Radford Group

Fellows Road, London

# Noise Impact Assessment

MLM. Group

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# Contents

# 1 Introduction

MLM Consulting Engineers has been commissioned by Radford Group to assess the impact of noise at the proposed development of Fellows Road, London, in respect of the site's suitability for residential use.

The proposed development comprises the erection of a new residential property which involves a 6,500ft$^2$ new dwelling over three floors (Lower Ground, Ground and First Floors).

The suitability of the site for development of the proposed usage has been based on the current development proposals and the measured noise levels. Where predicted levels indicate that noise may be a determining factor in the granting of planning permission, mitigation measures have been considered to ensure satisfactory conditions are met.

The report firstly defines appropriate acoustic design standards. It goes on to set out the measured acoustic data and presents the assessment of potential noise impacts in relation to the development. Whilst every effort has been made to ensure that this report is easily understood, it is technical in nature; a glossary of terms in Appendix A is included to assist the reader.

# 2 Policy and Assessment Methodology

## 2.1 National Planning Policy Framework

National Planning Policy Framework (NPPF)[1] published on 27 March 2012 sets out the Government's economic, environmental and social planning policies for England. It summarises in a single document all previous national planning policy advice. Taken together, these policies articulate the Government's vision of sustainable development, which should be interpreted and applied locally to meet local aspirations.

The NPPF sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities. Under Section 11; Conserving and enhancing the natural environment, the following is stated:

*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.*

The document goes on to state:

*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.*

As stated above, this document makes reference to avoiding noise generation from new developments that would adversely impact on health and quality of life.

1 Department for Communities and Local Government, March 2012. National Planning Policy Framework. HMSO.

## 2.2 Planning Practice Guidance – Noise

The National Planning Practice Guidance (NPPG[2]) has been revised and updated to be easily accessible and available online. The Noise Guidance advises on how planning can manage potential noise impacts in new development. It sets out when noise is relevant to planning and outlines the following Observed Effect Levels to determine the noise impact:

- *Significant observed adverse effect level: This is the level of noise exposure above which significant adverse effects on health and quality of life occur;*
- *Lowest observed adverse effect level: this is the level of noise exposure above which adverse effects on health and quality of life can be detected;*
- *No observed effect level: this is the level of noise exposure below which no effect at all on health or quality of life can be detected.*

The document recognises the subjective relationship between noise levels and the impact on those affected, and advises on factors which may influence on whether noise could be a concern.

## 2.3 National Planning Practice Guidance, England

Further guidance in relation to the National Planning Policy Framework and the Noise Policy Statement for England has been published in the National Planning Practice Guidance in England: Noise (NPPG)[3], which summarises the noise exposure hierarchy, based on the likely average response. This is reproduced in Table 1 below.

Table 1: Significance Criteria From NPPG In England: Noise

| Perception | Examples of Outcomes | Increasing Effect Level | Action |
|---|---|---|---|
| Not noticeable | No Effect | No Observed Effect | No specific measures required |
| Noticeable and not intrusive | Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life. | No Observed Adverse Effect | No specific measures required |
| Lowest Observed Adverse Effect Level | | | |
| Noticeable and intrusive | Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a | Observed Adverse Effect | Mitigate and reduce to a minimum |

[2] National Planning Practice Guidance, Department for Communities and Local Government (DCLG), March 2014

[3] Department for Communities and Local Government (DCLG), 2014. National Planning Practice Guidance for England: Noise. DCLG.

| Table 1: Significance Criteria From NPPG In England: Noise | | | |
|---|---|---|---|
| Perception | Examples of Outcomes | Increasing Effect Level | Action |
| | perceived change in the quality of life. | | |
| Significant Observed Adverse Effect Level | | | |
| Noticeable and disruptive | The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area. | Significant Observed Adverse Effect | Avoid |
| Noticeable and very disruptive | Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory | Unacceptable Adverse Effect | Prevent |

## 2.4 British Standard 8233:2014

BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings* draws on the results of research and experience to provide information on achieving internal acoustic environments appropriate to their functions. The guideline values provided are in terms of an average ($L_{Aeq}$) level.

The standard advises that, for steady external noise sources, it is desirable for residential internal ambient noise levels to not exceed the guidance values, as detailed below in Table 2.

| Table 2: BS8233:2014 Residential Indoor Ambient Noise Levels | | | |
|---|---|---|---|
| Activity | Location | 07:00 to 23:00 | 23:00 to 07:00 |
| Resting | Living room | 35 dB $L_{Aeq,16hour}$ | - |
| Dining | Dining room | 40 dB $L_{Aeq,16hour}$ | - |
| Sleeping (daytime resting) | Bedroom | 35 dB $L_{Aeq,16hour}$ | 30 dB $L_{Aeq,8hour}$ |

BS8233:2014 goes on to suggest that where development is considered necessary or desirable, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions will still be achieved.

With regard to maximum noise levels, the standard identifies that regular individual noise events (such as passing trains or scheduled aircraft etc.) can cause sleep disturbance. The standard does not provide a guideline design target, but simply goes on to suggest that a guideline value may be set in terms of SEL or $L_{Amax,F}$, depending upon the character and number of events per night. It goes on to suggest that more sporadic noise events could require separate values.

In respect of external noise levels, the guidance in BS8233:2014 suggests that "*it is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments*". Accordingly, the design criteria adopted for this assessment will ensure that noise within external amenity areas will be adequately controlled.

BS8233:2014 provides a much more detailed narrative on noise levels in external amenity areas and acknowledges that it may not always be necessary or feasible to ensure that noise levels remain within these guideline values.

In respect of gardens and patios, BS8233:2014 states; "*however, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited*".

