19

Table 4: Predicted specific noise contribution from the mechanical services plant at the nearby noise sensitive receptor locations.

As indicated in Table 4, predicted noise levels at the nearby noise sensitive locations, from the combined mechanical services plant, would be in the range of LAeq 30-35dB(A).

[2] *Sound power levels (LWA) are calculated from sound pressure level (LpA) measurements made at a specified distance from equipment.*

[3] *Bruel and Kjaer – Predictor V7 Environmental Noise Calculation Software Package, Type 7810*

[4] *ISO 9613-2:1996 "Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation to determine Noise Levels*

6.2 PREDICTION OF DELIVERY NOISE

For the purpose of this assessment, the specific L_{Aeq} noise level produced by a delivery to the proposed Aldi food store, at the noted residential receptor locations, will be established by prediction.

The delivery process is broadly similar at all Aldi stores. Consequently, as the basis of the prediction, the typical noise levels produced during this activity have been referenced from detailed noise measurements covering deliveries made to the Aldi Sandbach store.

For these measurements, continuous 2-second noise measurements were carried out at a height of 1.5m above ground, approximately 10m from the acoustic centre of the noise source (in this case the delivery operation). The same instrumentation was used, as for the background noise survey detailed in Section 4.2.

Deliveries to Aldi stores typically last between fifty minutes, and an hour and twenty minutes. However, this period can be variable depending on the amount of stock being accepted by the store, with some delivery cycles taking just thirty to forty minutes. The procedure for a delivery is for the delivery vehicle to reverse and lock into a dock sleeve within the loading bay, so that stock is directly unloaded into the store's warehouse with no external unloading.

Observations made during the measurement survey indicated that noise from the delivery vehicle (a HGV) is evident when the vehicle arrives, manoeuvres into position (with reverse alarm on) on the loading bay and then departs. However, the engine of the vehicle is then turned off once it has docked onto the loading bay, so for the greater part of the delivery, HGV engine noise is not evident.

With respect to noise from unloading of the vehicle, noise produced in the delivery bay area primarily consists of noise breaking out of the side of the trailer from pallets of stock being moved using a pallet truck, operating within the trailer and the dock sleeve. It is worth noting that the trailer of the vehicle under test was a temperature controlled unit, with noise emanating from a dedicated, diesel powered refrigeration motor. This presents a typical worst case delivery scenario, with regards to noise.

The noise profile taken over the delivery period (of approximately 40 minutes) is shown in Figure 1 below.

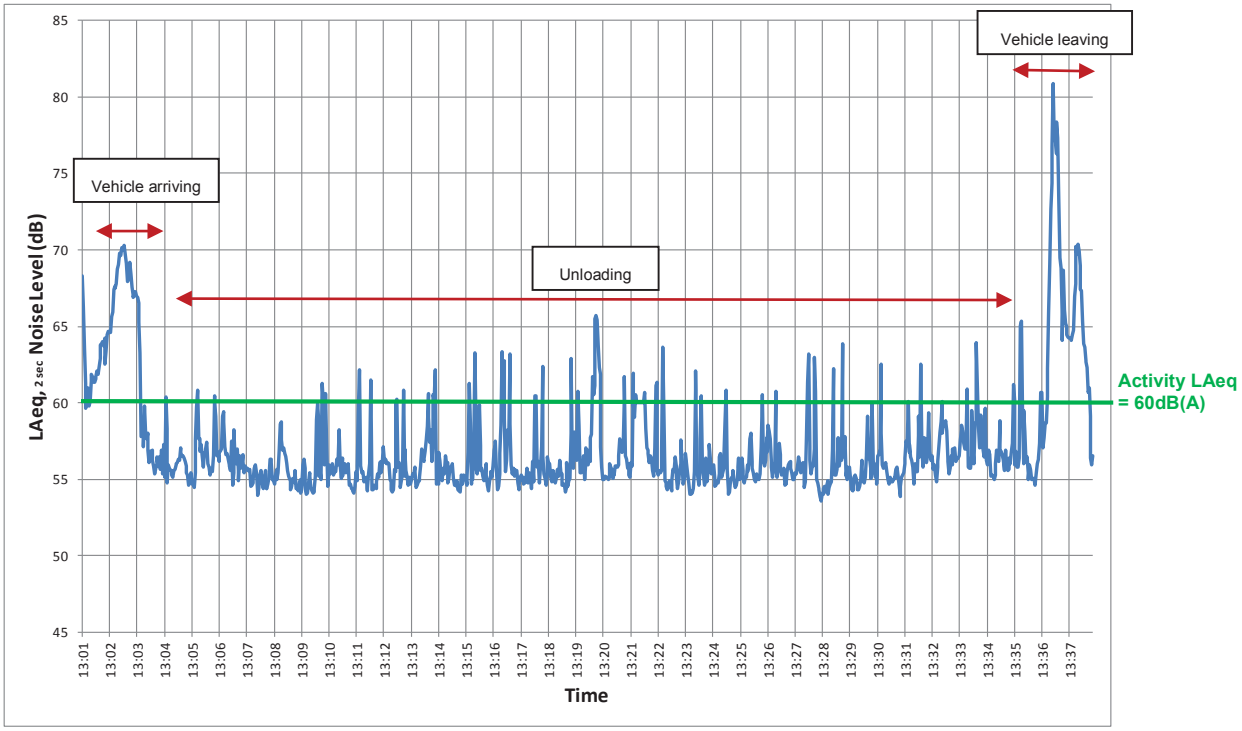


Figure 1: Measured noise levels from delivery activity at approximately 10m from the centre of the delivery area

Prediction methodologies use the sound power level (L_w) of a source as input data, so for this purpose the measured delivery activity noise level, expressed in terms of $L_{Aeq,T}$, needs to be converted to the equivalent activity sound power level. This is derived using the measured delivery $L_{Aeq,T}$ (where T is the delivery period), corrected firstly for the pre-existing ambient noise levels in the absence of the delivery and then to take account of the measurement surface area enveloping the noise source. A summary of the calculated activity sound power level associated with the delivery operation is shown in Table 5 below.

Detail	dB(A)	Octave Band Sound Power Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Activity $L_{Aeq,T}$ at 10m	60	66	65	55	53	55	54	45	38
L_p to L_w Correction	25	25	25	25	25	25	25	25	25
Activity Sound Power Level L_w	85	91	90	80	78	80	79	70	63

Table 5: Calculated activity sound power level associated with delivery operation

To accurately evaluate the overall effect of delivery noise, it is necessary to consider the noise that is likely to be generated by this operation, at the nearby residential receptor locations.

The sound power level of the delivery activity (as detailed in Table 5) is used as a starting point for the purpose of predicting noise levels in the surrounding environment and at specified community receptor locations near to the site, using an environmental noise propagation model. As with mechanical plant noise, the prediction of noise associated with deliveries is carried out using Bruel & Kjaer's 'Predictor' software.

Initial predictions concluded that unmitigated noise levels associated with a delivery to the proposed Aldi store would be significant at the nearby noise sensitive receptor locations. Consequently, mitigation options were discussed with the developer in order to reduce the noise impact. Accordingly, the developer is proposing to construct a 3.75m high acoustic barrier fence along the side of the delivery bay. There would also be 2.5m high barriers along the eastern boundary of the Aldi store site, as well as to the north of the site on the boundary with the proposed new residential properties. All of the barriers would need to have a minimum surface mass of 10kg/m^2. The 3.75m high barrier along the side of the delivery bay should have an absorbent inner lining to reduce reflections between the HGV and the barrier itself.

The noise map, showing the noise contours produced by the delivery is included in Appendix E of this report. Predicted specific noise levels at the nearby noise sensitive receptor locations are provided in Table 6 below.

Receptor	LAeq dB(A)	LAeq Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Hospital	28	21	25	17	18	20	18	8	-
Proposed Plot 140	33	16	23	21	24	29	28	16	-
Proposed Plot 75	29	16	21	14	20	23	23	9	-
Proposed Plot 88	31	20	27	20	21	24	21	9	-
Proposed Plot 90	32	21	29	21	22	25	23	11	-

Table 6: Predicted specific noise contribution from the delivery activity at the nearby existing and proposed residential receptor locations.

As indicated in Table 6, predicted noise levels at the community locations are in the range of L_{Aeq} 28-32dB(A).

7. ASSESSMENT OF NOISE

7.1 ASSESSMENT OF NOISE RELATING TO THE PROPOSED RESIDENTIAL PROPERTIES

Ambient noise levels at the site are dominated by road traffic movements on Rice Lane and other surrounding roads. Accordingly, a mitigation scheme that satisfies internal noise levels in accordance with BS 8233:2014 requirements is provided below in Section 7.3.1 of this report. Furthermore, an assessment of the noise levels in proposed external amenity areas in accordance with BS 8233:2014 and the WHO guidelines is provided below in Section 7.1.3 of this report.

7.1.1 Numeric specification of façade sound insulation

Internal noise levels can be calculated from the measured site external noise levels, taking into account the size and construction of the elements of the building façade, including glazing and ventilation. BS8233 sets out a method of calculating the internal noise levels, based on the external noise levels, areas of wall, glazing and ventilator.

It is understood that all dwellings would have brick and block external walls. Sound insulation data for the external walls has been taken from BS8233. Sound insulation data for windows and ventilation systems has been taken from manufacturers' data.

The proposed sound insulation scheme will be designed to meet the BS8233 recommended $L_{Aeq,16h}$ 35dB for living rooms (resting purpose) and the $L_{Aeq,\ 8h}$ 30dB for bedrooms during the night time (sleeping purpose). The requirement for L_{AFmax} values in bedrooms at night, has been taken as individual events not regularly exceeding 45dB.

The façade insulation requirements for the living rooms and bedrooms are detailed in Table 7 as follows.

Location	Parameter	Room	External Noise Level dB(A)	Indoor target dB(A)	Reduction Required dB(A)
Position 1 Representative of proposed Plot 24 overlooking the railway line	LAeq,16 hour LAeq,8 hour LAFmax	Living Room Bedrooms Bedrooms	45 42 61	35 30 45	10 12 16
Position 2 Representative of proposed Block A	LAeq,16 hour LAeq,8 hour LAFmax	Living Room Bedrooms Bedrooms	46 44 68	35 30 45	11 14 23
Position 3 Representative of proposed Block B overlooking Rice Lane	LAeq,16 hour LAeq,8 hour LAFmax	Living Room Bedrooms Bedrooms	63 58 72	35 30 45	28 28 27
Position 4 Representative of proposed Plot 110 overlooking the railway line	LAeq,16 hour LAeq,8 hour LAFmax	Living Room Bedrooms Bedrooms	43 43 59	35 30 45	8 13 14
Position 5 Representative of proposed Plot 90 adjacent to the proposed Aldi store	LAeq,16 hour LAeq,8 hour LAFmax	Living Room Bedrooms Bedrooms	45 44 62	35 30 45	10 14 17
Position 6 Representative of proposed Plot 144 opposite to the proposed Aldi store	LAeq,16 hour LAeq,8 hour LAFmax	Living Room Bedrooms Bedrooms	47 41 64	35 30 45	12 11 19

Table 7: Numeric sound insulation requirements for sensitive rooms in each property

Note: Sensitive rooms are living rooms and bedrooms

7.1.2 Materials specification

Based on the required overall façade sound insulation (column 6 'Reduction Required' in Table 7 above), an individual sound insulation specification has been determined for the three main elements of the façade (window, wall and ventilator). It should be noted that the performance of the window may be lower than the overall façade requirement, as the wall element provides a higher sound insulation performance to compensate.

Table 8 below details the sound insulation specification for all the proposed properties at the development. The comprehensive intrusive noise level calculations are included in Appendix F.

Property	Room	Wall type	Window Performance R_w+Ctr dB	Vent Performance $D_{n,e,w}$+Ctr dB
Block B flats (fronting Rice Lane)	Living Room Bedrooms	Brick/block Brick/block	32 25	42 42
All other remaining properties	Living Room Bedrooms	Brick/block Brick/block	25 25	32 32

Table 8: Sound insulation specification for the proposed development site

For the flats in Block B, acoustic performances in living rooms can be achieved by the following specification:

- Acoustic double glazed unit (rated R_w+C_{tr} 32dB), comprising 10mm float glass, 12mm cavity, 6mm float glass
- Acoustic trickle ventilators (rated at $D_{n,e,w}$ + Ctr 42dB).

For the bedrooms in Block B, acoustic performances can be achieved by the following specification:

- Standard double glazed unit (rated R_w+C_{tr} 25dB), comprising 4mm float glass, 12mm cavity, 4mm float glass
- Acoustic trickle ventilators (rated at $D_{n,e,w}$ + Ctr 42dB).

For all of the remaining proposed properties across the site, acoustic performances in living rooms and bedrooms can typically be achieved by the following specification:

- Standard double glazed unit (rated R_w+C_{tr} 25dB), comprising 4mm float glass, 12mm cavity, 4mm float glass
- Standard hit and miss trickle ventilators (rated at $D_{n,e,w}$ + Ctr 32dB).

7.1.3 Outdoor amenity areas

Noise levels in all of the proposed outdoor amenity areas would be comfortably below the guidelines set out in BS 8233 and WHO. Therefore no mitigation measures would be required.

7.2 ASSESSMENT OF MECHANICAL PLANT NOISE

All of the proposed mechanical plant items would potentially run during the night time period. Consequently, for the purposes of this assessment, the predicted plant rating levels will be compared with the background sound level measured during the night time period, at the nearby existing and proposed noise sensitive receptor locations.

Table 9 shows a BS4142 assessment covering the mechanical plant noise impact. None of the mechanical plant items emit any distinct tones or impulses. Therefore an acoustic feature correction has not been included in the rating level.

Residential Position	Rating Level (dB)	Background Level LA90 (dB)	Assessment Level (dB) (Background excess)
Hospital	31	39	-8
Proposed Plot 140	30	39	-9
Proposed Plot 75	30	39	-9
Proposed Plot 88	32	39	-7
Proposed Plot 90	35	39	-4

Table 9: Predicted rating levels from mechanical plant at the existing and proposed noise sensitive receptor locations, compared with the measured night time (23:00-07:00) background L_{A90} level

The study predicts that at the nearby noise sensitive receptor locations, mechanical plant rating levels would not exceed the background noise levels during the night time, in line with the guideline requirement advised by the Local Planning Authority. Furthermore, mechanical plant noise levels would be comfortably lower than the WHO $L_{Aeq,\ 8\ hour}$ 45dB advised night time criteria at all of the nearby residential receptor locations.

7.3 ASSESSMENT OF DELIVERY NOISE

Service deliveries to the store are proposed between 07:00 and 23:00. Table 10 shows a BS4142 assessment covering the delivery noise impact. As indicated, the predicted delivery rating levels are compared with the background sound level measured during the daytime, at the nearby existing and proposed noise sensitive receptor locations.

In this case the rating level includes a +6dB(A) feature correction, as the delivery noise contains some occasional bangs and clatters, which may be considered as having an impulsive character. No on-time correction has been applied, as the duration of the loading activity is greater than the 1 hour assessment period, covering the daytime hours.

Residential Location	Specific Activity Noise (dB)	Feature Correction (dB)	Rating Level (dB)	Background LA90 noise level (dB)	Assessment Level (dB) (Background excess)
Hospital	28	+6	34	43	-9
Proposed Plot 140	33	+6	39	43	-4
Proposed Plot 75	29	+6	35	43	-8
Proposed Plot 88	31	+6	37	43	-6
Proposed Plot 90	32	+6	38	43	-5

Table 10: Predicted rating level of delivery activity at the existing and proposed noise sensitive properties, compared with the daytime (07:00-23:00) background LA90 level

The study predicts that at the nearest existing and proposed noise sensitive properties, delivery rating levels would not exceed the background noise levels during the daytime period, in line with the guideline requirement advised by the Local Planning Authority. Again, delivery noise levels would also be comfortably lower than the WHO $L_{Aeq,\ 16\ hour}$ 50dB advised daytime criteria for moderate annoyance at all of the nearby residential receptor locations

8. CONCLUSIONS

At the request of the Local Planning Authority, a noise assessment has been completed to consider an assessment of noise associated with one hundred and ninety five proposed new residential properties, as well as the potential impacts of noise produced by mechanical services plant and deliveries associated with a proposed Aldi food store, on land at the former Walton Hospital off Rice Lane in Liverpool.

An ambient noise measurement survey has been conducted at locations representative of the most sensitive existing and proposed residential locations to the development site. Predictions of noise from the cumulative mechanical plant equipment at the Aldi food store have been completed, utilising a proprietary software package. Predictions of noise produced by deliveries at the Aldi food store have also been completed, together with an assessment of the existing and future noise environments impacting on the proposed dwellings.

The conclusions resulting from these noise assessments may be summarised as follows:

- An assessment of the proposed residential aspect of the development has been carried out. Proving the proposed façade sound insulation specification detailed in Section 7.1.2 is incorporated, noise levels inside habitable rooms, as well as the gardens would meet the noise limit objectives specified in BS8233 and WHO.

- Noise limits for mechanical plant at the Aldi store have been established for the sensitive night time period, based on measured background noise levels and taking account of BS4142. Predictions have indicated that the overall noise levels from these services would meet noise limit objectives and consequently have a low adverse impact.

- Noise limits for deliveries to the Aldi store have been established, based on measured background noise levels and taking account of BS4142. Predictions have indicated that with the proposed mitigation measures detailed in Section 6.2 in place, noise levels from deliveries would also meet noise limit objectives and consequently have a low adverse impact.

The assessment has indicated that with the proposed mitigation measures in place, the development would have a low adverse noise impact on the nearby residential community. Therefore, further mitigation measures need not be considered for this development.