In respect of balconies, roof gardens and terraces, BS8233:2014 states, *"Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses; however, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space".*

It is clear from the narrative of BS8233:2014, that proposed development within noisy environments should be designed to ensure that the recommended internal design standards are achieved, and that noise levels in external amenity areas are designed to effectively control and reduce noise levels, although it acknowledges that in certain circumstance meeting the external design recommendations may not be feasible, or necessary, especially where the provision of such spaces is desirable for other technical, planning or policy reasons.

## 2.5 British Standard 4142:2014 Method for Rating and Assessing Industrial and Commercial Sound

BS4142 describes the method for assessing whether noise sources of an industrial, commercial or fixed nature are likely to give rise to complaints from people residing in the area.

New commercial development can often incorporate plant and processes that have the potential to generate noise, especially if operated at night-time when background noise levels are at their lowest.

BS 4142 sets out a method to assess whether noise from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises are likely to give rise to complaints from noise-sensitive receptors in the vicinity.

The procedure contained in BS 4142 for assessing the likelihood of complaint is to compare the measured or predicted noise level from the source in question, the LAeq,T 'specific noise level', immediately outside the dwelling with the LA90,T background noise level.

Where the noise contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific noise level to obtain the LAr,Tr 'rating noise level'. A correction to include the consideration of a level of uncertainty in noise measurements, data and calculations can also be applied when necessary.

BS 4142 states: "*The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs*". An estimation of the impact of the specific noise can be obtained by the difference of the rating noise level and the background noise level and considering the following:

*Typically, the greater this difference, the greater the magnitude of the impact.*

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

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

*The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*

The periods associated with day and night, for the purposes of the Standard, are considered to be 07.00 to 23.00 and 23.00 to 07.00, respectively.

## 2.6 Local Authority Requirements

Consultation with the Local Authority's Environmental Health department has yet to be undertaken. However, subject to confirmation, the Local Authority's acoustic criteria are anticipated to be as follows.

The Local Authority's requirement is to undertake the sound assessment in line with the requirements of BS8233:2014 and BS4142:2014 to demonstrate the suitability of the site for residential purposes, this is outlined in the Camden Development Policy DP28.

Table 1: Camden Development Policies – DP28 Noise and vibration

| Noise description and location of measurement | Period | Time | Noise level |
|---|---|---|---|
| Noise at 1 metre external to a sensitive façade | Day, evening and night | 0000-2400 | 5dB(A)<LA90 |
| Noise that has a distinguishable discrete continuous note(whine, hiss, screech, hum) at 1 metre external to a sensitive façade | Day, evening and night | 0000-2400 | 10dB(A)<LA90 |
| Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade. | Day, evening and night | 0000-2400 | 10dB(A)<LA90 |
| Noise at 1 metre external to sensitive façade where LA90>60dB | Day, evening and night | 0000-2400 | 55dB(A) |

# 3 Site

## 3.1 Site Description

The site is located to the north of Fellows Road within the London Borough of Camden. The immediate surrounding area of the site is mostly residential. There is an underground railway line approximately thirty metres to the south.

The location of the proposed development site is identified in Figure 1.


Figure 1: Site Location (Approximate Red Line)

The nearest/worst-affected existing noise-sensitive receptors are the residential properties on Winchester Road.

The site is subject to road traffic noise which is the dominant noise source impacting the site.

## 3.2 Proposed Development

It is understood that the development proposals comprise a new residential property which involves a 6,500ft2 new dwelling over three floors (Lower Ground, Ground and First Floors).

Most of the proposed bedrooms art to be located at lower ground floor level. Therefore, it is understood that natural light is provided to these areas via lightwells surrounding the lower ground façade.

The site layout plan is shown in Figure 2.

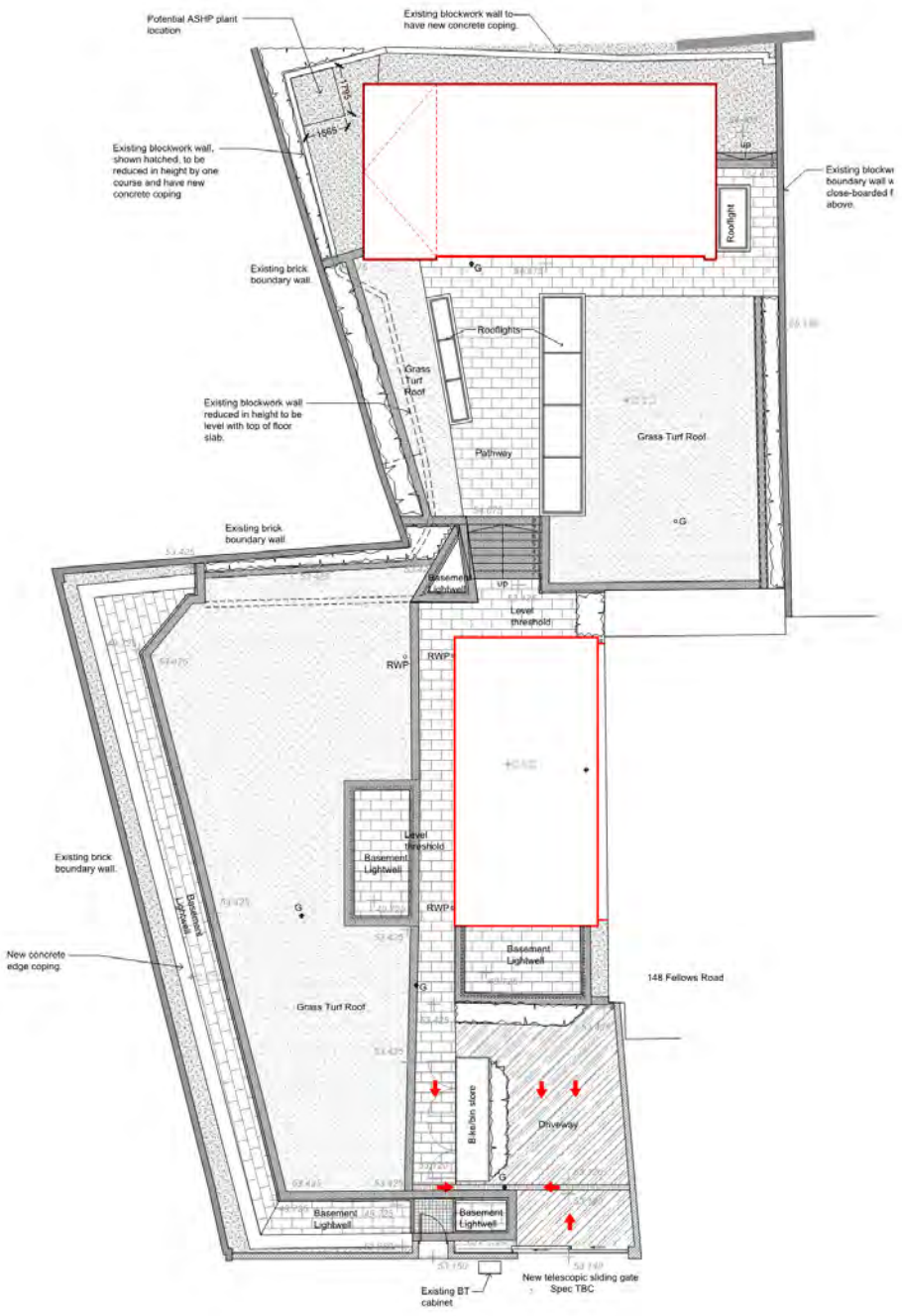


Figure 2: Draft Site Layout

# 4 Noise Measurements

## 4.1 Survey Details

The prevailing noise conditions at the location of the proposed development have been determined by an environmental noise survey. The survey was undertaken over a typical period, between Thursday 14 and Tuesday 19 December 2017. Two measurement positions were used to gather representative noise levels affecting the site.

## 4.2 Noise Monitoring Methodology

All noise measurements were undertaken by a consultant certified as competent in environmental noise monitoring, and in accordance with the principles of BS 7445[4].

All acoustic measurement equipment used during the noise survey conformed to Type 1 Specification of BS 61672[5]. A full inventory of this equipment is shown in table below.

Table 2: Inventory of Acoustic Measurement Equipment

| Equipment | Manufacturer-Model Type | Serial Number | Calibration | |
|---|---|---|---|---|
| | | | Certificate Number | Expiry Date |
| Sound Level Meter | Rion NA-28 | 00370297 | 1611623 | 29 Nov 2018 |
| Preamplifier | Rion NH-23 | 60306 | | |
| Microphone | Rion UC-59 | 00386 | | |
| Calibrator | Rion NC-74 | 35105086 | TCRT17/1344 | 12 June 2018 |

The noise measurement equipment used during the surveys was calibrated at the start and end of the measurement period. The calibrator used had itself been calibrated by an accredited calibration laboratory within the twelve months preceding the measurements. No significant drift in calibration was found to have occurred on the sound level meter.

The microphone was fitted with a protective windshield, with an appropriate correction applied on the sound level meter.

## 4.3 Weather Conditions

Weather conditions were dry with negligible wind during the entire duration of the noise monitoring period.

## 4.4 Procedure and Measurement Positions

The survey was undertaken on the basis of one unattended measurement position on the northern boundary and one unattended measurement position on the southern boundary.

The measurement positions are detailed below and can be seen in Figure 3.

[4] British Standard 7445: 2003: Description and measurement of environmental noise. BSI

[5] British Standard 61672: 2003: Electroacoustics. Sound level meters. Part 1 Specifications. BSI.

Measurement Position 1 (MP1):

Unattended survey location on the northern site boundary, 2.5m above local ground level. Measurements are representative of the noise levels to the rear of the site, and also the lowest background noise level at sensitive receivers on Winchester Road.

Measurement Position 2 (MP2):

Unattended survey location towards the southern boundary of the site, 3m above local ground level.


Figure 3: Measurement Locations

## 4.5 Noise Survey Results

The results of environmental noise survey are presented in Table 3-4 below.

| Table 3: Summary of Measured Noise Levels at MP1 | | | | | |
|---|---|---|---|---|---|
| Date | Period (T) | $L_{Aeq,T}$ (dB) | Typical $L_{Amax}$*(dB) | Minimum $L_{A90,T}$**(dB) | Average $L_{A10,T}$ (dB) |
| 14/12/17 | Daytime (11:00 – 23:00) | 56 | n/a | 42 | 52 |
| | Night time (23:00 – 07:00) | 45 | 59 | 39 | 45 |

| Table 4: Summary of Measured Noise Levels at MP2 | | | | | |
|---|---|---|---|---|---|
| Date | Period (T) | $L_{Aeq,T}$ (dB) | Typical $L_{Amax}$*(dB) | Minimum $L_{A90,T}$**(dB) | Average $L_{A10,T}$ (dB) |
| 15/12/17 | Daytime (11:00 – 23:00) | 60 | n/a | 48 | 61 |
| | Night time (23:00 – 07:00) | 52 | 74 | 43 | 53 |
| 16/12/17 | Daytime (07:00 – 11:30) | 58 | n/a | 47 | 61 |

*The typical $L_{Amax}$ is calculated as the 90$^{th}$ percentile of the five minute sample periods measured during the eight hours of the night.

**The $L_{A90}$ is stated for periods (T) of one hour during the day and fifteen minutes at night.

Measurement and parameters are only shown where relevant to this assessment.

# 5 Noise Impact Assessment

It is clear from the results of the noise monitoring exercise that the area of the proposed residential development is exposed to moderately high environmental noise levels as would be expected in close proximity to a typical residential road. The highest measured ambient noise levels are in the order of 60dB $L_{Aeq,16hr}$ daytime and 52dB $L_{Aeq,8hr}$ night-time.