Report Code: E/RT/R

APPENDIX A

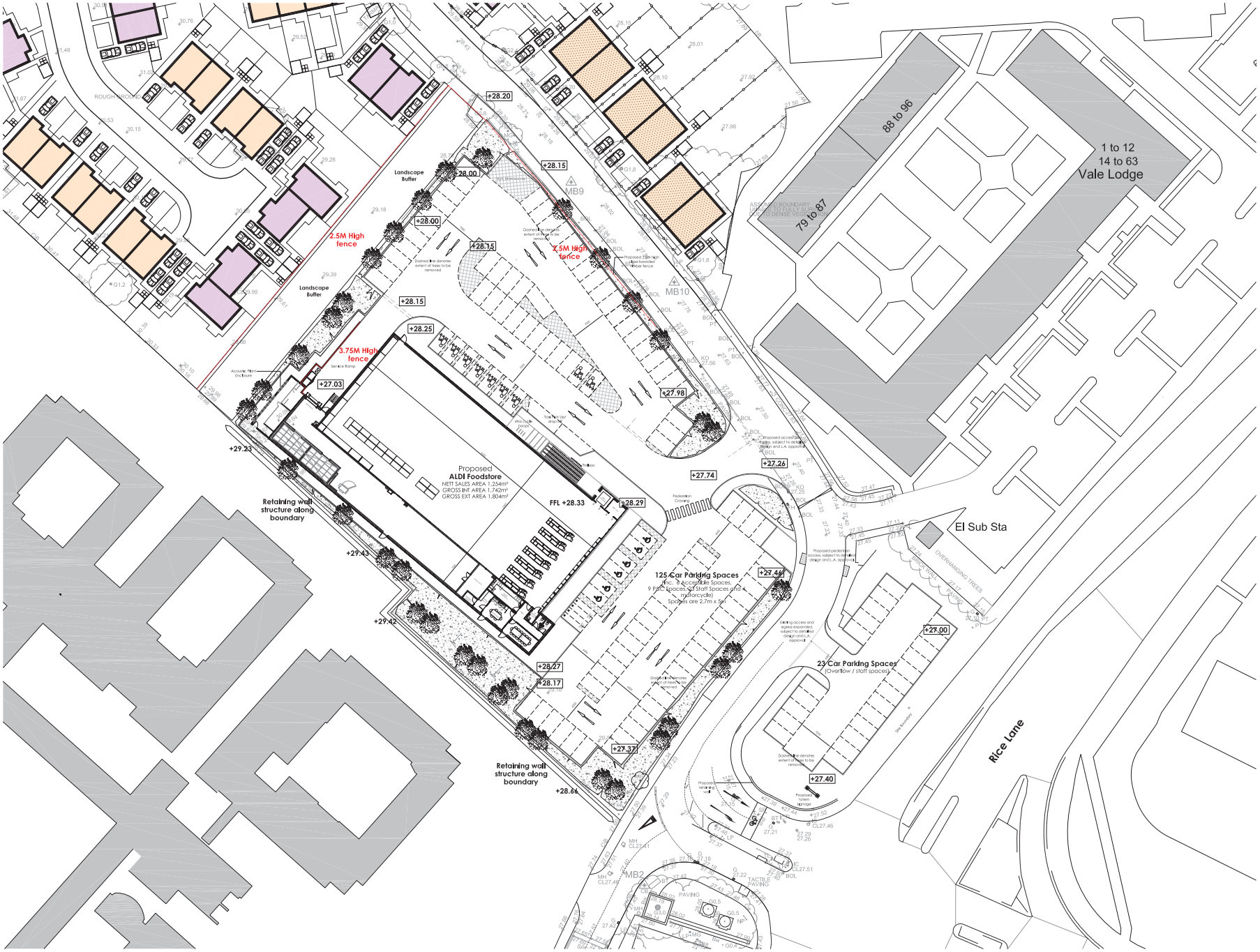
Existing Site Location Plan


N
Position 4
Position 6
Position 5
Rice Lane
Position 1
Position 2
Position 3

APPENDIX B

Proposed Scheme Layout Drawings


CLOCKTOWER DRIVE
HIGHFIELD ROAD
RICE LANE
LANCASTER STREET
HERBARTH CLOSE
BRECCE LANE
TRASBELL ST
Emergency access with bollards
Block A
15 x 1b2p apartments
12 x 2b3p apartments
total of 27 apartments
over 3 storeys
Merseycare NHS development
Proposed A66 footstore
Possible substation
Block B
24 x 1b2p apartments
total of 24 apartments
over 3 storeys
Open space
Bin store
Bicycle store
Notes
The extent of some areas of adopted highway is based on scanned information. Though using best endeavors to reproduce this information, Eden Building Design can not be held responsible for any discrepancies in the scanned plans.
Site area and immediate surrounds based on topographical survey; wider area based on Ordnance Survey data.
Existing roads
Extent of existing adopted highway
Sites Ai and Avi
2b4p house
Comfrey 24
2b3p bungalow
Ai1 6
3b5p house
Charlock 25
Hollyhock 12
Woodrush 3
Total 70
Sites Aii to Avi
2b3p house 29
2b3p house with potential attic conversion to 3b house 8
3b5p house 16
3b5p townhouse 23
1b2p apartment 15
2b3p apartment 12
Total 101
Site Avi
1b2p apartment 24
Total 24
Block A and units 38 to 74 (inclusive) to be rented; remaining units in Sites Aii to Avi to be shared ownership
Site Ai 1.56ha/3.85 acres
Site Aii 0.19ha/0.46 acres
Site Aiii 0.89ha/2.20 acres
Site Aiv 0.47ha/1.17 acres
Site Av 0.59ha/1.37 acres
Site Avi 0.23ha/0.58 acres
Site Avii 0.47ha/1.17 acres
Grand total 195
Site key plan
Proposed Housing Scheme at Walton Hospital Site, Liverpool for Mulbury Homes
Proposed Site Plan
Planning
1:500 at A0
13-186-P02
25/03/15
APS
APS
eden



Site Area
Proposed Site = 7,903m² / 1.95acres
Overflow car park = 1,087m² / 0.27acres

Total Area = 8,990m² / 2.22acres

Rev	Date	Description	Rev By	Chk'd By
E	16.03.15	Drawing tweaked to remove boundary and highlight in red the proposed fence's	SSR	SSR
D	13.03.15	Drawing updated following comments from Acoustic consultant.	SSR	SSR
C	22.01.15	Revised track plot added following receipt from CRA.	SSR	SSR
B	22.01.15	Adjustment to the HGV site access following comments from residential developer, landscape buffer maintained between retail and residential developments.	SSR	SSR
A	18.12.14	Revised track plot added following receipt from CRA.	SSR	SSR

Project Title	PROPOSED DEVELOPMENT WALTON HOSPITAL RICE LANE LIVERPOOL
Client	ALDI STORES LTD
Status	FEASIBILITY
Scale	1:500
Drawing Size	A2
Drawn By	HVS
Checked By	SSR
Date	DEC 14
Drawing Title	PROPOSED SITE PLAN
Job-Dwg No	0856NES-011
Rev	E

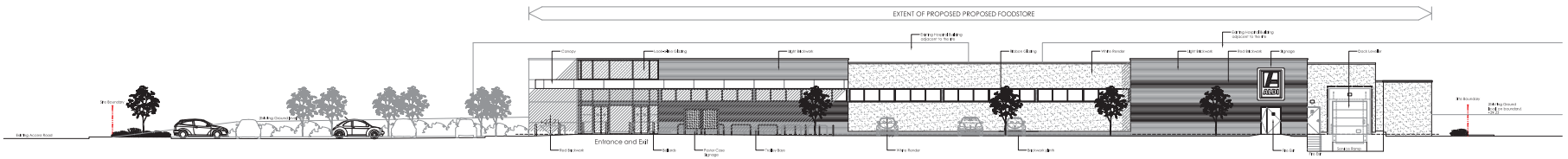
Proposed Site Plan 1:500

SCALE 1 : 500 0m 10m 20m 30m 40m 50m
SCALE 1 : 1 0m 10mm 20mm 40mm 60mm 80mm 100mm

Layout subject to full land registry information

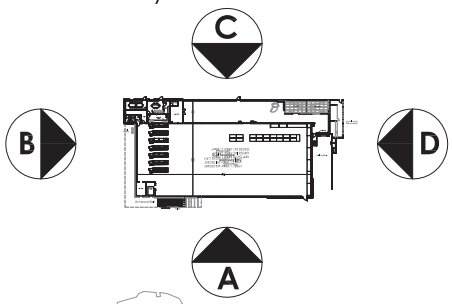
THE HARRIS PARTNERSHIP WAKEFIELD
2 St. Johns North, Wakefield, WF1 3QA
t. 01924 291 800 f. 01924 290 072
THE HARRIS PARTNERSHIP MANCHESTER
2nd Floor, Carvers Warehouse,
77 Dale Street, Manchester, M1 2HG
t. 0161 238 8555 f. 0161 244 5809
THE HARRIS PARTNERSHIP MILTON KEYNES
The Old Rectory, 79 High Street
Newport Pagnell, MK16 8AB
t. 01908 211 577 f. 01908 211 722
THE HARRIS PARTNERSHIP READING
101 London Road, Reading, RG1 5BY
t. 0118 950 7700 f. 0118 956 8642
THE HARRIS PARTNERSHIP
ARCHITECTS
www.harrispartnership.com

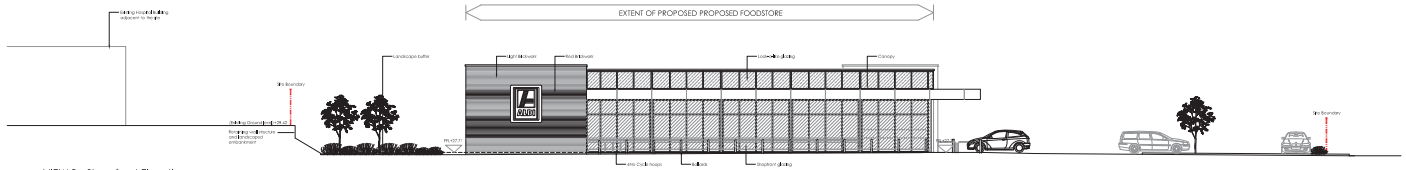
CAD file reference CAD FILE REFERENCE



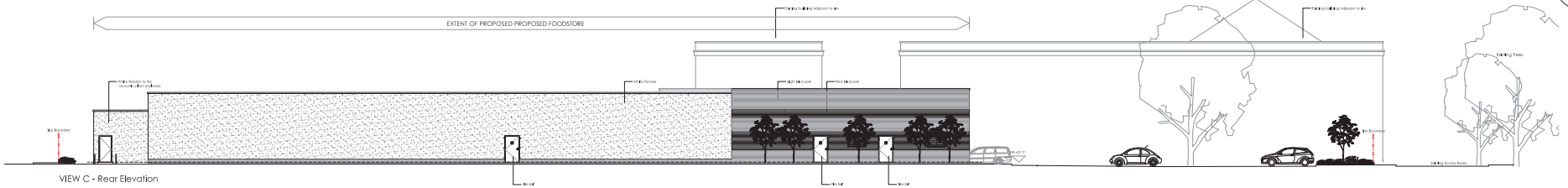
VIEW A - Front Elevation

Elevation Key: Not to Scale

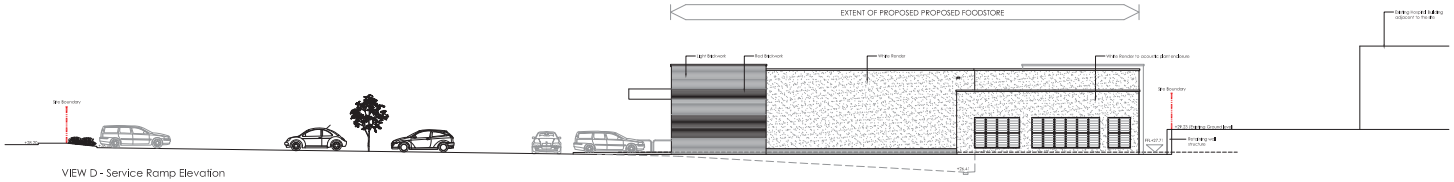




VIEW B - Shop front Elevation



VIEW C - Rear Elevation



VIEW D - Service Ramp Elevation

Rev	Date	Description	Rev By	Chk'd By
C	06.01.15	SCHEME RE-DESIGN FOLLOWING LEGAL RIGHTS OF WAY INFORMATION PROVIDED BY LANDOWNER.	SSR	SSR
B	10-11-14	AMENDED FOLLOWING DESIGN DEVELOPMENT	HVS	SSR
A	04-02-14	AMENDED FOLLOWING DESIGN DEVELOPMENT	HVS	SSR

Proposed Elevations 1:500

SCALE 1 : 500
SCALE 1 : 1

0m 10m 20m 30m 40m 50m
0m 10mm 20mm 40mm 60mm 80mm 100mm

Project Title	PROPOSED FOODSTORE WALTON HOSPITAL RICE LANE WALTON LIVERPOOL				
Client	ALDI STORES LTD				
Status	BOARD APPROVAL				
Scale	1:500		Drawing Size	A4	
Drawn By	JSM	Checked By	BB	Date	23/11/12

Drawing Title	PROPOSED ELEVATIONS
Job-Dwg No	0856NES-902 Rev C

THE HARRIS PARTNERSHIP WAKEFIELD
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t. 01924 291 800 f. 01924 290 072

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THE HARRIS PARTNERSHIP MILTON KEYNES
The Old Rectory, 79 High Street
Newport Pagnell, MK16 8AB
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THE HARRIS PARTNERSHIP
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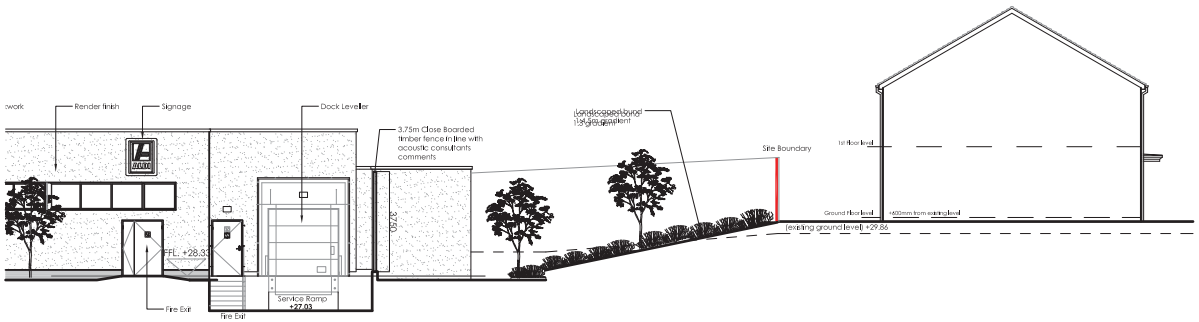
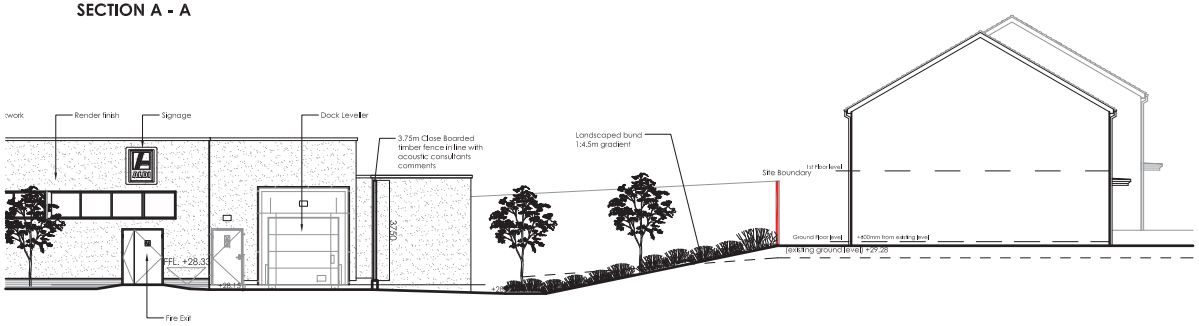
CAD file reference J:\PROJECTS\0856\900 SERIES\ 902



SECTION A - A



SECTION B - B

Rev	Date	Description	Rev By	Chk'd By
A	17.03.15	Retaining wall removed and landscpe bund reduced	SSR	SSR

Project Title	PROPOSED FOODSTORE FORMER WALTON HOSPITAL RICE LANE LIVERPOOL			Drawing Title	FENCE OPTION TO DELIVERY AREA - SECTIONS
				Job-Dwg No	0856NES - 015 Rev A
Client	ALDI STORES LTD.				
Status	FEASIBILITY				
Scale	1:200		Drawing Size A3		
Drawn By	SSR	Checked By SSR	Date MARCH 15		

THE HARRIS PARTNERSHIP WAKEFIELD
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77 Dale Street, Manchester, M1 2HG
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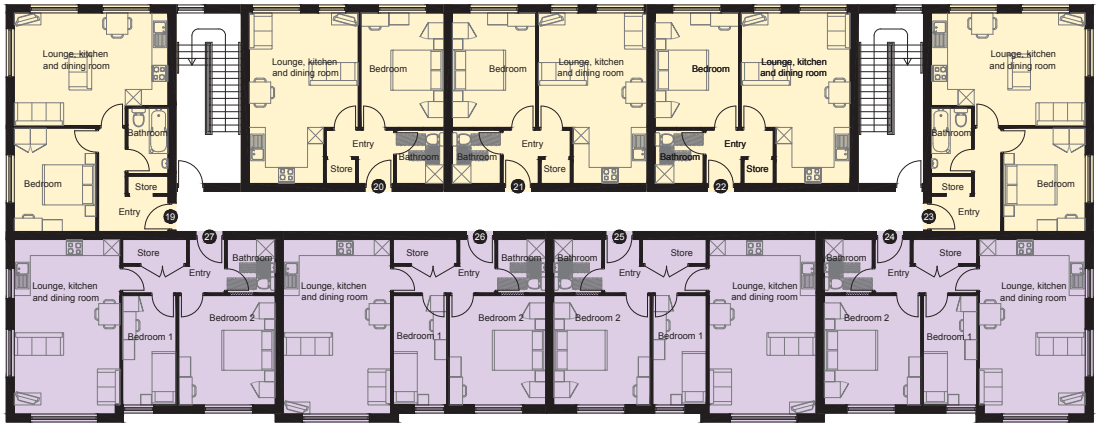
The Old Rectory, 79 High Street
Newport Pagnell, MK16 8AB
t. 01908 211 577 t. 01908 211 722

THE HARRIS PARTNERSHIP READING
101 London Road, Reading, RG1 5BY
t. 0118 950 7700 f. 0118 956 8642

THE HARRIS PARTNERSHIP
ARCHITECTS
www.harrispartnership.com

CAD file reference



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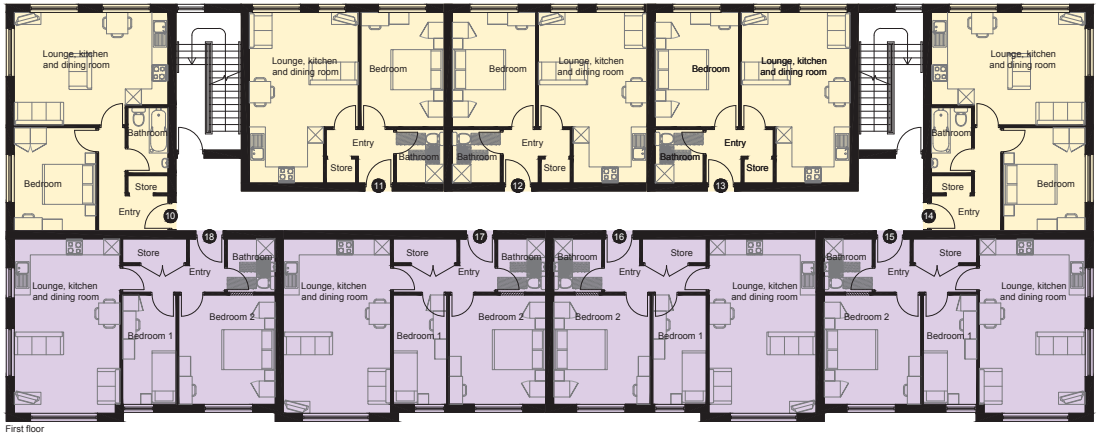
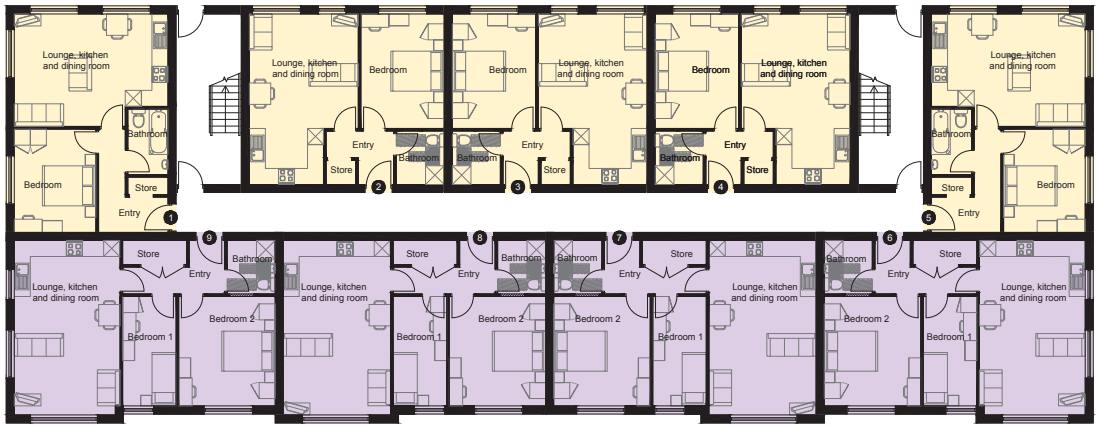


First floor



Ground floor

	Area
1	47.1m²/507ft²
2	46.6m²/502ft²
3	46.6m²/502ft²
4	46.6m²/502ft²
5	47.1m²/507ft²
6	60.6m²/652ft²
7	60.9m²/656ft²
8	60.9m²/656ft²
9	60.6m²/652ft²
10	47.1m²/507ft²
11	46.6m²/502ft²
12	46.6m²/502ft²
13	46.6m²/502ft²
14	47.1m²/507ft²
15	60.6m²/652ft²
16	60.9m²/656ft²
17	60.9m²/656ft²
18	60.6m²/652ft²
19	47.1m²/507ft²
20	46.6m²/502ft²
21	46.6m²/502ft²
22	46.6m²/502ft²
23	47.1m²/507ft²
24	60.6m²/652ft²
25	60.9m²/656ft²
26	60.9m²/656ft²
27	60.6m²/652ft²

1 bedroom/2 person apartment

2 bedroom/3 person apartment

1 Initial issue 25/03/15

project
Proposed Housing Scheme
at Walton Hospital Site, Liverpool
for Mulbury Homes

title
Block A Plans

status
Planning

scale
1:100 at A1

drawing no.
13-160-P25

date
25/03/15

drawn by
APS

checked by
APS

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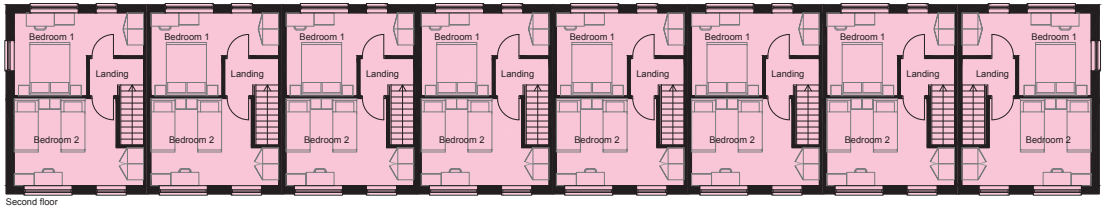

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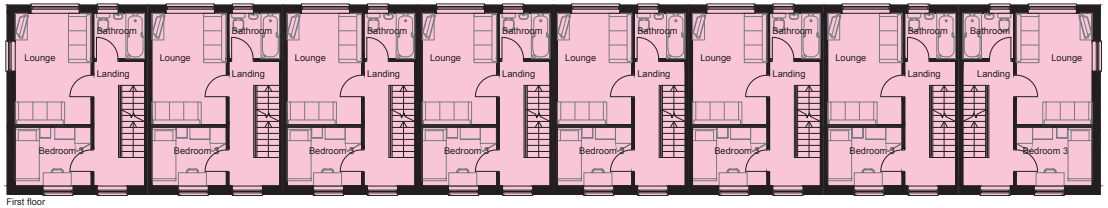
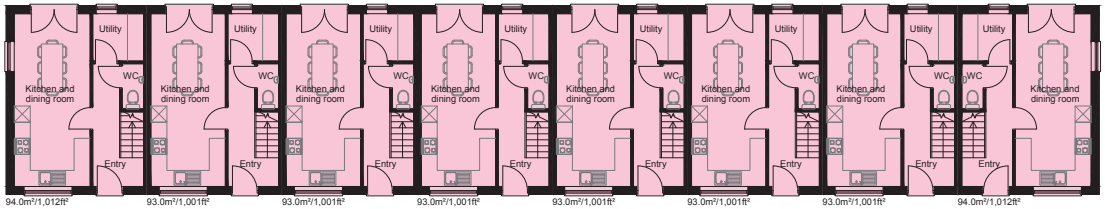
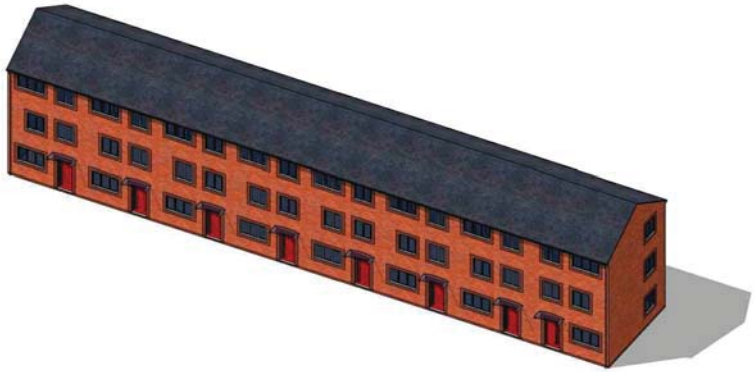


First floor



94.0m²/1,012ft² 93.0m²/1,001ft² 93.0m²/1,001ft² 93.0m²/1,001ft² 93.0m²/1,001ft² 93.0m²/1,001ft² 93.0m²/1,001ft² 94.0m²/1,012ft²

Ground floor



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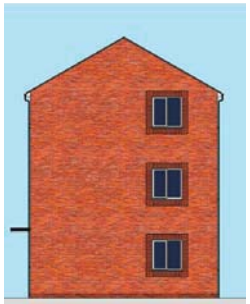
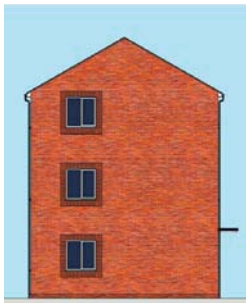


Side

Rear
Elevations



Side

1 Initial issue 25/03/15

project
Proposed Housing Scheme
at Walton Hospital Site, Liverpool
for Mulbury Homes

title
Type 21 Plans and Elevations

status
Planning

scale
1:100 at A1

drawing no.
13-160-P24

date
25/03/15

drawn by
APS

checked by
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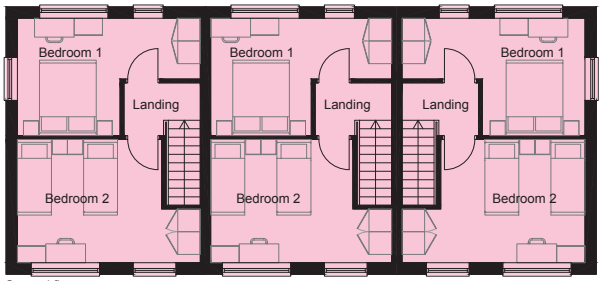
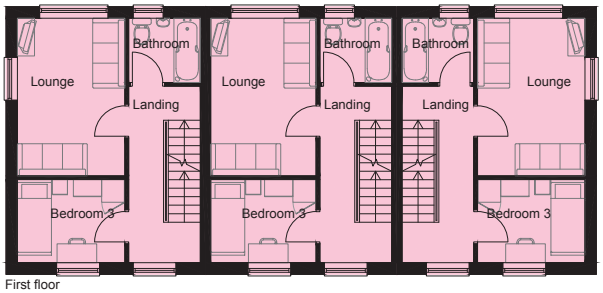
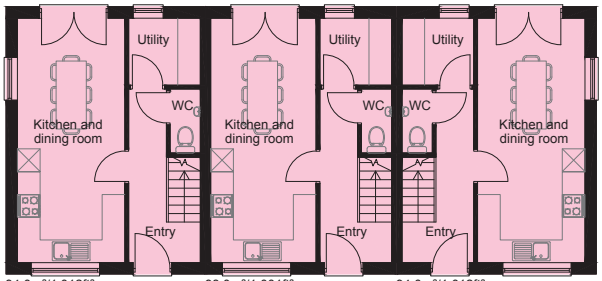


Second floor



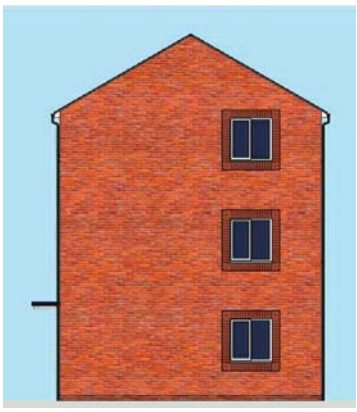
First floor



94.0m²/1,012ft² 93.0m²/1,001ft² 94.0m²/1,012ft²

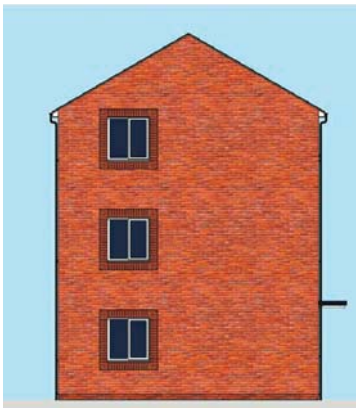
Ground floor

Front



Side

Rear
Elevations



Side

/ Initial issue 25/03/15

project
Proposed Housing Scheme
at Walton Hospital Site, Liverpool
for Mulbury Homes

title
Type 21 Plans and Elevations

status
Planning

scale
1:100 at A2

drawing no.
13-160-P23

date
25/03/15

drawn by
APS

checked by
APS

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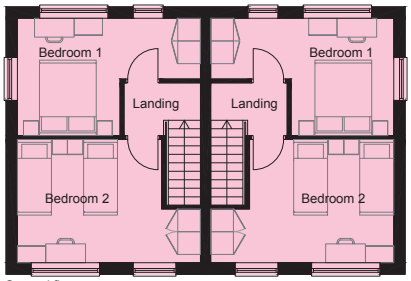
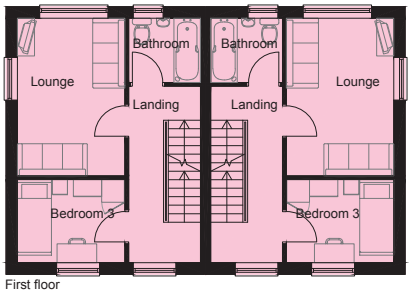
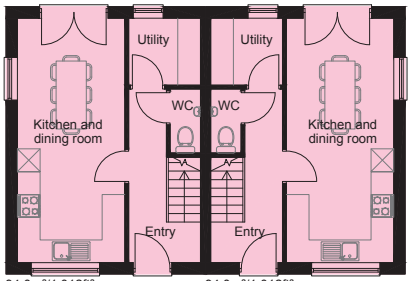


Second floor

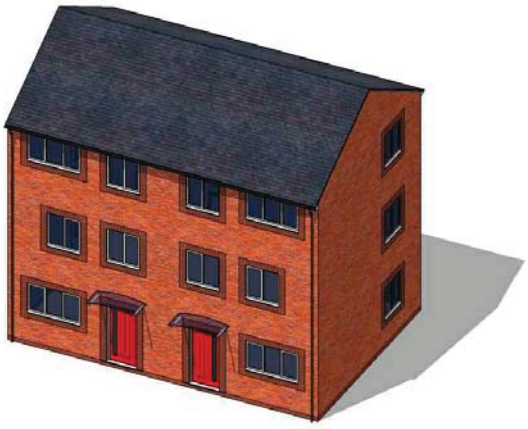


First floor



94.0m²/1,012ft² 94.0m²/1,012ft²

Ground floor



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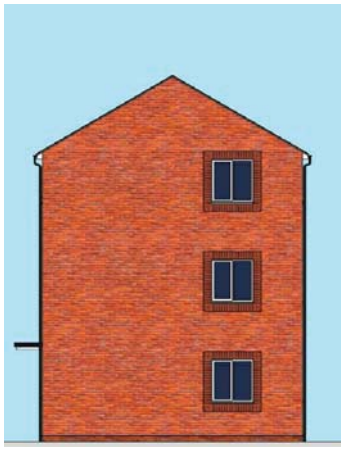

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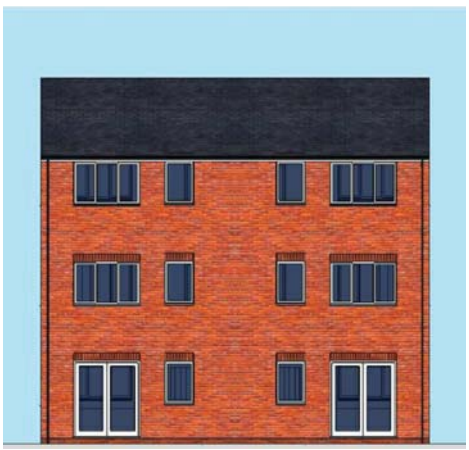
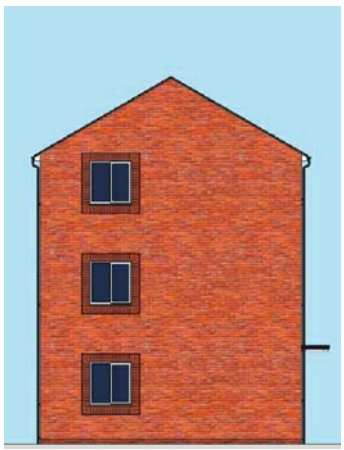


Rear
Elevations



Side

/ Initial issue 25/03/15

project
Proposed Housing Scheme
at Walton Hospital Site, Liverpool
for Mulbury Homes

title
Type 20 Plans and Elevations

status
Planning

scale
1:100 at A2

drawing no.
13-160-P22

date
25/03/15

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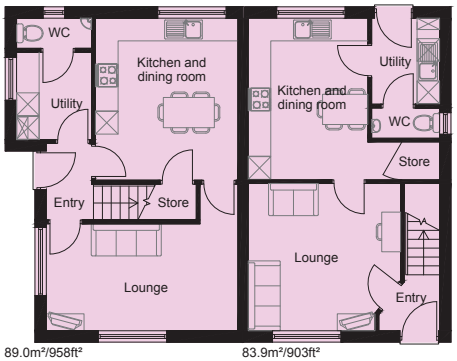
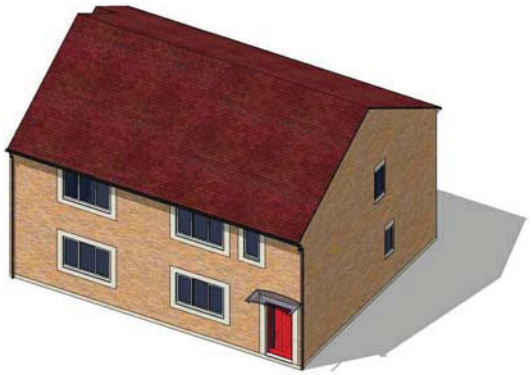
First floor



89.0m²/958ft²
83.9m²/903ft²
Ground floor



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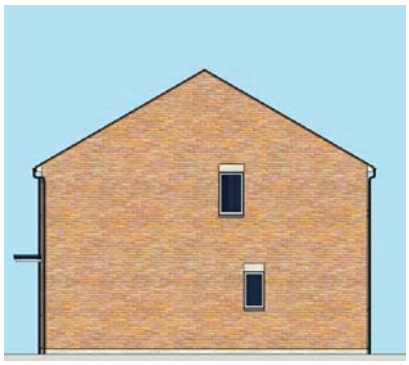

Side

Rear
Elevations

Side

/ Initial issue 25/03/15

project
Proposed Housing Scheme
at Walton Hospital Site, Liverpool
for Mulbury Homes

title
Type 19 Plans and Elevations

status
Planning

scale
1:100 at A2

drawing no.
13-160-P21

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25/03/15

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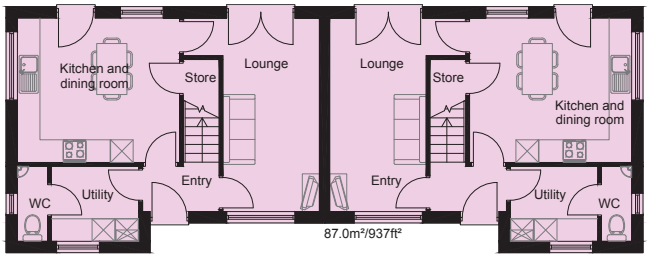
First floor



87.0m²/937ft²
Ground floor


Front


Side


Rear
Elevations


Side

/ Initial issue 25/03/15

project
Proposed Housing Scheme
at Walton Hospital Site, Liverpool
for Mulbury Homes

title
Type 18 Plans and Elevations

status
Planning

scale
1:100 at A2

drawing no.
13-160-P20

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25/03/15

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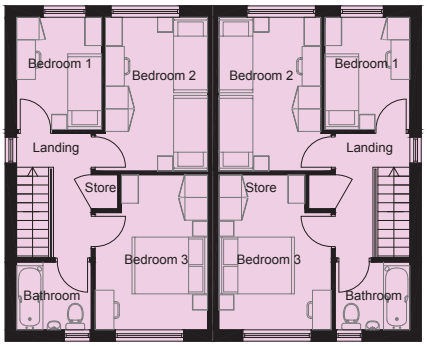
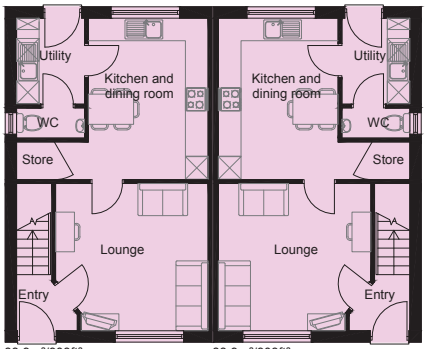
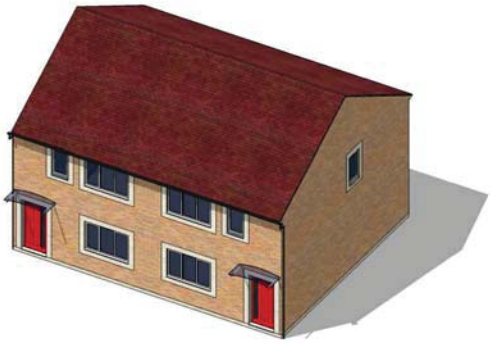


First floor



83.9m²/903ft² 83.9m²/903ft²

Ground floor



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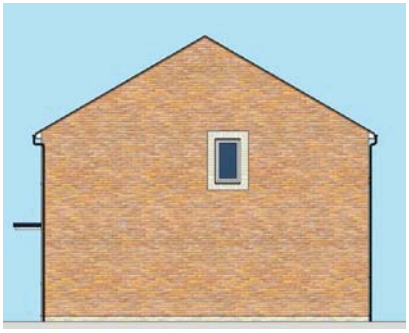
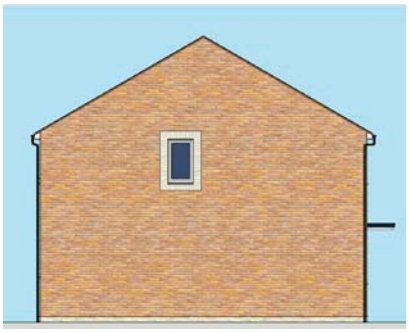


Side

Rear

Elevations



Side

/ Initial issue 25/03/15

project
Proposed Housing Scheme
at Walton Hospital Site, Liverpool
for Mulbury Homes

title
Type 17 Plans and Elevations

status
Planning

scale
1:100 at A2

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date
25/03/15

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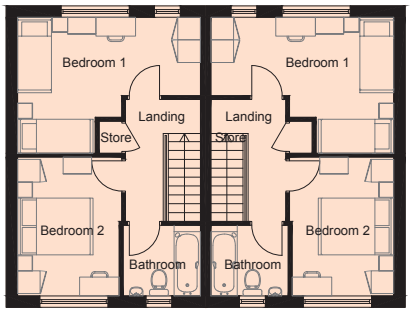
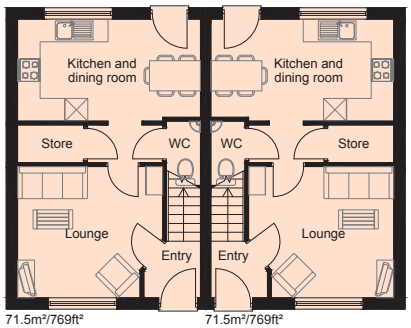
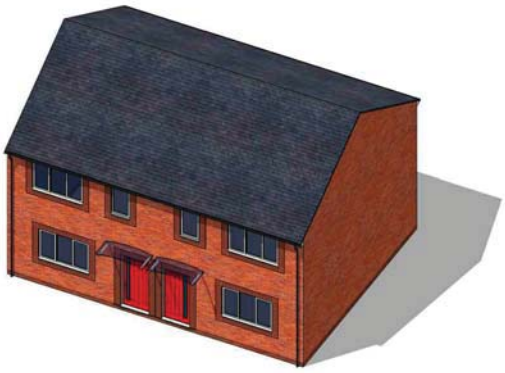


First floor

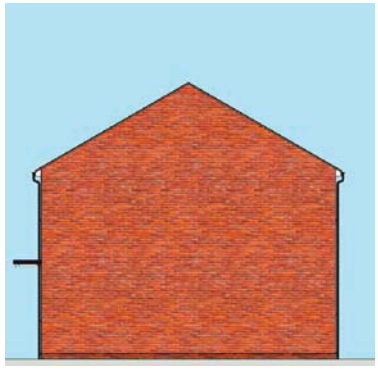


71.5m²/769ft² 71.5m²/769ft²

Ground floor



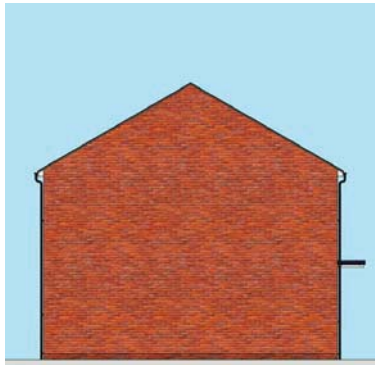
Front



Side

Rear

Elevations



Side

/ Initial issue 25/03/15

project
Proposed Housing Scheme
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for Mulbury Homes

title
Type 16 Plans and Elevations

status
Planning

scale
1:100 at A2

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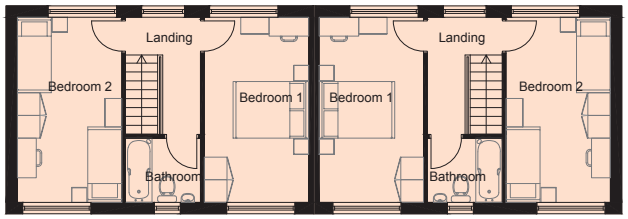
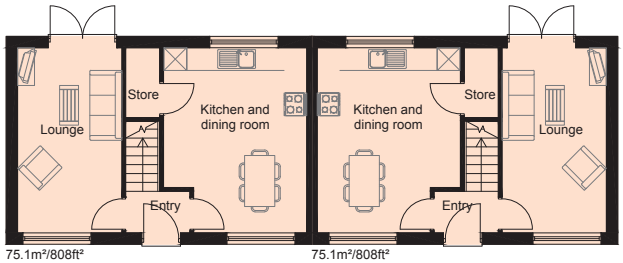
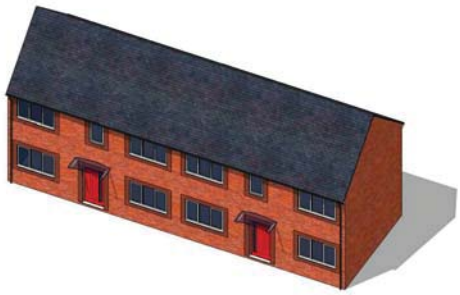