The noise maps in Appendix B show the variation in noise levels across the site.

## 5.1 Internal Noise Level and Façade Requirements

The key significance criteria adopted for this assessment are those contained within BS8233:2014 as summarised earlier in this report.

In order to achieve the target daytime and night-time internal noise levels, it is necessary to determine the minimum acoustic performance requirements of the ventilation system and the building envelope.

The façade numbering/layout is shown in the Appendix C mark-ups.

## 5.2 Ventilation Acoustic Requirements

To determine the ventilation sound reduction requirements, representative external noise levels have been considered at the façades of the proposed development, based on the results of the noise monitoring exercise as described in Tables 3 and 4 earlier in this report. The noise maps are shown in Appendix B.

To achieve appropriate internal ambient noise levels within residential dwellings, the standard ventilation rates should be achieved with windows closed. This is typical for developments in close proximity to roads. It is recommended that standard ventilation be provided using either trickle ventilators or mechanical ventilation such as MVHR units. Windows may be openable for purge ventilation purposes at the resident's discretion. If overheating is found to be an issue then it is recommended that this be remedied using mechanical cooling as opposed to opening windows.

If trickle ventilators are chosen as the preferred strategy, then the specifications should achieve the sound reductions set out in Table 5 as a minimum. Façade numbering is detailed in Appendix C.

Table 5: Minimum Performance Requirements Ventilators

| Façade No. | Octave Band Centre Frequency, Hz | | | | | | | $D_{n,e,w}$ (dB) |
|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | |
| | Element Normalised Level Difference, Dne (dB) | | | | | | | |
| All Facades | 28 | 33 | 34 | 33 | 42 | 29 | 32 | 34 |

The calculations are based on assumed internal layouts as these haven't been finalised at the time of writing. All calculations must be verified once layouts and elevations have been fixed.

## 5.3 Building Envelope Sound Reduction Requirements

The results of the noise monitoring exercise are also used to assess the sound insulation requirements of the building envelope, namely the external glazing, walls and roof. In order to achieve the required internal noise levels as set out in relevant guidelines, the following minimum sound reductions are likely to be required.

| Table 6: Minimum Performance Requirements for External Glazing | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Façade No. | Octave Band Centre Frequency, Hz | | | | | | | $R_w(C_{tr})$ (dB) |
| | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | |
| | Sound Reduction Performance, R (dB) | | | | | | | |
| Façade 1 | 22 | 27 | 26 | 33 | 39 | 39 | 47 | 36(-3) |
| Façade 2 | 22 | 27 | 26 | 25 | 34 | 35 | 38 | 32(-3) |

The glazing shown for Façade 1 is representative of glazing with an enhanced acoustic performance. Façade 2 glazing is representative of standard thermal double glazing.

The table below sets out the minimum performance of the external wall.

| Table 7: Minimum Performance Requirements for the External Walls and Roof | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Façade No. | Octave Band Centre Frequency, Hz | | | | | | | $R_w(C_{tr})$ (dB) |
| | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | |
| | Sound Reduction Performance, R (dB) | | | | | | | |
| All Facades | 31 | 36 | 40 | 41 | 45 | 52 | 52 | 46(-3) |

For the purposes of the initial assessment, a standard brickwork external wall has been assumed achieving the sound reduction shown in Table 7. Various other construction types are likely to be suitable; alternatives should be verified by a suitably qualified acoustician.

The table below sets out the minimum performance of the roof.

| Table 8: Minimum Performance Requirements for the External Walls and Roof | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Façade No. | Octave Band Centre Frequency, Hz | | | | | | | $R_w(C_{tr})$ (dB) |
| | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | |
| | Sound Reduction Performance, R (dB) | | | | | | | |
| All Facades | 32 | 37 | 36 | 45 | 52 | 59 | 62 | 49(-5) |

This performance is representative of a concrete slab roof of a minimum of 100mm thickness. Various other construction types are likely to be suitable; alternatives should be verified by a suitably qualified acoustician.

## 5.4 External Amenity

Residential gardens are proposed at the ground level around the proposed buildings. Noise levels are expected to be within the 55dB $L_{Aeq}$ BS8233 guideline limit for external amenity space for the majority of the garden space.

# 6 Building Services Acoustic Design

## 6.1 Nearest Noise Sensitive Receivers (NNSR)

The nearest existing noise-sensitive receptors are the residential properties located on Winchester Road.

## 6.2 External Sound Level Criteria

In order to comply with BS4142 requirements, the noise criteria set out in Table 9 are proposed. These limits are based on achieving Local Authority's acoustic criteria at the nearest noise sensitive receptor, during a typical week day / weekend period. These limits apply to operating hours of the installation, which may be during the day and night time periods.

Table 9: Proposed Plant sound Emission Limits during extended opening hours

| Operating Period | Typical Measured Background Sound Level $L_{A90,T}$ | Proposed Plant "Rating Level" At The Nearest Noise Sensitive Receptor |
|---|---|---|
| Daytime (07:00-23:00) | 42 | 37 |
| Night-time (23:00-07:00) | 39 | 34 |

The above limits apply to the total sound emission level from all static plant and processes within the proposed development. Individual plant items may need to be designed to a lower limit such that the overall total achieves the stated criteria above. Should the proposed plant items be found to be tonal, or impulsive in nature (so as to attract attention), a penalty should be applied to the above limits.

Compliance with the above limiting noise levels would result in a low impact at existing receptors.

## 6.3 Proposed External Noise Sources

The following external plant noise sources are currently proposed.