First floor



75.1m²/808ft²
Ground floor

75.1m²/808ft²



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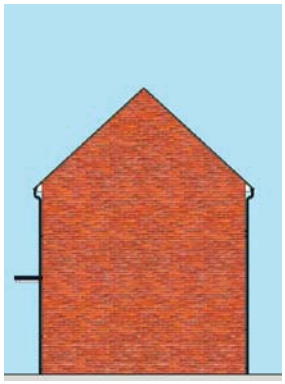
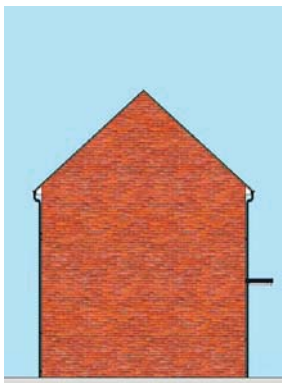


Side

Rear
Elevations



Side

/ Initial issue 25/03/15

project
Proposed Housing Scheme
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for Mulbury Homes

title
Type 15 Plans and Elevations

status
Planning

scale
1:100 at A2

drawing no.
13-160-P17

date
25/03/15

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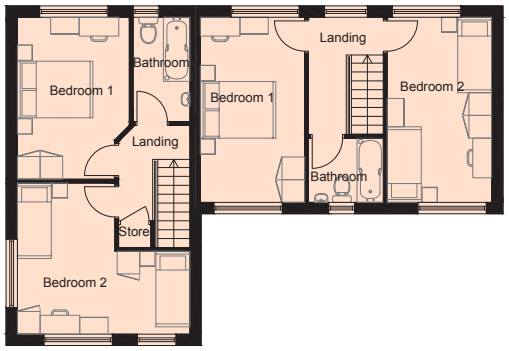
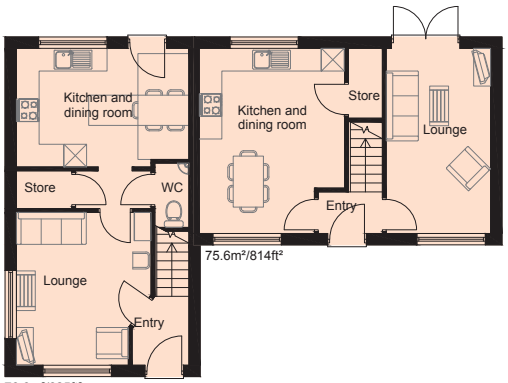
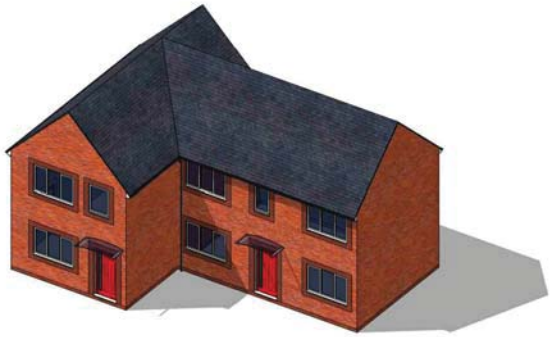


First floor

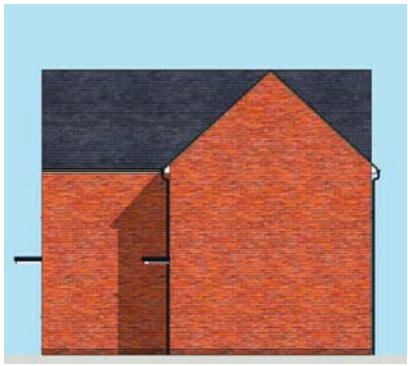


75.6m²/814ft²

76.6m²/825ft²
Ground floor



Front



Side

Rear
Elevations

Side

/ Initial issue 25/03/15

project
Proposed Housing Scheme
at Walton Hospital Site, Liverpool
for Mulbury Homes

title
Type 14 Plans and Elevations

status
Planning

scale
1:100 at A2

drawing no.
13-160-P16

date
25/03/15

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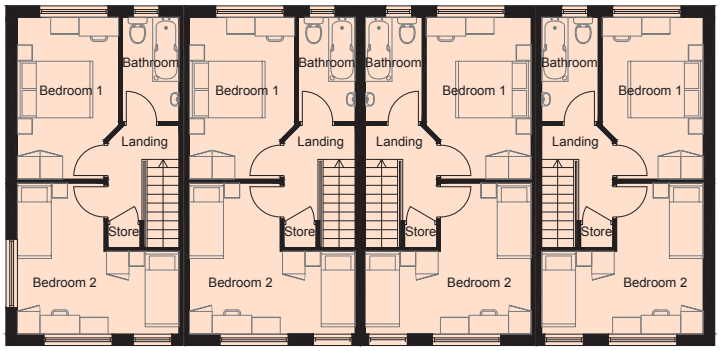
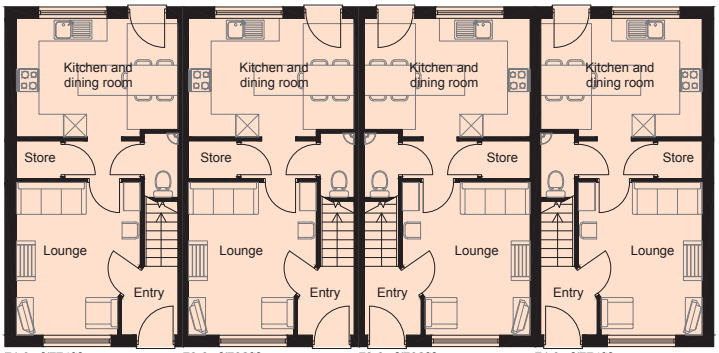


First floor



71.9m²/774ft² 73.6m²/792ft² 73.6m²/792ft² 71.9m²/774ft²

Ground floor

Front

Side

Rear
Elevations

Side

/ Initial issue 25/03/15

project
Proposed Housing Scheme
at Walton Hospital Site, Liverpool
for Mulbury Homes

title
Type 13 Plans and Elevations

status
Planning

scale
1:100 at A2

drawing no.
13-160-P15

date
25/03/15

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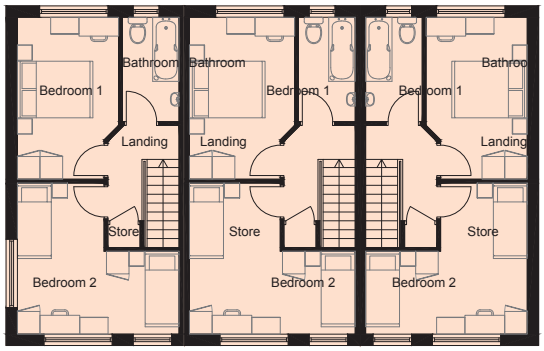
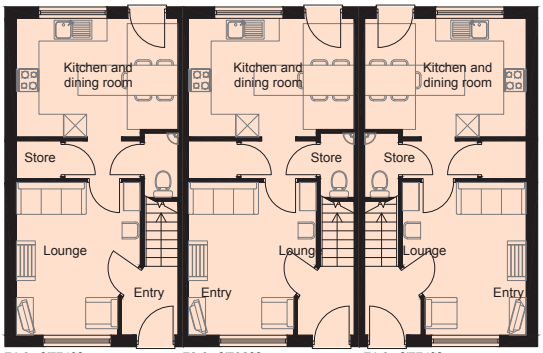


First floor

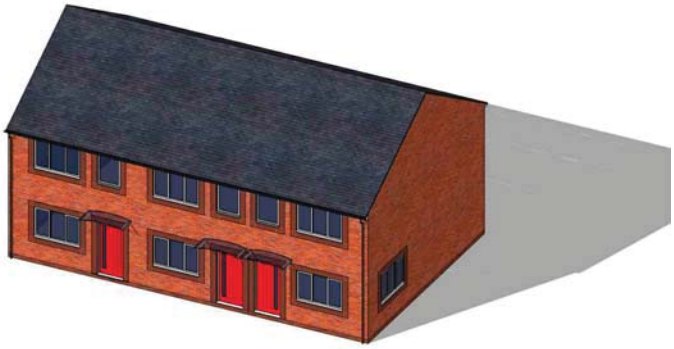
First floor



71.9m²/774ft²
Ground floor

73.6m²/792ft²

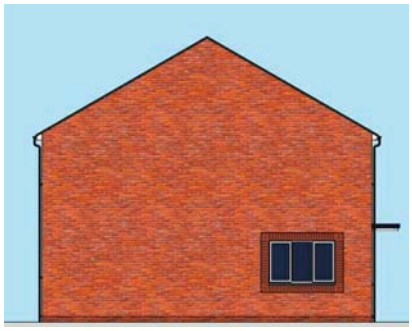
71.9m²/774ft²



Front

Side

Rear
Elevations



Side

/ Initial issue 25/03/15

project
Proposed Housing Scheme
at Walton Hospital Site, Liverpool
for Mulbury Homes

title
Type 12 Plans and Elevations

status
Planning

scale
1:100 at A2

drawing no.
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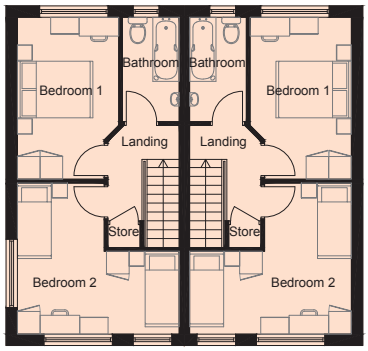
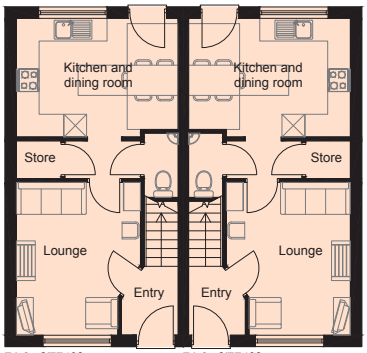


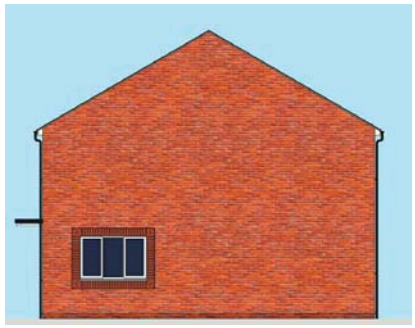
First floor



71.9m²/774ft² 71.9m²/774ft²

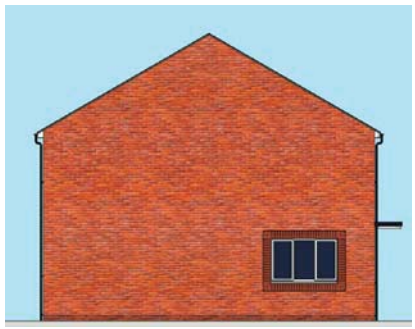
Ground floor

Front



Side

Rear
Elevation



Side

/ Initial issue 25/03/15

project
Proposed Housing Scheme
at Walton Hospital Site, Liverpool
for Mulbury Homes

title
Type 11 Plans and Elevations

status
Planning

scale
1:100 at A2

drawing no.
13-160-P13

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25/03/15

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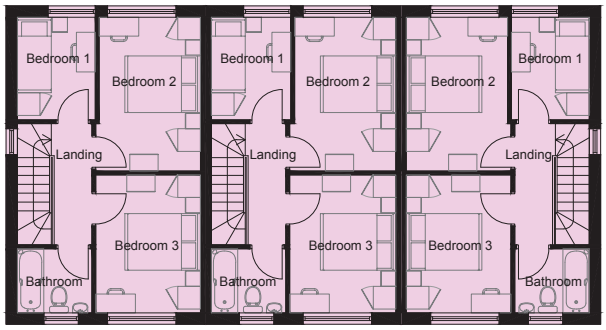
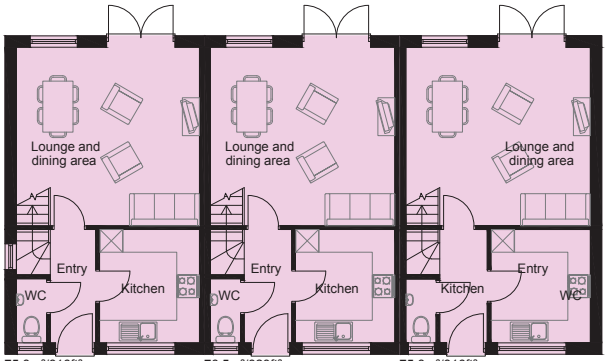


First floor



75.8m²/816ft²
Woodrush
Ground floor

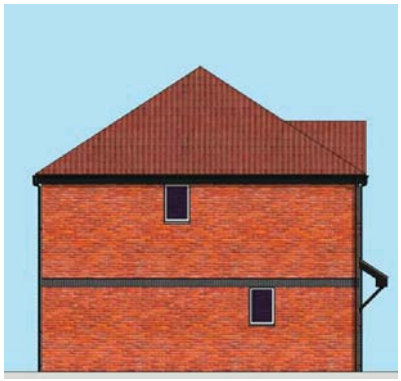
76.5m²/823ft²
Woodrush

75.8m²/816ft²
Woodrush

Front

Side

Rear
Elevations



Side

/ Initial issue 25/03/15

project
Proposed Housing Scheme
at Walton Hospital Site, Liverpool
for Mulbury Homes

title
Type 10 Plans and Elevations

status
Planning

scale
1:100 at A2

drawing no.
13-160-P12

date
25/03/15

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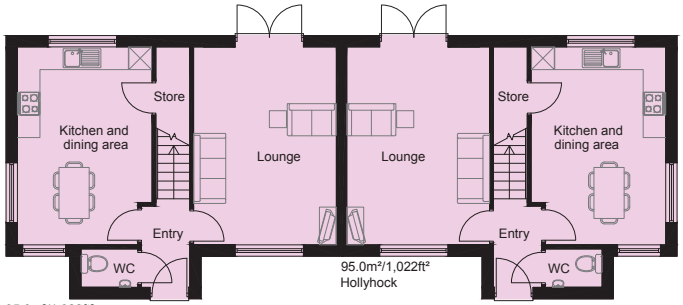
First floor



95.0m²/1,022ft²
Hollyhock
Ground floor

95.0m²/1,022ft²
Hollyhock

Front

Side

Rear
Elevations

Side

/ Initial issue 25/03/15

project
Proposed Housing Scheme
at Walton Hospital Site, Liverpool
for Mulbury Homes

title
Type 9 Plans and Elevations

status
Planning

scale
1:100 at A2

drawing no.
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date
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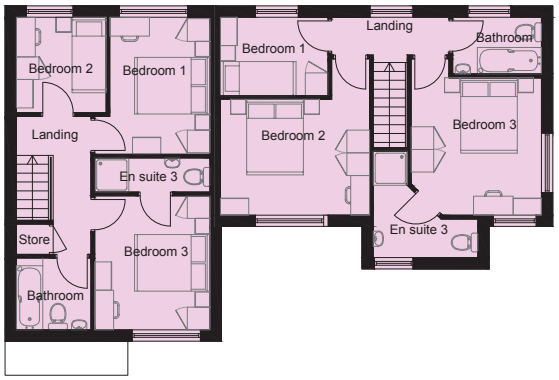
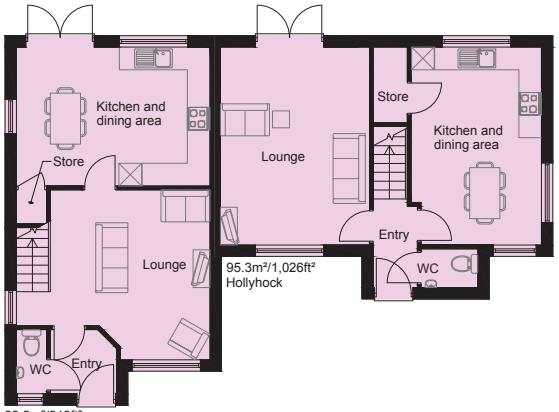


First floor



95.3m²/1,026ft²
Hollyhock

88.2m²/949ft²
Charlock
Ground floor

Front

Side

Rear
Elevations

Side

/ Initial issue 25/03/15

project
Proposed Housing Scheme
at Walton Hospital Site, Liverpool
for Mulbury Homes

title
Type 8 Plans and Elevations

status
Planning

scale
1:100 at A2

drawing no.
13-160-P10

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25/03/15

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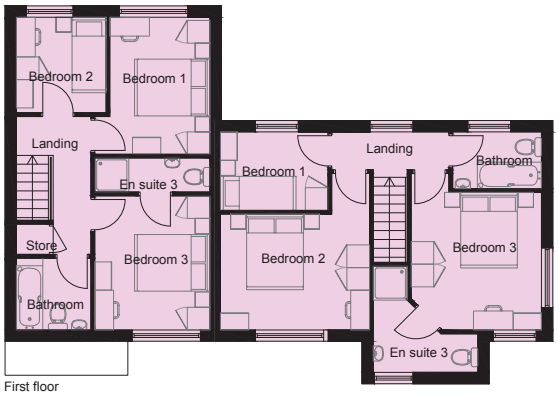
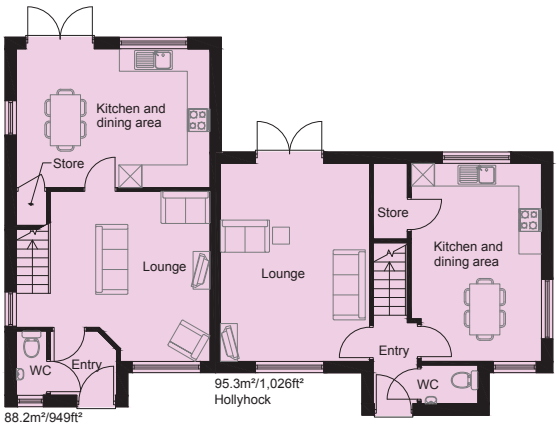


First floor



95.3m²/1,026ft²
Hollyhock

88.2m²/949ft²
Charlock
Ground floor

Front

Side

Rear

Side

Elevations

/ Initial issue 25/03/15

project
Proposed Housing Scheme
at Walton Hospital Site, Liverpool
for Mulbury Homes

title
Type 7 Plans and Elevations

status
Planning

scale
1:100 at A2

drawing no.
13-160-P09

date
25/03/15

drawn by
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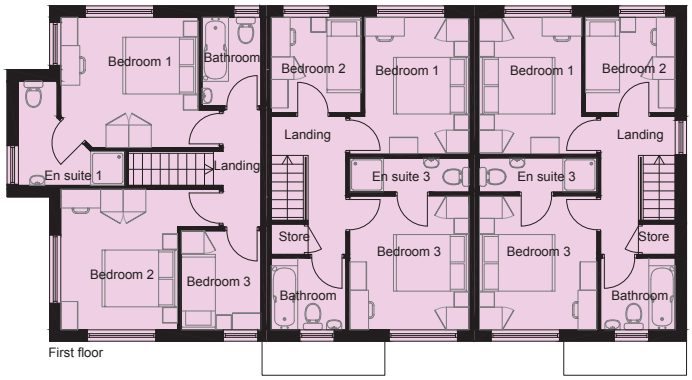
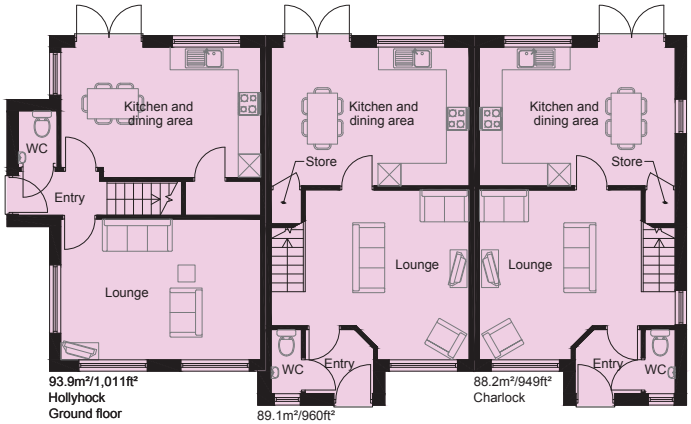