Table 10: Manufacturer Plant Noise Data

| Manufacturer | Model | Acoustic Specifications-Sound Power Level(dB) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 125Hz | 250Hz | 500Hz | 1000Hz | 2000Hz | 4000Hz | 8000Hz |
| SAMSUNG | Condenser Unit: AM140JXVHGR/ET | 82 | 80 | 79 | 77 | 72 | 67 | 66 |

It is assumed that plant may operate 24 hours a day.

## 6.4 Plant Layouts

The proposed condenser unit is to be located at ground level to the north west of the site. The figure below shows the layout as currently proposed.

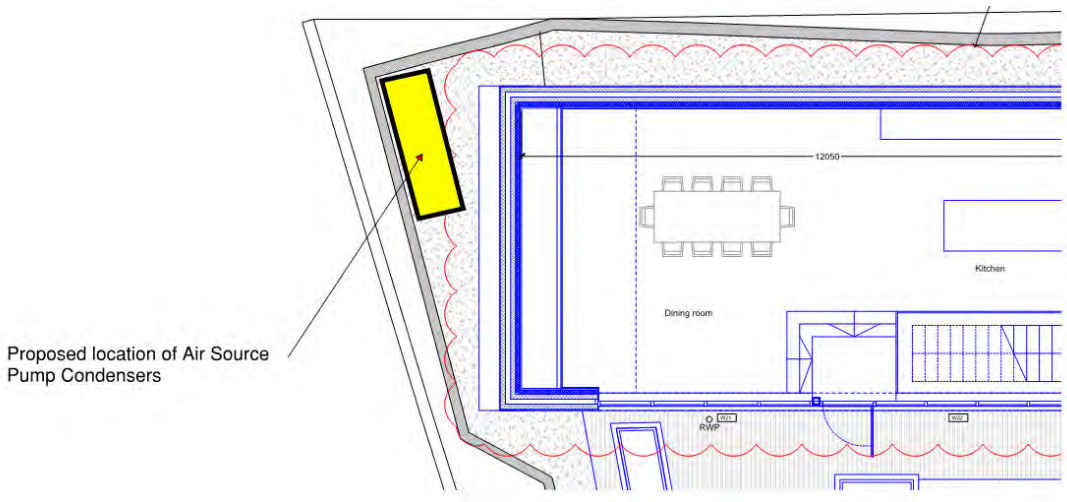


Figure 4: Proposed Plant Layout

## 6.5 Expected External Plant Noise Levels

### Option 1: No Barrier

The expected noise level from the proposed unit at the nearest residential receptor without mitigation measures is 44dBA.The unit has direct line of sight to the receptors.

The expected noise level is 5dBA above the lowest site background noise measurement and therefore the Condenser Unit noise emissions are would not be expected to comply with the Local Authority's plant noise requirements and therefore additional mitigation measures are recommended.

### Option 2: 2 metre Barrier

If a 2m barrier can be installed around the proposed unit, blocking direct line of site to the sensitive receivers, the expected noise level would be 33dBA.

The expected noise level is 6dBA below the lowest site background noise measurement and therefore the Condenser Unit noise emissions would be expected to be compliant with the Local Authority's requirements and therefore these mitigation measures would be recommended.

### Practical Control Measures

Any other proposed items of plant should be included in these calculations when proposals are finalised. The following general guidance may be applicable to the installations.

Screening of any external plant as well as provision of sound attenuators to items of plant may be necessary to control the transmission of sound and achieve the above criteria as well as to reduce the sound level produced by the plant to a reasonable extend around the footprint of the building itself.

Environmental attenuators and possibly other means of sound mitigation such as acoustic louvres or acoustic screens may be required to control sound emanating from the plantrooms, air intake and discharge points or from externally mounted plant.

Locating the future plant installation as far as possible from the NNSR and using the proposed building to screen any future plant items would to ensure compliant emissions sound levels.

# 7 Conclusion

MLM Consulting Engineers has been commissioned by Radford Group to assess the impact of noise at the development on Fellows Road, London in respect of the site's suitability for the proposed usages.

The assessment has been based on detailed environmental noise measurements made at the proposed development site.

The suitability of the site for residential development has been assessed based on the current development proposals and the measured noise levels, which has shown that the site will require acoustically rated glazing and ventilation to ensure internal noise level compliance. Some external amenity space will experience higher noise levels than those suggested in the guidelines of BS8233 however the majority of external amenity space would be within the guideline values.

Initial plant noise calculations have been carried out in accordance with BS4142:2014 and Local Authority guidance and mitigation measures have been proposed where necessary.

In the light of the findings of this report, it is considered that noise should not present a constraint to the granting of planning permission for residential development at this site, provided that the mitigation measures set out in this report are implemented in the design of the buildings.

# Appendix A - Glossary of Acoustic Terminology

| Wording | Description |
|---|---|
| Sound Pressure | Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure. |
| Sound Pressure Level (Sound Level) | The sound level is the sound pressure relative to a standard reference pressure of 20μPa (20x10-6 Pascal's) on a decibel scale. |
| Decibel (dB) | A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa. |
| A-weighting, dB(A) | The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies. |
| Noise Level Indices | Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out. |
| Leq,T | A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded. |
| Lmax,T | A noise level index defined as the maximum noise level during the period T. Lmax is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response. |
| L90,T | A noise level index. The noise level exceeded for 90% of the time over the period T. L90 can be considered to be the "average minimum" noise level and is often used to describe the background noise. |
| L10,T | A noise level index. The noise level exceeded for 10% of the time over the period T. L10 can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. |
| Free-Field | Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m |
| Facade | At a distance of 1m in front of a large sound reflecting object such as a building façade. |
| Fast Time Weighting | An averaging time used in sound level meters. Defined in BS 5969. |