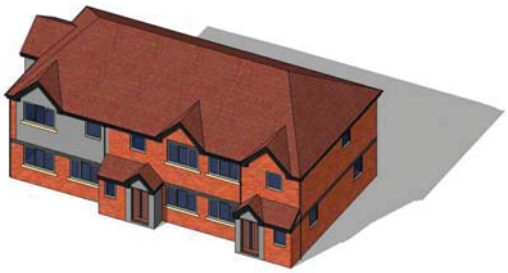
First floor



93.9m²/1,011ft²
Hollyhock
Ground floor

89.1m²/960ft²
Charlock

88.2m²/949ft²
Charlock



Front

Side

Rear
Elevations

Side

/ Initial issue 25/03/15

project
Proposed Housing Scheme
at Walton Hospital Site, Liverpool
for Mulbury Homes

title
Type 6 Plans and Elevations

status
Planning

scale
1:100 at A2

drawing no.
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date
25/03/15

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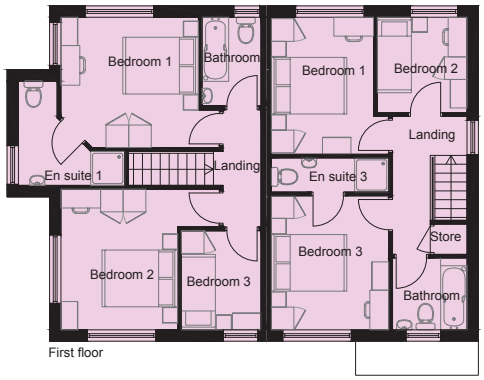
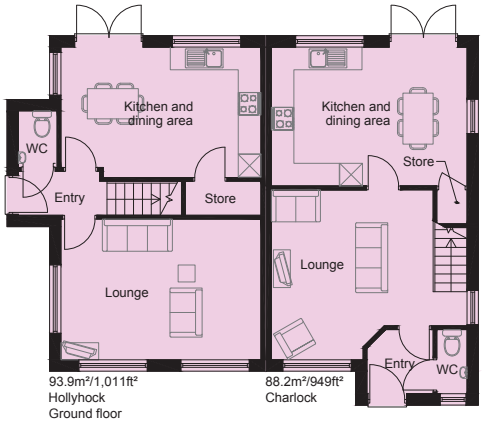
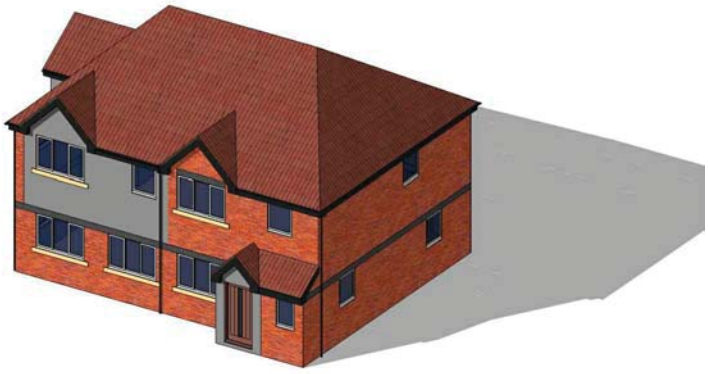


First floor



93.9m²/1,011ft²
Hollyhock
Ground floor

88.2m²/949ft²
Charlock



Front

Side

Rear
Elevations

Side

/ Initial issue 25/03/15

project
Proposed Housing Scheme
at Walton Hospital Site, Liverpool
for Mulbury Homes

title
Type 5 Plans and Elevations

status
Planning

scale
1:100 at A2

drawing no.
13-160-P07

date
25/03/15

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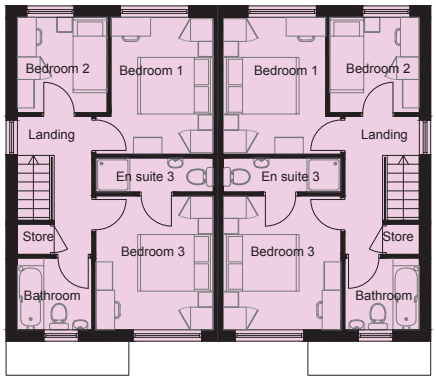
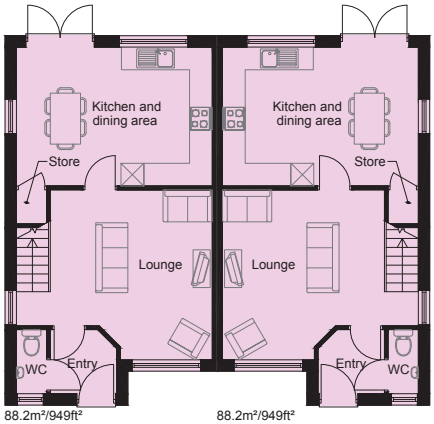
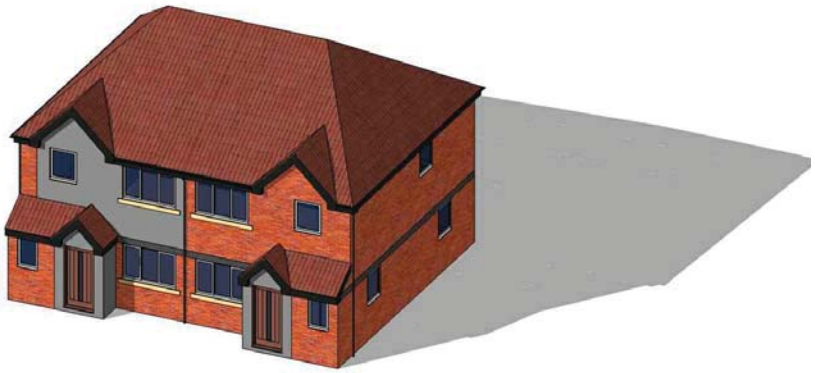


First floor



88.2m²/949ft²
Charlock
Ground floor

88.2m²/949ft²
Charlock



Front

Side

Rear
Elevations

Side

/ Initial issue 25/03/15

project
Proposed Housing Scheme
at Walton Hospital Site, Liverpool
for Mulbury Homes

title
Type 4 Plans and Elevations

status
Planning

scale
1:100 at A2

drawing no.
13-160-P06

date
25/03/15

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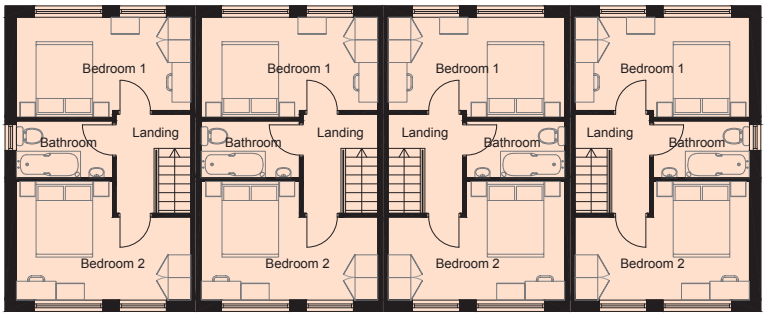
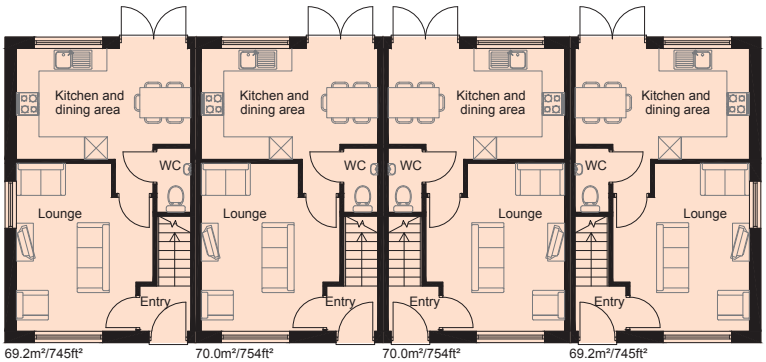


First floor

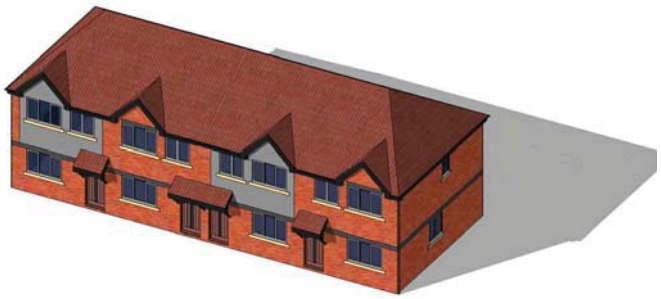


69.2m²/745ft²
Comfrey
Ground floor

70.0m²/754ft²
Comfrey

70.0m²/754ft²
Comfrey

69.2m²/745ft²
Comfrey



Front

Side

Rear
Elevations

Side

/ Initial issue 25/03/15

project
Proposed Housing Scheme
at Walton Hospital Site, Liverpool
for Mulbury Homes

title
Type 3 Plans and Elevations

status
Planning

scale
1:100 at A2

drawing no.
13-160-P05

date
25/03/15

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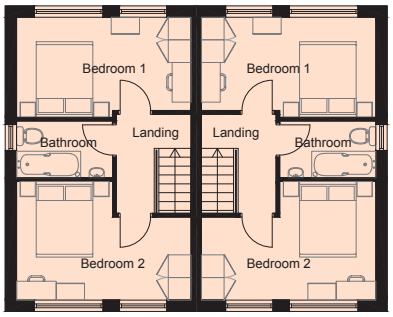
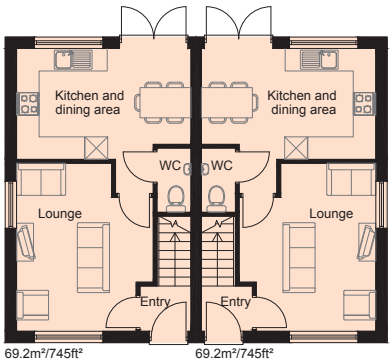


First floor



69.2m²/745ft²
Comfrey
Ground floor

69.2m²/745ft²
Comfrey

Front

Side

Rear
Elevations

Side

/ Initial issue 25/03/15

project
Proposed Housing Scheme
at Walton Hospital Site, Liverpool
for Mulbury Homes

title
Type 2 Plans and Elevations

status
Planning

scale
1:100 at A3

drawing no.
13-160-P04

date
25/03/15

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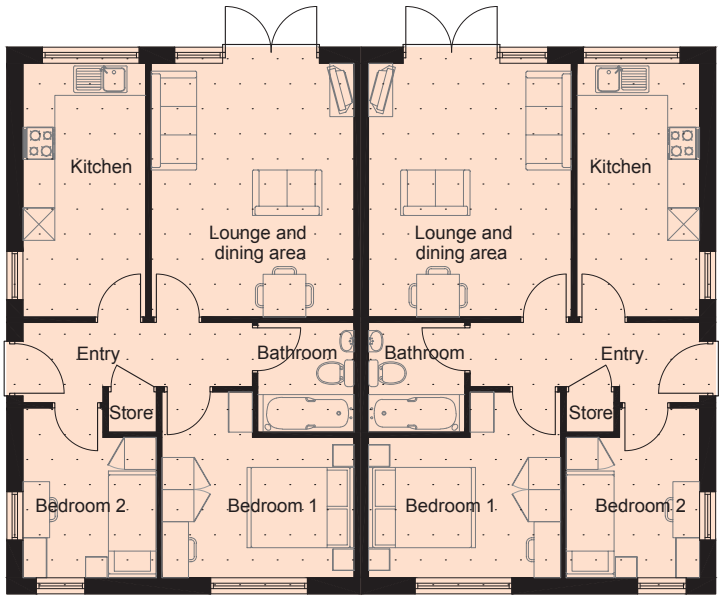

59.6m²/642ft²
A1
Ground floor

59.6m²/642ft²

Front

Side

Rear
Elevation

Side

/ Initial issue 25/03/15

project
Proposed Housing Scheme
at Walton Hospital Site, Liverpool
for Mulbury Homes

title
Type 1 Plans and Elevations

status
Planning

scale
1:100 at A3

drawing no.
13-160-P03

date
25/03/15

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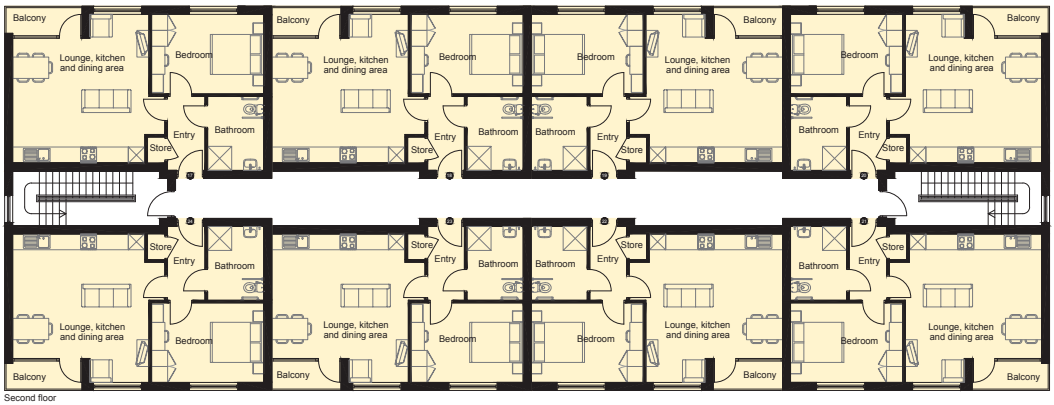
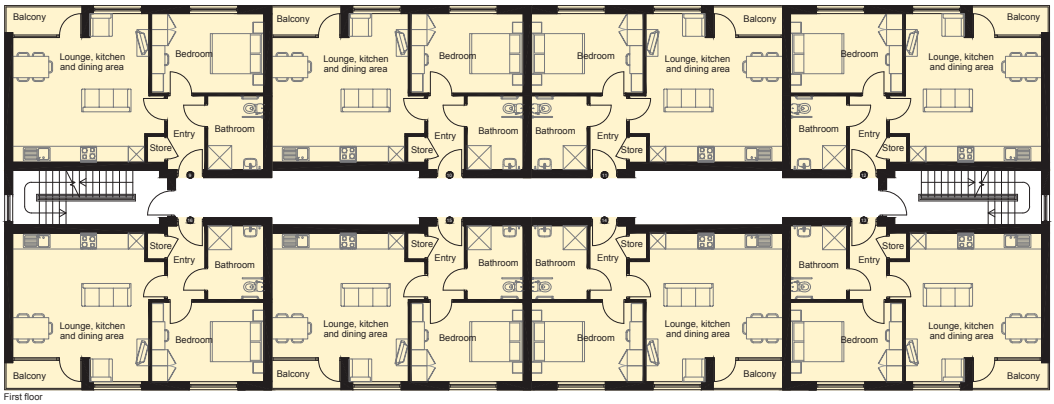
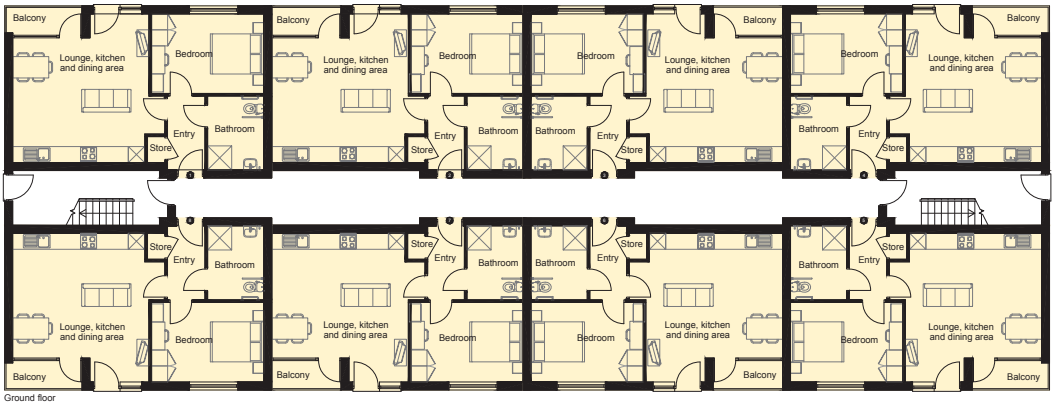


Second floor



First floor



Ground floor

	Area including balcony
1	54.0m²/581ft²
2	53.8m²/579ft²
3	53.8m²/579ft²
4	54.0m²/581ft²
5	54.0m²/581ft²
6	53.8m²/579ft²
7	53.8m²/579ft²
8	54.0m²/581ft²
9	54.0m²/581ft²
10	53.8m²/579ft²
11	53.8m²/579ft²
12	54.0m²/581ft²
13	54.0m²/581ft²
14	53.8m²/579ft²
15	53.8m²/579ft²
16	54.0m²/581ft²
17	54.0m²/581ft²
18	53.8m²/579ft²
19	53.8m²/579ft²
20	54.0m²/581ft²
21	54.0m²/581ft²
22	53.8m²/579ft²
23	53.8m²/579ft²
24	54.0m²/581ft²

1 Initial issue 23/03/15

project
Proposed Housing Scheme at Walton Hospital Site, Liverpool for Mulbury Homes

title
Block B Plans

status
Feasibility

scale
1:100 at A1

drawing no.
13-160-F17

date
23/03/15

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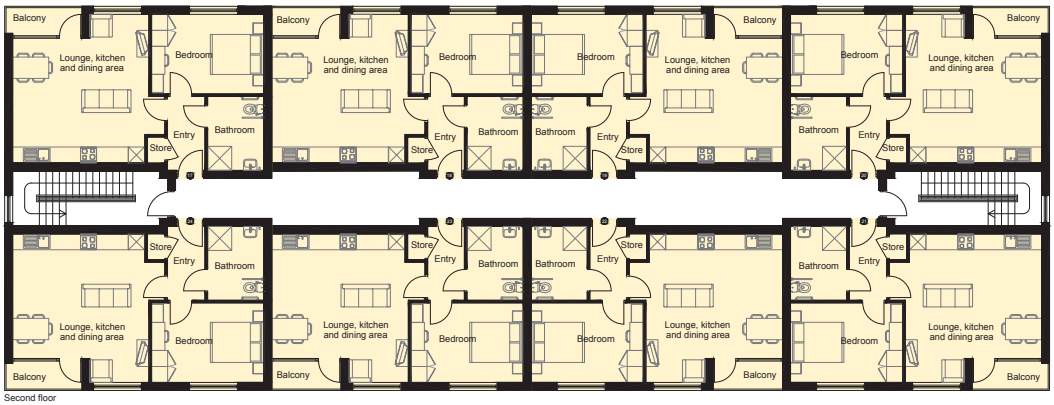
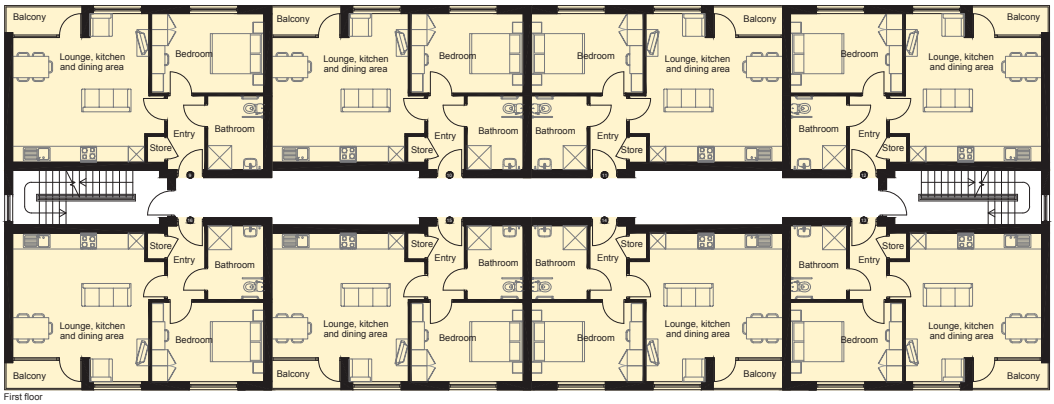
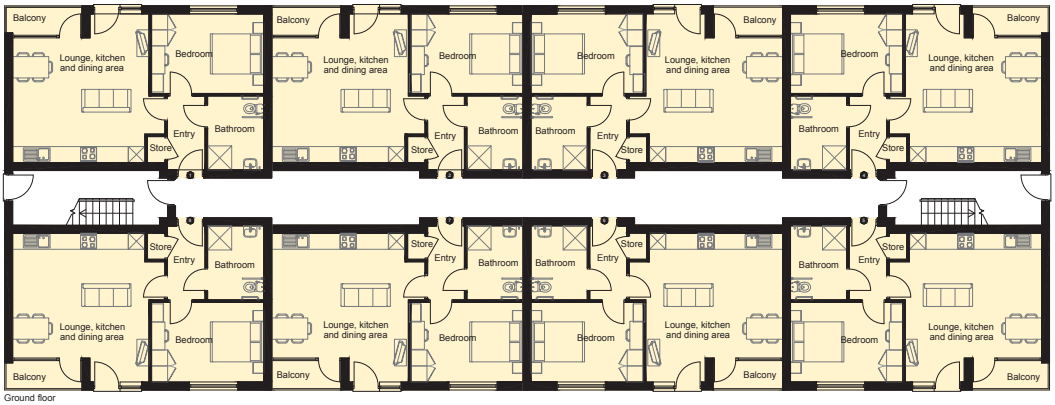


Second floor



First floor



Ground floor

	Area including balcony
1	54.0m²/581ft²
2	53.8m²/579ft²
3	53.8m²/579ft²
4	54.0m²/581ft²
5	54.0m²/581ft²
6	53.8m²/579ft²
7	53.8m²/579ft²
8	54.0m²/581ft²
9	54.0m²/581ft²
10	53.8m²/579ft²
11	53.8m²/579ft²
12	54.0m²/581ft²
13	54.0m²/581ft²
14	53.8m²/579ft²
15	53.8m²/579ft²
16	54.0m²/581ft²
17	54.0m²/581ft²
18	53.8m²/579ft²
19	53.8m²/579ft²
20	54.0m²/581ft²
21	54.0m²/581ft²
22	53.8m²/579ft²
23	53.8m²/579ft²
24	54.0m²/581ft²

1 Initial issue 23/03/15

project
Proposed Housing Scheme at Walton Hospital Site, Liverpool for Mulbury Homes

title
Block B Plans

status
Feasibility

scale
1:100 at A1

drawing no.
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date
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Visual 1

Visual 2

/ Initial issue 16/09/12

project
Proposed Housing Scheme
at Walton Hospital Site, Liverpool
for Mulbury Homes

title
Site Avii Apartment visuals

status
Feasibility

scale
nts at A3

drawing no.
13-160-F08

date
25/03/15

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APPENDIX C

Environmental Noise Record Sheets

ENVIRONMENTAL NOISE RECORD SHEET

Location: Position 1 – Proposed Plot 24 overlooking the railway line
Project: Aldi Walton Hospital
Date: 03/02/2015
Instrumentation: Bruel & Kjaer Type 2260/1 Sound Level Meter
Calibration Times: 12:36, 15:40, 21:56, 00:55
Plant Operating Condition: -

Date	Time		Weather			Noise Level dB(A)						Comments
	Start	Dur'n (Min)	Wind Speed m/s	Wind Dir'n	Cloud (%)	L_{10}	L_{50}	L_{90}	L_{MAX}	L_{MIN}	L_{Aeq}	(Including description of noise (eg whine, hiss, rumble, impact, vehicle rain, vegetation, or animal noise).
03/02/2015	12:42	15:00	1-3	NE	10	48	43	42	58	40	46	Distant traffic, plane, trains, birdsong, distant plant to west (whine).
03/02/2015	13:41	15:00	1-3	NE	0	47	42	41	62	39	45	Distant traffic, plane, trains, dog barking to north east residence, distant siren, birdsong, car horn to west.
03/02/2015	14:39	15:00	1-2	NE	0	47	42	40	72	38	45	Distant traffic, plane, trains, train horn, distant siren.
03/02/2015	22:00	15:00	1-3	N	0	48	43	42	59	40	45	Distant traffic, planes, distant dog barking to north west, trains, siren.
03/02/2015	22:58	15:00	1-3	N	70	44	42	41	61	39	43	Distant traffic, dog barking to north east, train.
03/02/2015	23:54	15:00	1-2	N	30	44	41	39	56	37	42	Distant traffic, train, distant dog barking to north west.

Date	Time	dB(A)	Octave Band Pressure Level									Comments
			31	63	125	250	500	1k	2k	4k	8k	
03/02/2015	12:42	46	57	55	50	46	44	41	34	24	19	Distant traffic, plane, trains, birdsong, distant plant to west (whine).
03/02/2015	13:41	45	57	56	46	41	44	42	34	25	18	Distant traffic, plane, trains, dog barking to north east residence, distant siren, birdsong, car horn to west.
03/02/2015	14:39	45	56	55	46	41	42	42	36	26	17	Distant traffic, plane, trains, train horn, distant siren.
03/02/2015	22:00	45	55	53	47	45	44	41	33	22	15	Distant traffic, planes, distant dog barking to north west, trains, siren.
03/02/2015	22:58	43	53	51	45	39	41	40	32	23	14	Distant traffic, dog barking to north east, train.
03/02/2015	23:54	42	52	51	45	39	40	39	31	22	17	Distant traffic, train, distant dog barking to north west.

ENVIRONMENTAL NOISE RECORD SHEET

Location: Position 2 – Proposed Block A
Date: 03/02/2015
Calibration Times: 12:36, 15:40, 21:56, 00:55
Project: Aldi Walton Hospital
Instrumentation: Bruel & Kjaer Type 2260/1 Sound Level Meter
Plant Operating Condition: -

Date	Time		Weather			Noise Level dB(A)						Comments
	Start	Dur'n (Min)	Wind Speed m/s	Wind Dir'n	Cloud (%)	L_{10}	L_{50}	L_{90}	L_{MAX}	L_{MIN}	L_{Aeq}	(Including description of noise (eg whine, hiss, rumble, impact, vehicle rain, vegetation, or animal noise).
03/02/2015	13:01	15:00	1-3	NE	0	53	45	42	68	40	50	Vehicles on Clocktower Drive, dog barking at residence, planes, voices, car doors closing, distant siren, distant traffic, birdsong, lorry reversing alarm to east, recycling lorry dumping bins.
03/02/2015	14:01	15:00	2-4	NE	0	47	42	40	59	38	45	Vehicles on Clocktower Drive, dog barking at residence, birdsong, plane, train horn to north west.
03/02/2015	14:58	15:00	1-3	NE	0	51	43	40	69	38	49	Distant traffic, voices, car doors closing, occasional vehicles on Clocktower Drive, car horn, birdsong, distant train, plane.
03/02/2015	22:18	15:00	2-3	N	10	46	42	39	66	38	45	Distant traffic, occasional vehicles on Clocktower Drive, voices, car doors closing, distant siren.
03/02/2015	23:16	15:00	1-2	N	30	46	41	40	65	38	45	Distant traffic, voices, music to residence just audible, occasional vehicles on Clocktower Drive, plane just audible.
04/02/2015	00:19	15:00	2-4	N	10	43	40	38	68	36	44	Distant traffic, voices, occasional vehicles on Clocktower Drive, dog barking at residence, mechanical plant to north east just audible, extract fan at residence (west).

Date	Time	dB(A)	Octave Band Pressure Level									Comments
			31	63	125	250	500	1k	2k	4k	8k	
03/02/2015	13:01	50	60	59	53	49	45	44	45	34	26	Vehicles on Clocktower Drive, dog barking at residence, planes, voices, car doors closing, distant siren, distant traffic, birdsong, lorry reversing alarm to east, recycling lorry dumping bins.
03/02/2015	14:01	45	57	57	49	44	41	41	37	29	22	Vehicles on Clocktower Drive, dog barking at residence, birdsong, plane, train horn to north west.
03/02/2015	14:58	49	61	59	52	47	45	44	41	36	34	Distant traffic, voices, car doors closing, occasional vehicles on Clocktower Drive, car horn, birdsong, distant train, plane.
03/02/2015	22:18	45	57	54	48	43	40	41	38	30	22	Distant traffic, occasional vehicles on Clocktower Drive, voices, car doors closing, distant siren.
03/02/2015	23:16	45	57	54	48	43	41	41	37	29	23	Distant traffic, voices, music to residence just audible, occasional vehicles on Clocktower Drive, plane just audible.
04/02/2015	00:19	44	55	51	48	44	44	39	35	30	23	Distant traffic, voices, occasional vehicles on Clocktower Drive, dog barking at residence, mechanical plant to north east just audible, extract fan at residence (west).

ENVIRONMENTAL NOISE RECORD SHEET

Location: Position 3 – Proposed Block B overlooking Rice Lane
Date: 03/02/2015
Calibration Times: 12:36, 15:40, 21:56, 00:55
Project: Aldi Walton Hospital
Instrumentation: Bruel & Kjaer Type 2260/1 Sound Level Meter
Plant Operating Condition: -

Date	Time		Weather			Noise Level dB(A)						Comments
	Start	Dur'n (Min)	Wind Speed m/s	Wind Dir'n	Cloud (%)	L_{10}	L_{50}	L_{90}	L_{MAX}	L_{MIN}	L_{Aeq}	(Including description of noise (eg whine, hiss, rumble, impact, vehicle rain, vegetation, or animal noise).
03/02/2015	13:20	15:00	1-2	N	0	67	62	57	76	51	64	Traffic on Rice Lane, voices, occasional vehicles on Clocktower Drive.
03/02/2015	14:19	15:00	1-3	N	0	66	61	55	73	51	63	Traffic on Rice Lane, voices, occasional vehicles on Clocktower Drive, distant music from a car to north west.
03/02/2015	15:17	15:00	2-3	N	0	67	62	57	74	52	64	Traffic on Rice Lane, voices.
03/02/2015	22:37	15:00	1-2	N	30	65	59	51	81	45	62	Traffic on Rice Lane, music from a car, distant siren, plane.
03/02/2015	23:34	15:00	1-2	N	30	64	53	44	72	39	60	Traffic on Rice Lane, voices, distant traffic.
04/02/2015	00:38	15:00	1-2	N	40	62	51	42	72	37	58	Traffic on Rice Lane, occasional vehicles on Clocktower Drive, voices, distant traffic.

Date	Time	dB(A)	Octave Band Pressure Level									Comments
			31	63	125	250	500	1k	2k	4k	8k	
03/02/2015	13:20	64	70	72	65	59	58	61	57	47	38	Traffic on Rice Lane, voices, occasional vehicles on Clocktower Drive.
03/02/2015	14:19	63	70	72	67	60	57	59	56	47	42	Traffic on Rice Lane, voices, occasional vehicles on Clocktower Drive, distant music from a car to north west.
03/02/2015	15:17	64	73	75	67	60	57	60	57	48	40	Traffic on Rice Lane, voices.
03/02/2015	22:37	62	61	65	62	60	57	59	55	45	33	Traffic on Rice Lane, music from a car, distant siren, plane.
03/02/2015	23:34	60	59	61	55	52	52	57	53	42	30	Traffic on Rice Lane, voices, distant traffic.
04/02/2015	00:38	58	59	59	54	51	51	55	51	40	28	Traffic on Rice Lane, occasional vehicles on Clocktower Drive, voices, distant traffic.

ENVIRONMENTAL NOISE RECORD SHEET

Location: Position 4 – Plot 110 overlooking the railway line
Date: 03/02/2015
Calibration Times: 12:35, 15:24, 21:54, 00:49
Project: Aldi Walton Hospital
Instrumentation: Bruel & Kjaer Type 2260/5 Sound Level Meter
Plant Operating Condition: -

Date	Time		Weather			Noise Level dB(A)						Comments
	Start	Dur'n (Min)	Wind Speed m/s	Wind Dir'n	Cloud (%)	L_{10}	L_{50}	L_{90}	L_{MAX}	L_{MIN}	L_{Aeq}	(Including description of noise (eg whine, hiss, rumble, impact, vehicle rain, vegetation, or animal noise).
03/02/2015	12:44	15:00	1-3	NE	0	47	43	41	61	39	46	Distant traffic, distant aircraft, birdsong, occasional trains, car on Clocktower Drive, distant dog barking.
03/02/2015	13:42	15:00	1-3	NE	0	46	42	41	60	39	45	Distant traffic (beyond rail line and Rice Lane), birdsong, occasional trains.
03/02/2015	14:37	15:00	1-2	NE	0	46	41	40	71	37	45	Distant traffic, birdsong, occasional trains, train horn, distant siren.
03/02/2015	21:59	15:00	1-3	N	40	46	43	41	63	40	45	Distant traffic, trains, distant siren.
03/02/2015	22:51	15:00	1-3	N	80	43	41	40	60	39	43	Traffic beyond rail line and Rice Lane, trains.
03/02/2015	23:48	15:00	1-2	N	30	43	40	39	59	37	43	Traffic beyond rail line and Rice Lane, trains.

Date	Time	dB(A)	Octave Band Pressure Level									Comments
			31	63	125	250	500	1k	2k	4k	8k	
03/02/2015	12:44	46	59	58	53	43	43	41	35	30	23	Distant traffic, distant aircraft, birdsong, occasional trains, car on Clocktower Drive, distant dog barking.
03/02/2015	13:42	45	60	57	49	41	43	41	36	31	26	Distant traffic (beyond rail line and Rice Lane), birdsong, occasional trains.
03/02/2015	14:37	45	59	56	48	41	42	42	37	32	27	Distant traffic, birdsong, occasional trains, train horn, distant siren.
03/02/2015	21:59	45	58	56	49	44	44	41	33	27	21	Distant traffic, trains, distant siren.
03/02/2015	22:51	43	53	53	48	39	41	39	32	24	18	Traffic beyond rail line and Rice Lane, trains.
03/02/2015	23:48	43	55	53	48	40	41	39	33	26	20	Traffic beyond rail line and Rice Lane, trains.

ENVIRONMENTAL NOISE RECORD SHEET

Location: Position 5 – Proposed Plot 90 adjacent to the proposed Aldi store
Project: Aldi Walton Hospital
Date: 03/02/2015 – 04/02/2015
Instrumentation: Bruel & Kjaer Type 2260/5 Sound Level Meter
Calibration Times: 12:35, 15:24, 21:54, 00:49
Plant Operating Condition: -

Date	Time		Weather			Noise Level dB(A)						Comments
	Start	Dur'n (Min)	Wind Speed m/s	Wind Dir'n	Cloud (%)	L_{10}	L_{50}	L_{90}	L_{MAX}	L_{MIN}	L_{Aeq}	(Including description of noise (eg whine, hiss, rumble, impact, vehicle rain, vegetation, or animal noise).
03/02/2015	13:02	15:00	1-3	NE	0	49	46	43	63	41	47	Traffic on Rice Lane, birdsong, distant siren, distant aircraft, occasional trains, distant banging, distant plant.
03/02/2015	13:59	15:00	2-4	NE	0	48	45	43	63	41	46	Traffic on Rice Lane, birdsong, occasional trains, distant aircraft.
03/02/2015	14:54	15:00	1-3	NE	0	48	45	43	64	41	46	Traffic on Rice Lane, birdsong, occasional trains, train horn, distant aircraft.
03/02/2015	22:15	15:00	2-3	N	40	47	44	42	64	40	45	Traffic on Rice Lane, occasional trains.
03/02/2015	23:09	15:00	1-2	N	60	46	43	41	60	39	44	Traffic on Rice Lane, occasional trains, aircraft.
04/02/2015	00:14	15:00	2-4	N	10	44	41	39	61	37	42	Traffic on Rice Lane.
04/02/2015	06:17	15:00	1-2	N	30	49	46	45	60	42	47	Traffic, trains, motorbike.
04/02/2015	06:56	15:00	1-2	N	30	51	49	47	62	45	49	Traffic, trains.
04/02/2015	07:38	15:00	1-2	N	30	53	51	49	72	47	52	Traffic, helicopter, distant banging.

Date	Time	dB(A)	Octave Band Pressure Level									Comments
			31	63	125	250	500	1k	2k	4k	8k	
03/02/2015	13:02	47	61	62	54	46	41	43	38	30	24	Traffic on Rice Lane, birdsong, distant siren, distant aircraft, occasional trains, distant banging, distant plant.
03/02/2015	13:59	46	63	61	52	45	41	42	38	31	25	Traffic on Rice Lane, birdsong, occasional trains, distant aircraft.
03/02/2015	14:54	46	61	62	53	45	40	42	37	30	25	Traffic on Rice Lane, birdsong, occasional trains, train horn, distant aircraft.
03/02/2015	22:15	45	57	56	49	42	40	42	37	28	22	Traffic on Rice Lane, occasional trains.
03/02/2015	23:09	44	55	55	47	41	40	41	36	28	22	Traffic on Rice Lane, occasional trains, aircraft.
04/02/2015	00:14	42	58	53	45	39	38	39	33	24	18	Traffic on Rice Lane.
04/02/2015	06:17	47	59	60	51	44	43	45	38	27	18	Traffic, trains, motorbike.
04/02/2015	06:56	49	60	62	53	46	45	47	40	29	18	Traffic, trains.
04/02/2015	07:38	52	62	63	55	48	47	49	43	31	19	Traffic, helicopter, distant banging.

ENVIRONMENTAL NOISE RECORD SHEET

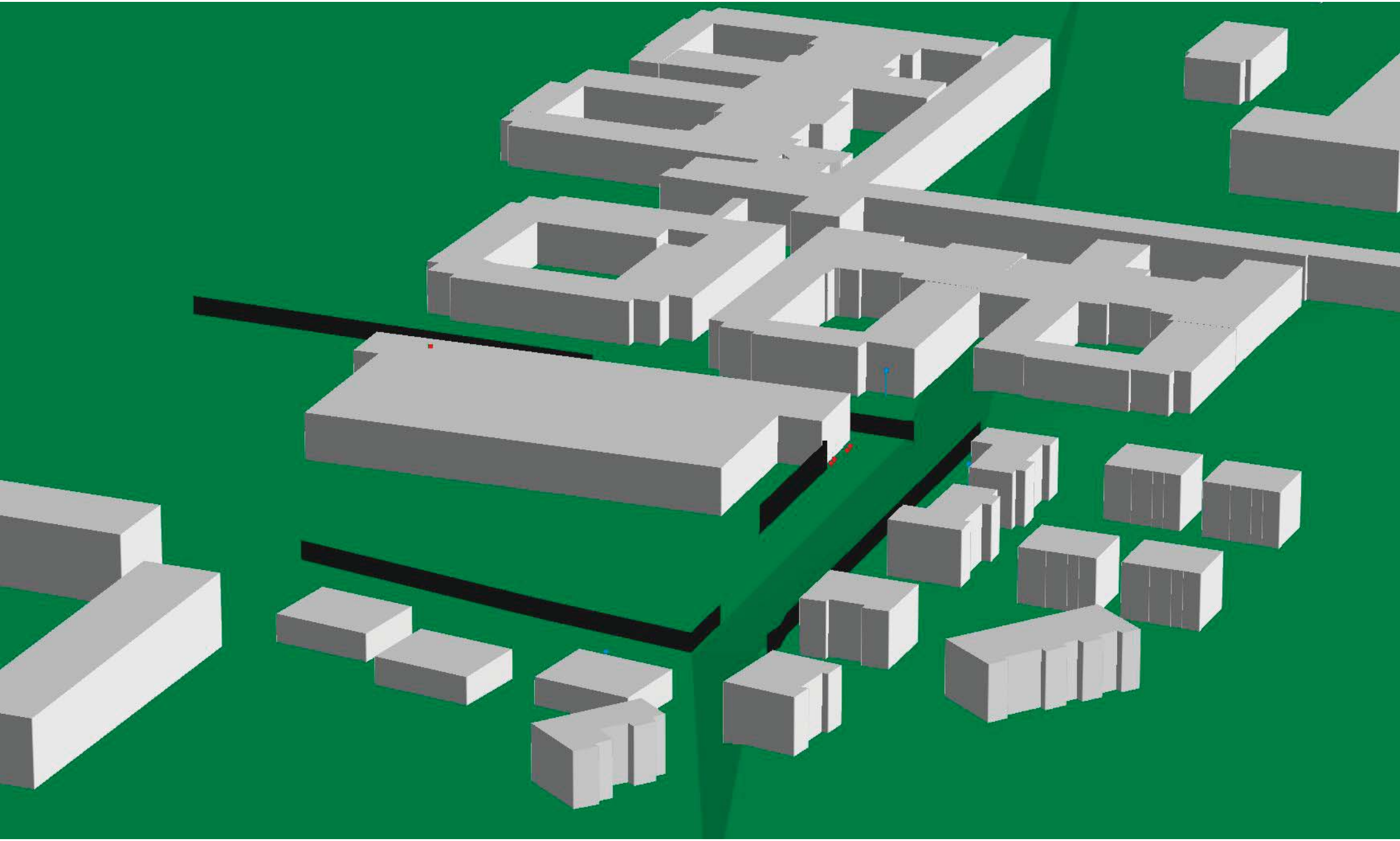
Location: Position 6 – Proposed Plot 144 opposite to the proposed Aldi store
Project: Aldi Walton Hospital
Date: 03/02/2015 – 04/02/2015
Instrumentation: Bruel & Kjaer Type 2260/5 Sound Level Meter
Calibration Times: 12:35, 15:24, 21:54, 00:49
Plant Operating Condition: -

Date	Time		Weather			Noise Level dB(A)						Comments
	Start	Dur'n (Min)	Wind Speed m/s	Wind Dir'n	Cloud (%)	L_{10}	L_{50}	L_{90}	L_{MAX}	L_{MIN}	L_{Aeq}	(Including description of noise (eg whine, hiss, rumble, impact, vehicle rain, vegetation, or animal noise).
03/02/2015	13:20	12:26	1-2	N	0	51	46	43	69	41	49	Traffic on Rice Lane, birdsong, distant aircraft, distant banging, voices.
03/02/2015	14:20	15:00	1-3	N	0	50	46	43	63	40	47	Traffic on Rice Lane, distant motorbike, birdsong, occasional trains, distant train horn.
03/02/2015	15:11	15:00	2-3	N	0	50	46	43	67	40	47	Traffic on Rice Lane, distant aircraft, birdsong, occasional trains.
03/02/2015	22:33	15:00	1-2	N	40	48	44	40	66	38	46	Traffic beyond rail line and on Rice Lane, occasional trains, aircraft overhead, motorbike.
03/02/2015	23:27	15:00	1-2	N	30	46	42	39	61	36	43	Traffic, trains, loud distant vehicles.
04/02/2015	00:31	15:00	1-2	N	10	42	37	35	57	33	40	Traffic, dog barking.
04/02/2015	06:00	15:00	1-2	N	30	48	45	43	59	40	46	Distant traffic, distant dog barking, helicopter.
04/02/2015	06:35	15:00	1-2	N	30	50	47	45	64	43	49	Traffic, trains.
04/02/2015	07:21	15:00	1-2	N	30	53	50	48	64	46	51	Traffic, trains, aircraft.