# Appendix B - Site Noise Maps


MLM Group

PROJECT NAME
**Fellows Road, London**

MLM REFERENCE
**102039**

## Noise Map

**NOTES**

1) LAeq,day
2) Ground Level Grid

| REV | DATE | MADE | CHK |
|---|---|---|---|
| 01 | 4/1/18 | RT | JW |

DRAWING STATUS
**PRELIMINARY**

SUITABILITY DESCRIPTION
**SUITABLE FOR INFORMATION**

- > -99.0 dB
- > 35.0 dB
- > 40.0 dB
- > 45.0 dB
- > 50.0 dB
- > 55.0 dB
- > 60.0 dB
- > 65.0 dB
- > 70.0 dB
- > 75.0 dB
- > 80.0 dB
- > 85.0 dB


MLM Group

PROJECT NAME
**Fellows Road, London**

MLM REFERENCE
**102039**

## Noise Map

**NOTES**

1) LAeq,night
2) Ground Level Grid

| REV | DATE | MADE | CHK |
|---|---|---|---|
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DRAWING STATUS
**PRELIMINARY**

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- > 80.0 dB
- > 85.0 dB


MLM Group

PROJECT NAME
**Fellows Road, London**

MLM REFERENCE
**102039**

## Noise Map

**NOTES**

1) LAeq,day
2) 1.5m Height Grid

| REV | DATE | MADE | CHK |
|---|---|---|---|
| 01 | 4/1/18 | RT | JW |

DRAWING STATUS
**PRELIMINARY**

SUITABILITY DESCRIPTION
**SUITABLE FOR INFORMATION**

- > -99.0 dB
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- > 70.0 dB
- > 75.0 dB
- > 80.0 dB
- > 85.0 dB


MLM Group

PROJECT NAME
**Fellows Road, London**

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## Noise Map

**NOTES**

1) LAeq,night
2) 1.5m Height Grid

| REV | DATE | MADE | CHK |
|---|---|---|---|
| 01 | 4/1/18 | RT | JW |

DRAWING STATUS
**PRELIMINARY**

SUITABILITY DESCRIPTION
**SUITABLE FOR INFORMATION**

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- > 45.0 dB
- > 50.0 dB
- > 55.0 dB
- > 60.0 dB
- > 65.0 dB
- > 70.0 dB
- > 75.0 dB
- > 80.0 dB
- > 85.0 dB


MLM Group

PROJECT NAME
**Fellows Road, London**

MLM REFERENCE
**102039**

## Noise Map

**NOTES**

1) LAeq,day
2) 3.5m Height Grid

| REV | DATE | MADE | CHK |
|---|---|---|---|
| 01 | 4/1/18 | RT | JW |

DRAWING STATUS
**PRELIMINARY**

SUITABILITY DESCRIPTION
**SUITABLE FOR INFORMATION**

- > -99.0 dB
- > 35.0 dB
- > 40.0 dB
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- > 50.0 dB
- > 55.0 dB
- > 60.0 dB
- > 65.0 dB
- > 70.0 dB
- > 75.0 dB
- > 80.0 dB
- > 85.0 dB


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PROJECT NAME
**Fellows Road, London**

MLM REFERENCE
**102039**

## Noise Map

**NOTES**

1) LAeq,night
2) 3.5m Height Grid

| REV | DATE | MADE | CHK |
|---|---|---|---|
| 01 | 4/1/18 | RT | JW |

DRAWING STATUS
**PRELIMINARY**

SUITABILITY DESCRIPTION
**SUITABLE FOR INFORMATION**

- > -99.0 dB
- > 35.0 dB
- > 40.0 dB
- > 45.0 dB
- > 50.0 dB
- > 55.0 dB
- > 60.0 dB
- > 65.0 dB
- > 70.0 dB
- > 75.0 dB
- > 80.0 dB
- > 85.0 dB


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## Noise Map

**NOTES**

1) LAeq,day
2) 5.5m Height Grid

| REV | DATE | MADE | CHK |
|---|---|---|---|
| 01 | 4/1/18 | RT | JW |

DRAWING STATUS
**PRELIMINARY**

SUITABILITY DESCRIPTION
**SUITABLE FOR INFORMATION**

- > -99.0 dB
- > 35.0 dB
- > 40.0 dB
- > 45.0 dB
- > 50.0 dB
- > 55.0 dB
- > 60.0 dB
- > 65.0 dB
- > 70.0 dB
- > 75.0 dB
- > 80.0 dB
- > 85.0 dB