Date	Time	dB(A)	Octave Band Pressure Level									Comments
			31	63	125	250	500	1k	2k	4k	8k	
03/02/2015	13:20	49	63	63	57	50	45	43	39	34	27	Traffic on Rice Lane, birdsong, distant aircraft, distant banging, voices.
03/02/2015	14:20	47	64	62	55	47	43	43	37	31	24	Traffic on Rice Lane, distant motorbike, birdsong, occasional trains, distant train horn.
03/02/2015	15:11	47	63	64	55	48	42	43	38	31	23	Traffic on Rice Lane, distant aircraft, birdsong, occasional trains.
03/02/2015	22:33	46	54	56	51	49	43	41	35	25	20	Traffic beyond rail line and on Rice Lane, occasional trains, aircraft overhead, motorbike.
03/02/2015	23:27	43	54	55	46	41	40	40	35	26	21	Traffic, trains, loud distant vehicles.
04/02/2015	00:31	40	54	51	44	37	37	36	31	25	20	Traffic, dog barking.
04/02/2015	06:00	46	56	57	51	45	43	42	36	28	24	Distant traffic, distant dog barking, helicopter.
04/02/2015	06:35	49	61	62	54	48	45	45	39	27	19	Traffic, trains.
04/02/2015	07:21	51	62	62	55	48	47	47	42	36	23	Traffic, trains, aircraft.

APPENDIX D

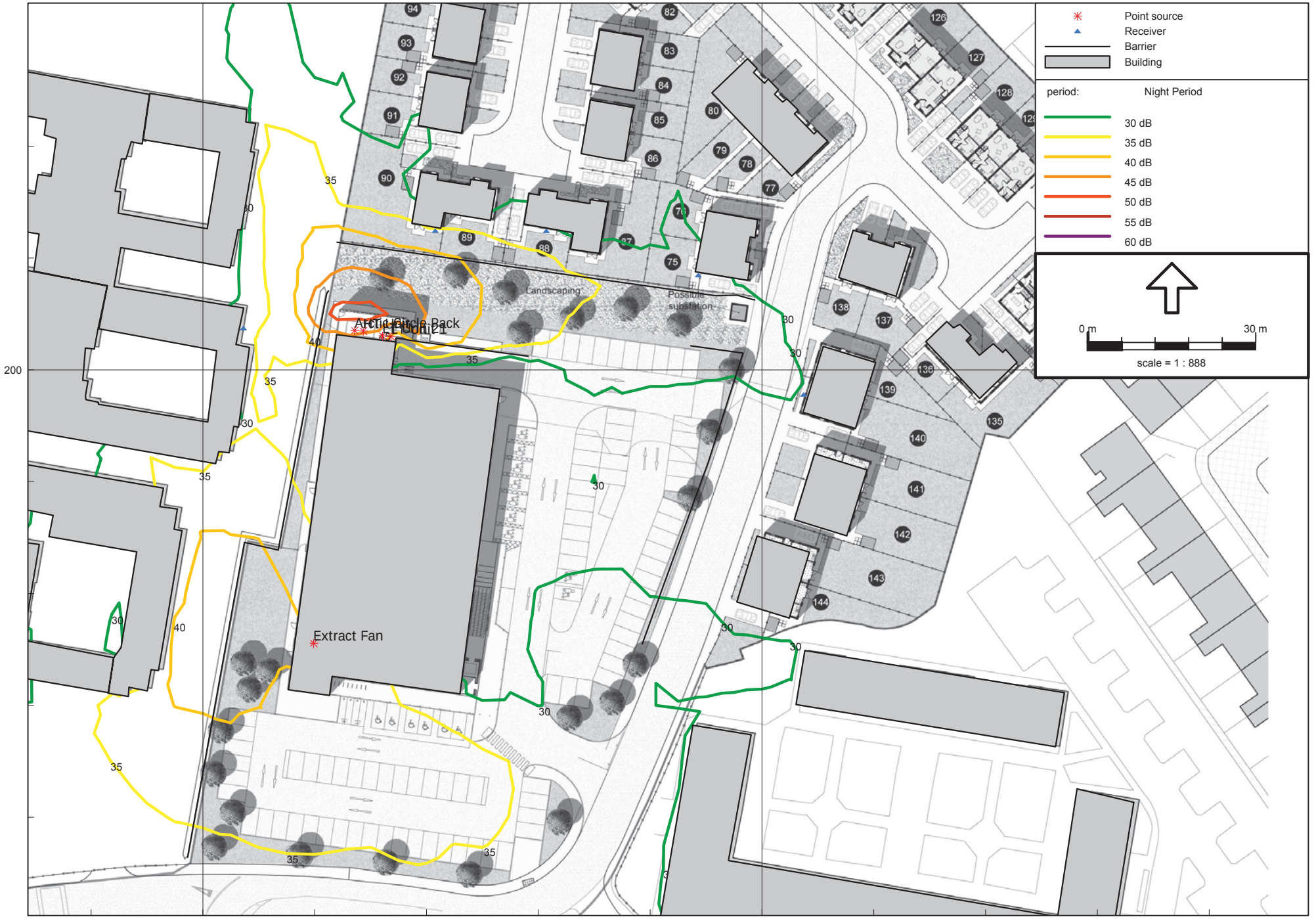
Results of noise prediction model relating to mechanical plant



Report: Table of Results
Model: Plant Noise Model - Rev 2 [with quieter plant]
LAeq per octave: total results for receivers
Group: (main group)
Group Reduction: No

Name Receiver	Description	Height	Night Total	63	125	250	500	1000	2000	4000	8000
_A	Hospital	3.50	31	5	17	21	27	27	23	15	4
_A	Proposed Plot 140 - Site Aii	3.50	30	--	10	13	25	26	25	17	3
_A	Proposed Plot 75 - Site Aii	3.50	30	--	11	15	24	26	24	18	8
_A	Proposed Plot 88 - Site Aii	3.50	32	--	14	19	26	28	26	20	9
_A	Proposed Plot 90 - Site Aii	3.50	35	2	18	23	28	31	30	25	19

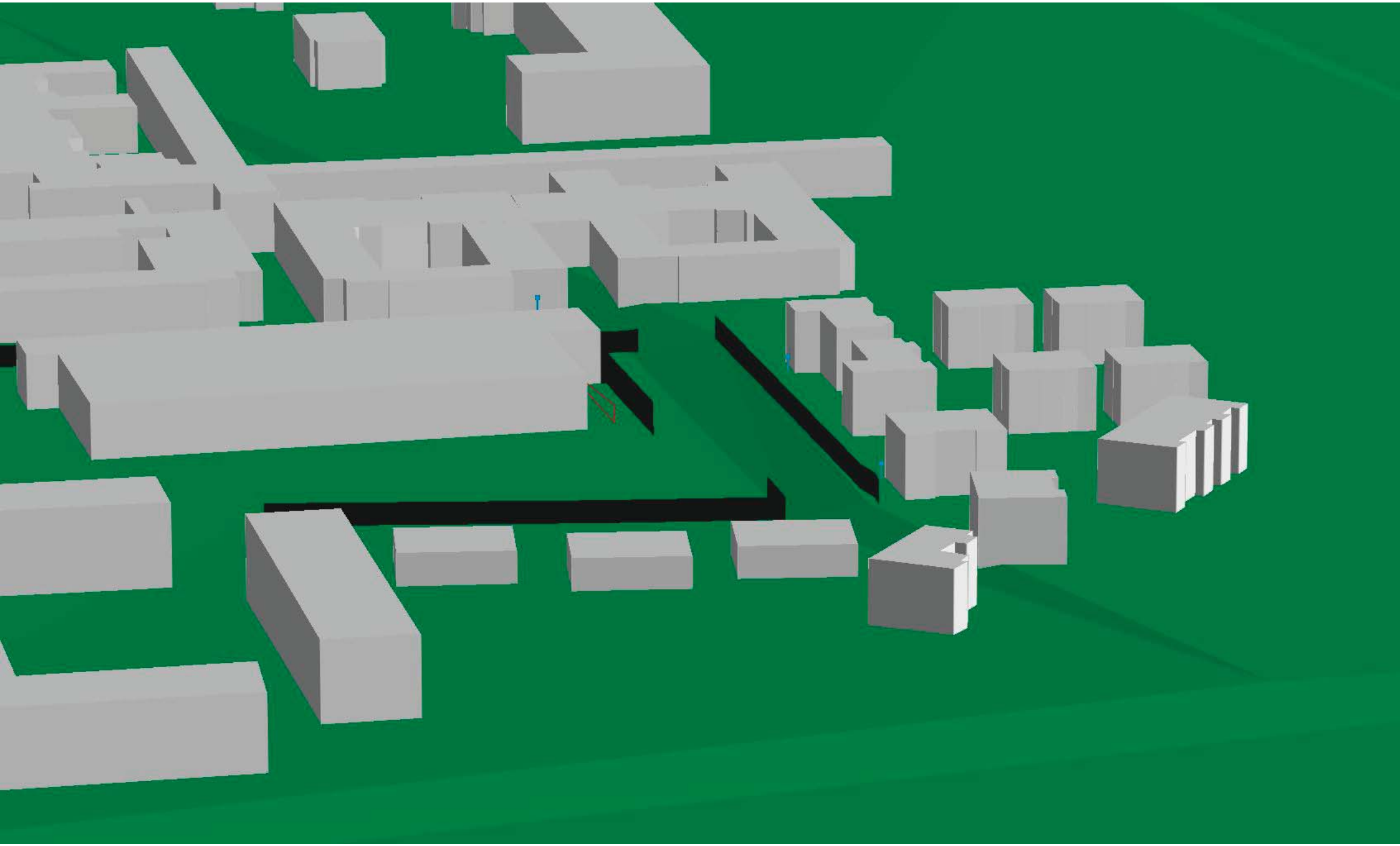
All shown dB values are A-weighted



Industrial noise - LimA - ISO 9613.1/2, [version of 14237 - Aldi Rice Lane - Plant Noise Model - Rev 2 [with quieter plant]] , Predictor V9.11

APPENDIX E

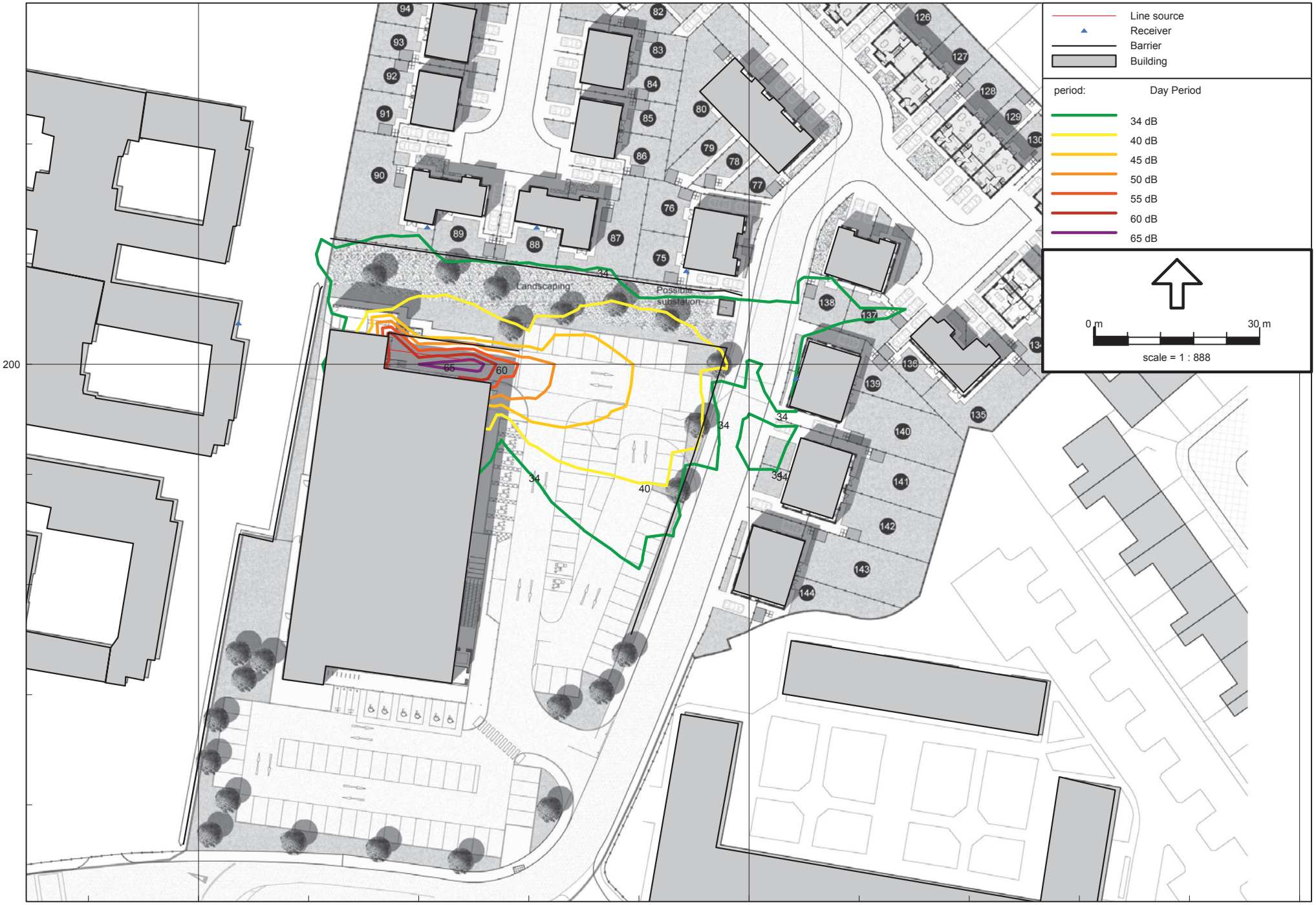
Results of noise prediction model relating to deliveries



Report: Table of Results
Model: Delivery Noise Model - Rev 1 [Daytime only]
LAeq per octave: total results for receivers
Group: (main group)
Group Reduction: No

Name Receiver	Description	Height	Day Total	63	125	250	500	1000	2000	4000	8000
_A	Hospital	3.50	28	21	25	17	18	20	18	8	--
_A	Proposed Plot 140 - Site Aii	1.50	33	16	23	21	24	29	28	16	--
_A	Proposed Plot 75 - Site Aii	1.50	29	16	21	14	20	23	23	9	--
_A	Proposed Plot 88 - Site Aii	1.50	31	20	27	20	21	24	21	9	--
_A	Proposed Plot 90 - Site Aii	1.50	32	21	29	21	22	25	23	11	--

All shown dB values are A-weighted



Aldi Rice Lane
Delivery Noise Model - Rev 1

Spectrum Acoustics Consultants, UK

Industrial noise - LimA - ISO 9613.1/2, [version of 14237 - Aldi Rice Lane - Delivery Noise Model - Rev 1 [Daytime only]] , Predictor V9.11

APPENDIX F

Intrusive Noise Calculations

Date : 21/04/2015 **Project No.:** 14237 **Project:** Rice Lane

Receiver room for this calculation: Plot 24 (Type 19) - Living Room (daytime)

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Appendix G, Section 2.1 of BS8233:2014

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAeq,16hour) - i.e. the design external LAeq
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

		Octave Band Centre Frequency (Hz)							
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
LAeq,16hour	**45.1**	55.9	46.1	41.0	43.6	41.5	34.0	25.2	17.8
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Basic double glazing (e.g. 4/12/4) Rw+Ctr 25 dB									
Area:		4.1	m^2						
R:		18	24	20	25	35	38	35	35
Brick and block external wall									
Area:		15.7							
R:		34	40	44	45	51	56	60	63
Hit and miss trickle ventilators (Dnew+Ctr 32)									
Number of:		4							
D_{ne}		30	38	37	34	30	34	37	46
Room Data									
Living Room Reverberation Time		0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3
Total Façade Area		19.8	m^2						
Room Volume		39	m^3						
Overall sound reduction of the facade									
Combined sound reduction		22.5	29.1	26.0	28.3	26.8	30.8	33.3	39.3
		Octave Band Centre Frequency (Hz)							
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	22.3	**39.1**	**22.7**	**19.9**	**20.2**	**18.7**	**7.2**	**0.0**	**0.0**

Date : 21/04/2015 **Project No.:** 14237 **Project:** Rice Lane

Receiver room for this calculation: Plot 24 (Type 19) - Bedroom (night-time)

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Appendix G, Section 2.1 of BS8233:2014

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAeq,8hour) - i.e. the design external LAeq
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

		Octave Band Centre Frequency (Hz)							
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
LAeq,8hour	**42.2**	50.7	44.7	39.4	40.4	38.6	30.5	21.8	17.1
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Basic double glazing (e.g. 4/12/4) Rw+Ctr 25 dB									
Area:		3.6	m^2						
R:		18	24	20	25	35	38	35	35
Brick and block external wall									
Area:		15.2							
R:		34	40	44	45	51	56	60	63
Hit and miss trickle ventilators (Dnew+Ctr 32)									
Number of:		4							
D_{ne}		30	38	37	34	30	34	37	46
Room Data									
Bedroom Reverberation Time		0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3
Total Façade Area		18.8	m^2						
Room Volume		30	m^3						
Overall sound reduction of the facade									
Combined sound reduction		22.6	29.3	26.2	28.3	26.6	30.5	33.1	39.4
		Octave Band Centre Frequency (Hz)							
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	20.1	**34.8**	**22.1**	**19.0**	**18.0**	**16.9**	**0.0**	**0.0**	**0.0**

Date : 21/04/2015 **Project No.:** 14237 **Project:** Rice Lane

Receiver room for this calculation: Plot 24 (Type 19) - Bedroom (night-time)

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Appendix G, Section 2.1 of BS8233:2014

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAFMax) - i.e. the design external LAFMax
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

			Octave Band Centre Frequency (Hz)						
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
LAFMax	**62.2**	66.0	59.0	52.0	56.0	52.0	59.0	52.0	33.0
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Basic double glazing (e.g. 4/12/4) Rw+Ctr 25 dB									
Area:		3.6	m^2						
R:		18	24	20	25	35	38	35	35
Brick and block external wall									
Area:		15.2							
R:		34	40	44	45	51	56	60	63
Hit and miss trickle ventilators (Dnew+Ctr 32)									
Number of:		4							
D_{ne}		30	38	37	34	30	34	37	46
Room Data									
Bedroom Reverberation Time		0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3
Total Façade Area		18.8	m^2						
Room Volume		30	m^3						
Overall sound reduction of the facade									
Combined sound reduction		22.6	29.3	26.2	28.3	26.6	30.5	33.1	39.4
			Octave Band Centre Frequency (Hz)						
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	37.7	**50.1**	**36.4**	**31.6**	**33.6**	**30.3**	**33.3**	**23.8**	**0.0**

Date : 21/04/2015 **Project No.:** 14237 **Project:** Rice Lane

Receiver room for this calculation: Block A - Living Room (daytime)

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Appendix G, Section 2.1 of BS8233:2014

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAeq,16hour) - i.e. the design external LAeq
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

			Octave Band Centre Frequency (Hz)						
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
LAeq,16hour	**46.1**	56.9	47.1	42.0	44.6	42.5	35.0	26.2	18.8
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Basic double glazing (e.g. 4/12/4) Rw+Ctr 25 dB									
Area:		5.6	m^2						
R:		18	24	20	25	35	38	35	35
Brick and block external wall									
Area:		20.2							
R:		34	40	44	45	51	56	60	63
Hit and miss trickle ventilators (Dnew+Ctr 32)									
Number of:		5							
D_{ne}		30	38	37	34	30	34	37	46
Room Data									
Living Room Reverberation Time		0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3
Total Façade Area		25.8	m^2						
Room Volume		30	m^3						
Overall sound reduction of the facade									
Combined sound reduction		22.4	29.0	25.9	28.3	27.0	30.9	33.4	39.3
			Octave Band Centre Frequency (Hz)						
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	25.5	**42.5**	**26.1**	**23.4**	**23.6**	**21.8**	**10.4**	**0.0**	**0.0**

Date : 21/04/2015 **Project No.:** 14237 **Project:** Rice Lane

Receiver room for this calculation: Block A - Bedroom (night-time)

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Appendix G, Section 2.1 of BS8233:2014

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAeq,8hour) - i.e. the design external LAeq
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

		Octave Band Centre Frequency (Hz)							
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
$L_{Aeq,8hour}$	**44.7**	51.1	48.0	43.8	44.1	38.5	34.5	29.6	23.3
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Basic double glazing (e.g. 4/12/4) Rw+Ctr 25 dB									
Area:		1.8	m^2						
R:		18	24	20	25	35	38	35	35
Brick and block external wall									
Area:		8.0							
R:		34	40	44	45	51	56	60	63
Hit and miss trickle ventilators (Dnew+Ctr 32)									
Number of:		2							
D_{ne}		30	38	37	34	30	34	37	46
Room Data									
Bedroom Reverberation Time		0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3
Total Façade Area		9.8	m^2						
Room Volume		30	m^3						
Overall sound reduction of the facade									
Combined sound reduction		22.8	29.4	26.4	28.5	26.7	30.7	33.3	39.6
		Octave Band Centre Frequency (Hz)							
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	19.3	**32.1**	**22.3**	**20.3**	**18.6**	**13.7**	**5.8**	**0.0**	**0.0**

Date : 21/04/2015 **Project No.:** 14237 **Project:** Rice Lane

Receiver room for this calculation: Block A - Bedroom (night-time)

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Appendix G, Section 2.1 of BS8233:2014

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAFMax) - i.e. the design external LAFMax
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

			Octave Band Centre Frequency (Hz)						
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
LAFMax	**69.5**	61.0	62.0	69.0	70.0	62.0	58.0	56.0	51.0
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Basic double glazing (e.g. 4/12/4) Rw+Ctr 25 dB									
Area:		1.8	m^2						
R:		18	24	20	25	35	38	35	35
Brick and block external wall									
Area:		8.0							
R:		34	40	44	45	51	56	60	63
Hit and miss trickle ventilators (Dnew+Ctr 32)									
Number of:		2							
D_{ne}		30	38	37	34	30	34	37	46
Room Data									
Bedroom Reverberation Time		0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3
Total Façade Area		9.8	m^2						
Room Volume		30	m^3						
Overall sound reduction of the facade									
Combined sound reduction		22.8	29.4	26.4	28.5	26.7	30.7	33.3	39.6
		Octave Band Centre Frequency (Hz)							
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	44.0	**42.0**	**36.3**	**45.5**	**44.5**	**37.2**	**29.3**	**24.7**	**12.2**

Date : 21/04/2015 **Project No.:** 14237 **Project:** Rice Lane

Receiver room for this calculation: Block B - Living Room (daytime)

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Appendix G, Section 2.1 of BS8233:2014

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAeq,16hour) - i.e. the design external LAeq
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

		Octave Band Centre Frequency (Hz)							
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
LAeq,16hour	**63.0**	72.1	67.4	59.8	56.6	59.4	55.9	47.0	41.5
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
High performance glazing (e.g. 10/12/6) Rw+Ctr 32dB									
Area:		4.2	m^2						
R:		20	26	27	34	40	38	46	44
Brick and block external wall									
Area:		18.8							
R:		34	40	44	45	51	56	60	63
Glazed external door (x2) Rw+Ctr 25 dB									
Area:		3.8	m^2						
R:		18	24	20	25	35	38	35	35
Acoustic trickle ventilators (Dnew+Ctr 42 dB)									
Number of:		3							
D_{ne}		30	40	43	36	46	48	41	38
Room Data									
Living Room Reverberation Time		0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3
Total Façade Area		26.8	m^2						
Room Volume		66	m^3						
Overall sound reduction of the facade									
Combined sound reduction		22.8	29.4	27.4	30.9	40.3	41.7	38.6	36.4
		Octave Band Centre Frequency (Hz)							
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	33.7	**54.0**	**42.7**	**36.3**	**29.6**	**22.1**	**17.1**	**11.4**	**6.8**

Date : 21/04/2015 **Project No.:** 14237 **Project:** Rice Lane

Receiver room for this calculation: Block B - Bedroom (night-time)

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Appendix G, Section 2.1 of BS8233:2014

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAeq,8hour) - i.e. the design external LAeq
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

			Octave Band Centre Frequency (Hz)						
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
LAeq,8hour	**57.7**	59.4	53.7	50.8	50.8	55.1	51.1	40.0	27.7
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Basic double glazing (e.g. 4/12/4) Rw+Ctr 25 dB									
Area:		1.8	m^2						
R:		18	24	20	25	35	38	35	35
Brick and block external wall									
Area:		8.7							
R:		34	40	44	45	51	56	60	63
Acoustic trickle ventilators (Dnew+Ctr 42 dB)									
Number of:		2							
D_{ne}		30	40	43	36	46	48	41	38
Room Data									
Bedroom Reverberation Time		0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3
Total Façade Area		10.5	m^2						
Room Volume		31	m^3						
Overall sound reduction of the facade									
Combined sound reduction		23.1	30.2	27.3	29.8	39.6	42.3	36.9	34.5
		Octave Band Centre Frequency (Hz)							
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	24.8	**40.3**	**27.4**	**26.6**	**24.1**	**17.6**	**11.0**	**5.3**	**0.0**

Date : 21/04/2015 **Project No.:** 14237 **Project:** Rice Lane

Receiver room for this calculation: Block B - Bedroom (night-time)

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Appendix G, Section 2.1 of BS8233:2014

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAFMax) - i.e. the design external LAFM
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

			Octave Band Centre Frequency (Hz)						
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
L_{AFMax}	**72.8**	78.0	76.0	67.0	65.0	70.0	66.0	56.0	46.0
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Basic double glazing (e.g. 4/12/4) Rw+Ctr 25 dB									
Area:		1.8	m^2						
R:		18	24	20	25	35	38	35	35
Brick and block external wall									
Area:		8.7							
R:		34	40	44	45	51	56	60	63
Acoustic trickle ventilators (Dnew+Ctr 42 dB)									
Number of:		2							
D_{ne}		30	40	43	36	46	48	41	38
Room Data									
Bedroom Reverberation Time		0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3
Total Façade Area		10.5	m^2						
Room Volume		31	m^3						
Overall sound reduction of the facade									
Combined sound reduction		23.1	30.2	27.3	29.8	39.6	42.3	36.9	34.5
		Octave Band Centre Frequency (Hz)							
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	40.9	**58.9**	**49.7**	**42.8**	**38.3**	**32.5**	**25.9**	**21.3**	**12.4**

Date : 21/04/2015 **Project No.:** 14237 **Project:** Rice Lane

Receiver room for this calculation: Plot 110 (Type 4) - Kitchen/Dining Room (daytime)

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Appendix G, Section 2.1 of BS8233:2014

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAeq,16hour) - i.e. the design external LAeq
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

		Octave Band Centre Frequency (Hz)							
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
LAeq,16hour	**43.1**	52.9	47.5	39.6	41.0	39.1	32.7	26.3	20.2
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Basic double glazing (e.g. 4/12/4) Rw+Ctr 25 dB									
Area:		2.7	m^2						
R:		18	24	20	25	35	38	35	35
Brick and block external wall									
Area:		15.8							
R:		34	40	44	45	51	56	60	63
Glazed external door (x2) Rw+Ctr 25 dB									
Area:		3.8	m^2						
R:		18	24	20	25	35	38	35	35
Hit and miss trickle ventilators (Dnew+Ctr 32)									
Number of:		3							
D_{ne}		30	38	37	34	30	34	37	46
Room Data									
Living Room Reverberation Time		0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3
Total Façade Area		22.3	m^2						
Room Volume		48	m^3						
Overall sound reduction of the facade									
Combined sound reduction		22.0	28.4	24.9	28.3	28.4	32.3	34.4	39.0
		Octave Band Centre Frequency (Hz)							
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	19.2	**36.2**	**24.4**	**19.2**	**17.2**	**14.3**	**3.9**	**0.0**	**0.0**

Date : 21/04/2015 **Project No.:** 14237 **Project:** Rice Lane

Receiver room for this calculation: Plot 110 (Type 4) - Bedroom (night-time)

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Appendix G, Section 2.1 of BS8233:2014

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAeq,8hour) - i.e. the design external LAeq
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

			Octave Band Centre Frequency (Hz)						
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
LAeq,8hour	**43.1**	52.9	47.5	39.6	41.0	39.1	32.7	26.3	20.2
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Basic double glazing (e.g. 4/12/4) Rw+Ctr 25 dB									
Area:		1.4	m^2						
R:		18	24	20	25	35	38	35	35
Brick and block external wall									
Area:		10.8							
R:		34	40	44	45	51	56	60	63
Hit and miss trickle ventilators (Dnew+Ctr 32)									
Number of:		2							
D_{ne}		30	38	37	34	30	34	37	46
Room Data									
Bedroom Reverberation Time		0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3
Total Façade Area		12.3	m^2						
Room Volume		15	m^3						
Overall sound reduction of the facade									
Combined sound reduction		24.1	30.9	28.1	29.8	27.8	31.7	34.4	41.0
		Octave Band Centre Frequency (Hz)							
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	20.8	**36.5**	**24.4**	**18.5**	**18.2**	**17.4**	**7.0**	**0.0**	**0.0**

Date : 21/04/2015 **Project No.:** 14237 **Project:** Rice Lane

Receiver room for this calculation: Plot 110 (Type 4) - Bedroom (night-time)

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Appendix G, Section 2.1 of BS8233:2014

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAFMax) - i.e. the design external LAFM
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

			Octave Band Centre Frequency (Hz)						
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
LAFMax	**61.1**	67.6	67.3	59.1	56.6	56.4	53.2	47.7	42.9
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Basic double glazing (e.g. 4/12/4) Rw+Ctr 25 dB									
Area:		1.4	m^2						
R:		18	24	20	25	35	38	35	35
Brick and block external wall									
Area:		10.8							
R:		34	40	44	45	51	56	60	63
Hit and miss trickle ventilators (Dnew+Ctr 32)									
Number of:		2							
D_{ne}		30	38	37	34	30	34	37	46
Room Data									
Bedroom Reverberation Time		0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3
Total Façade Area		12.3	m^2						
Room Volume		15	m^3						
Overall sound reduction of the facade									
Combined sound reduction		24.1	30.9	28.1	29.8	27.8	31.7	34.4	41.0
		Octave Band Centre Frequency (Hz)							
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	38.3	**51.2**	**44.2**	**38.0**	**33.8**	**34.7**	**27.5**	**19.3**	**6.6**

Date : 21/04/2015 **Project No.:** 14237 **Project:** Rice Lane

Receiver room for this calculation: Plot 90 (Type 7) - Kitchen/Dining Room (daytime)

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Appendix G, Section 2.1 of BS8233:2014

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAeq,16hour) - i.e. the design external LAeq
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

		Octave Band Centre Frequency (Hz)							
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
$L_{Aeq,16hour}$	**45.2**	60.6	52.4	43.7	39.1	41.0	36.1	28.9	23.6
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Basic double glazing (e.g. 4/12/4) Rw+Ctr 25 dB									
Area:		2.7	m^2						
R:		18	24	20	25	35	38	35	35
Brick and block external wall									
Area:		25.0							
R:		34	40	44	45	51	56	60	63
Glazed external door (x2) Rw+Ctr 25 dB									
Area:		3.8	m^2						
R:		18	24	20	25	35	38	35	35
Hit and miss trickle ventilators (Dnew+Ctr 32)									
Number of:		3							
D_{ne}		30	38	37	34	30	34	37	46
Room Data									
Living Room Reverberation Time		0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3
Total Façade Area		31.5	m^2						
Room Volume		48	m^3						
Overall sound reduction of the facade									
Combined sound reduction		23.4	29.8	26.4	29.8	29.9	33.8	35.9	40.5
		Octave Band Centre Frequency (Hz)							
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	22.4	**44.0**	**29.4**	**23.3**	**15.4**	**16.2**	**7.3**	**0.0**	**0.0**

Date : 21/04/2015 **Project No.:** 14237 **Project:** Rice Lane

Receiver room for this calculation: Plot 90 (Type 7) - Bedroom (night-time)

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Appendix G, Section 2.1 of BS8233:2014

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAeq,8hour) - i.e. the design external LAeq
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

			Octave Band Centre Frequency (Hz)						
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
LAeq,8hour	**44.1**	54.6	46.9	40.7	39.6	40.9	35.7	27.7	22.1
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Basic double glazing (e.g. 4/12/4) Rw+Ctr 25 dB									
Area:		1.4	m^2						
R:		18	24	20	25	35	38	35	35
Brick and block external wall									
Area:		10.8							
R:		34	40	44	45	51	56	60	63
Hit and miss trickle ventilators (Dnew+Ctr 32)									
Number of:		2							
D_{ne}		30	38	37	34	30	34	37	46
Room Data									
Bedroom Reverberation Time		0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3
Total Façade Area		12.3	m^2						
Room Volume		15	m^3						
Overall sound reduction of the facade									
Combined sound reduction		24.1	30.9	28.1	29.8	27.8	31.7	34.4	41.0
		Octave Band Centre Frequency (Hz)							
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	21.8	**38.2**	**23.8**	**19.6**	**16.8**	**19.2**	**10.0**	**0.0**	**0.0**

Date : 21/04/2015 **Project No.:** 14237 **Project:** Rice Lane

Receiver room for this calculation: Plot 90 (Type 7) - Bedroom (night-time)

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Appendix G, Section 2.1 of BS8233:2014

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAFMax) - i.e. the design external LAFM
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

			Octave Band Centre Frequency (Hz)						
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
LAFMax	**64.4**	78.0	66.0	56.0	53.0	58.0	59.0	57.0	48.0
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Basic double glazing (e.g. 4/12/4) Rw+Ctr 25 dB									
Area:		1.4	m^2						
R:		18	24	20	25	35	38	35	35
Brick and block external wall									
Area:		10.8							
R:		34	40	44	45	51	56	60	63
Hit and miss trickle ventilators (Dnew+Ctr 32)									
Number of:		2							
D_{ne}		30	38	37	34	30	34	37	46
Room Data									
Bedroom Reverberation Time		0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3
Total Façade Area		12.3	m^2						
Room Volume		15	m^3						
Overall sound reduction of the facade									
Combined sound reduction		24.1	30.9	28.1	29.8	27.8	31.7	34.4	41.0
		Octave Band Centre Frequency (Hz)							
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	41.1	**61.6**	**42.9**	**34.9**	**30.2**	**36.3**	**33.3**	**28.6**	**11.7**

Date : 21/04/2015 **Project No.:** 14237 **Project:** Rice Lane

Receiver room for this calculation: Plot 144 (Type 1) - Living Room (daytime)

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Appendix G, Section 2.1 of BS8233:2014

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAeq,16hour) - i.e. the design external LAeq
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

			Octave Band Centre Frequency (Hz)						
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
LAeq,16hour	**47.6**	63.6	55.3	47.6	42.2	42.5	38.0	31.4	23.4
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Basic double glazing (e.g. 4/12/4) Rw+Ctr 25 dB									
Area:		4.8	m^2						
R:		18	24	20	25	35	38	35	35
Brick and block external wall									
Area:		4.7							
R:		34	40	44	45	51	56	60	63
Hit and miss trickle ventilators (Dnew+Ctr 32)									
Number of:		2							
D_{ne}		30	38	37	34	30	34	37	46
Room Data									
Living Room Reverberation Time		0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3
Total Façade Area		9.5	m^2						
Room Volume		45	m^3						
Overall sound reduction of the facade									
Combined sound reduction		19.9	26.2	22.6	26.1	26.4	30.4	32.4	36.7
			Octave Band Centre Frequency (Hz)						
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	24.0	**45.7**	**31.0**	**26.1**	**17.2**	**16.2**	**7.8**	**0.0**	**0.0**

Date : 21/04/2015 **Project No.:** 14237 **Project:** Rice Lane

Receiver room for this calculation: Plot 144 (Type 1) - Bedroom (night-time)

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Appendix G, Section 2.1 of BS8233:2014

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAeq,8hour) - i.e. the design external LAeq
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

		Octave Band Centre Frequency (Hz)							
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
LAeq,8hour	**40.8**	52.1	45.0	38.3	37.5	36.8	31.5	25.6	21.4
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Basic double glazing (e.g. 4/12/4) Rw+Ctr 25 dB									
Area:		3.5	m^2						
R:		18	24	20	25	35	38	35	35
Brick and block external wall									
Area:		16.5							
R:		34	40	44	45	51	56	60	63
Hit and miss trickle ventilators (Dnew+Ctr 32)									
Number of:		2							
D_{ne}		30	38	37	34	30	34	37	46
Room Data									
Bedroom Reverberation Time		0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3
Total Façade Area		20.0	m^2						
Room Volume		20	m^3						
Overall sound reduction of the facade									
Combined sound reduction		23.9	30.3	27.0	30.1	29.7	33.7	35.9	40.9
		Octave Band Centre Frequency (Hz)							
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	18.4	**36.9**	**23.4**	**19.1**	**15.3**	**14.0**	**0.0**	**0.0**	**0.0**

Date : 21/04/2015 **Project No.:** 14237 **Project:** Rice Lane

Receiver room for this calculation: Plot 144 (Type 1) - Bedroom (night-time)

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Appendix G, Section 2.1 of BS8233:2014

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAFMax) - i.e. the design external LAFM
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

			Octave Band Centre Frequency (Hz)						
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
LAFMax	**64.5**	73.0	64.0	65.0	59.0	60.0	58.0	48.0	41.0
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Basic double glazing (e.g. 4/12/4) Rw+Ctr 25 dB									
Area:		3.5	m^2						
R:		18	24	20	25	35	38	35	35
Brick and block external wall									
Area:		16.5							
R:		34	40	44	45	51	56	60	63
Hit and miss trickle ventilators (Dnew+Ctr 32)									
Number of:		2							
D_{ne}		30	38	37	34	30	34	37	46
Room Data									
Bedroom Reverberation Time		0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3
Total Façade Area		20.0	m^2						
Room Volume		20	m^3						
Overall sound reduction of the facade									
Combined sound reduction		23.9	30.3	27.0	30.1	29.7	33.7	35.9	40.9
			Octave Band Centre Frequency (Hz)						
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	42.1	**57.8**	**42.4**	**45.8**	**36.8**	**37.2**	**31.2**	**19.0**	**5.7**

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