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## Noise Map

**NOTES**

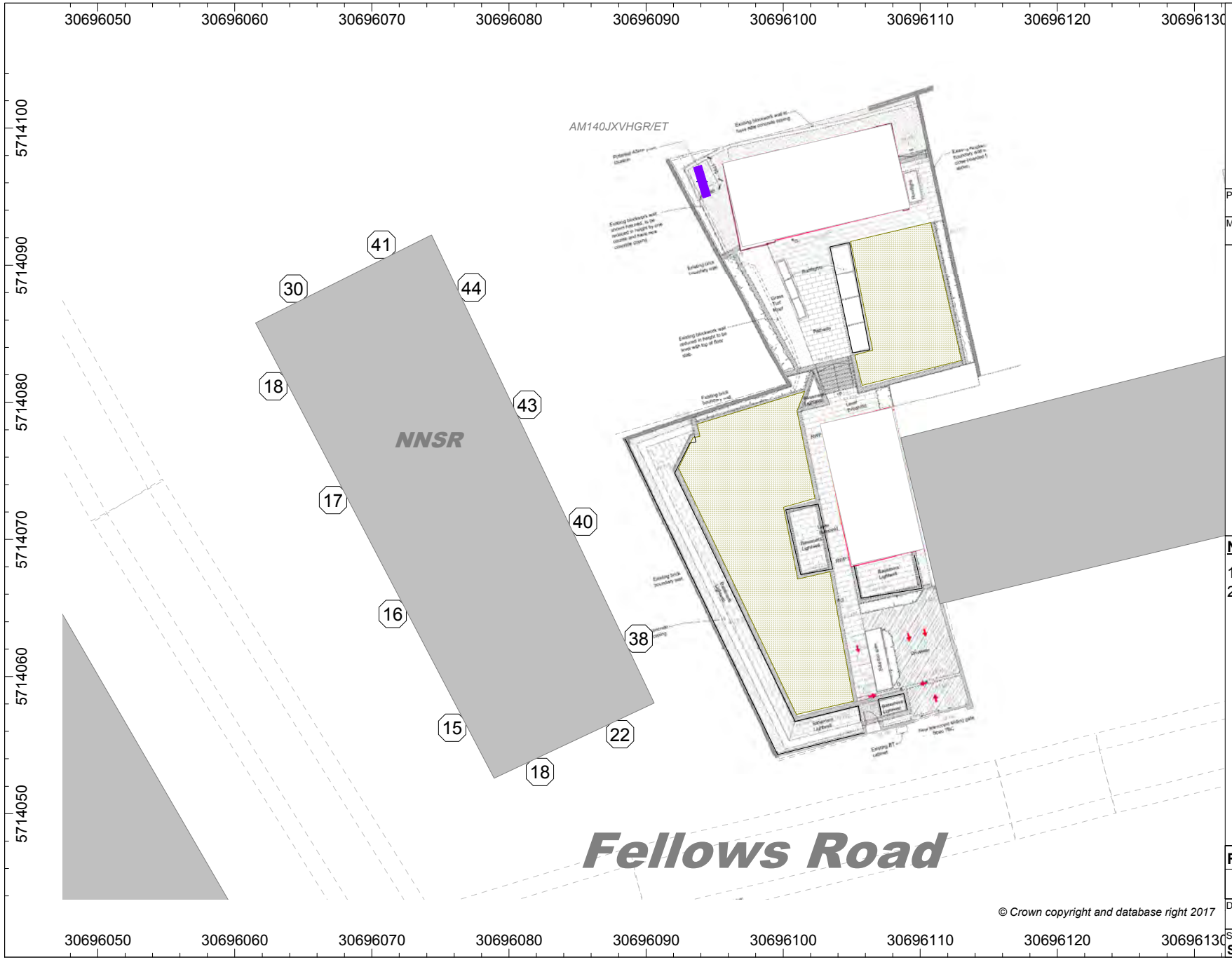
1) LAeq,night
2) 5.5m Height Grid

| REV | DATE | MADE | CHK |
|---|---|---|---|
| 01 | 4/1/18 | RT | JW |

DRAWING STATUS
**PRELIMINARY**

SUITABILITY DESCRIPTION
**SUITABLE FOR INFORMATION**

- > -99.0 dB
- > 35.0 dB
- > 40.0 dB
- > 45.0 dB
- > 50.0 dB
- > 55.0 dB
- > 60.0 dB
- > 65.0 dB
- > 70.0 dB
- > 75.0 dB
- > 80.0 dB
- > 85.0 dB

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## Facade Noise Incident levels at NNSR

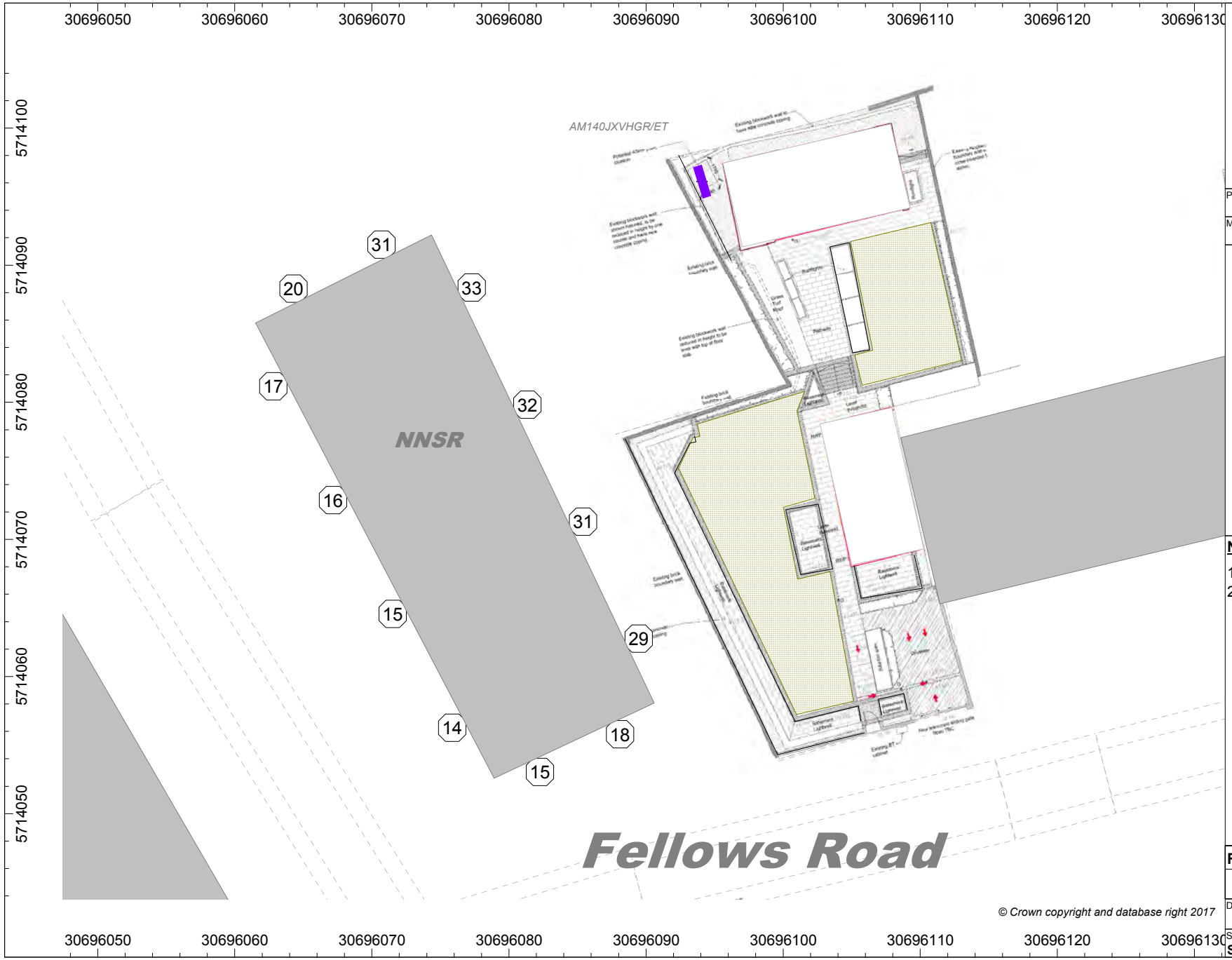
**NOTES**

1) LAeq,T,1m facade
2) No barrier

| REV | DATE | MADE | CHK |
|---|---|---|---|
| 01 | 04/01/18 | RT | JW |

DRAWING STATUS
**PRELIMINARY**

SUITABILITY DESCRIPTION
**SUITABLE FOR INFORMATION**

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# Facade Noise Incident levels at NNSR

**NOTES**

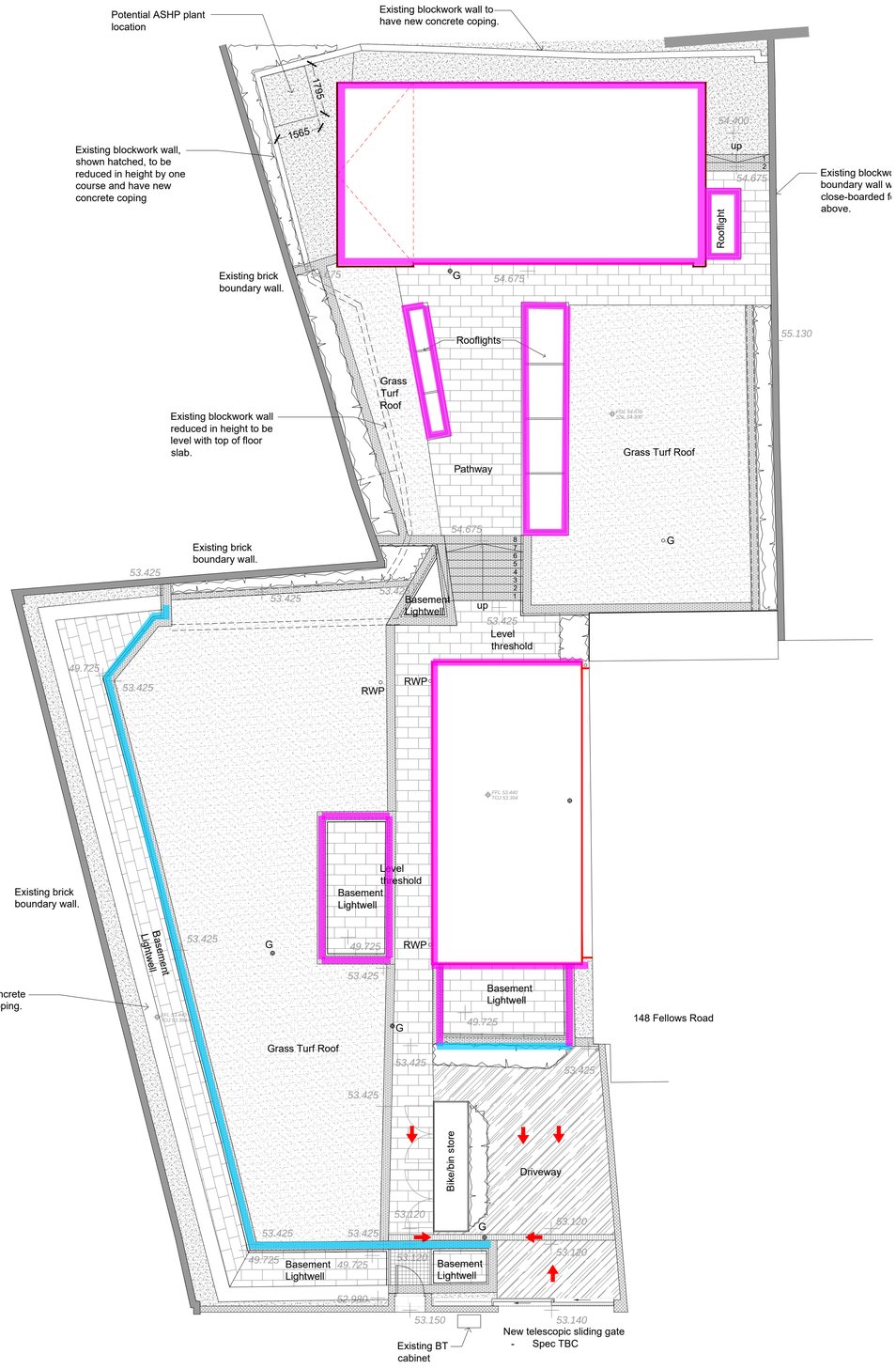
1) LAeq,T,1m facade
2) 2m barrier

| REV | DATE | MADE | CHK |
|---|---|---|---|
| 01 | 04/01/18 | RT | JW |

DRAWING STATUS
**PRELIMINARY**

SUITABILITY DESCRIPTION
**SUITABLE FOR INFORMATION**

# Appendix C - Façade Mark-Ups

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# Facade Markup
# External Building Fabric

Facade 1

Facade 2


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