southdowns
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GRAHAM EDWARDS

WHITESTONE HOUSE, WHITESTONE LANE, HAMPSTEAD, LONDON, NW3 1EA

LONDON BOROUGH OF CAMDEN

CONSTRUCTION NOISE AND VIBRATION ASSESSMENT REPORT

APRIL 2019

2310W-SEC-00001-02

FINAL REPORT

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DOCUMENT REFERENCE: 2310W-SEC-00001-02

REVIEW AND AUTHORISATION			
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Approved By Patrick Williams	**Position** Director	**Signature**	**Date** 18/04/2019

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1. INTRODUCTION

1.1.1 Southdowns Environmental Consultants Ltd (Southdowns) was instructed in March 2019 by Graham Edwards to produce a Construction Noise and Vibration Assessment for the proposed development at Whitestone House within the London Borough of Camden (LBC).

1.1.2 The purpose of the noise and vibration assessment is to identify the potential risk of adverse noise and vibration effects which may be caused by construction activities associated with the works.

1.1.3 The noise and vibration assessment has been prepared to satisfy the local authority's planning condition no. 10 associated with the construction works at Whitestone House which states:

"Prior to commencement of the development, a noise and vibration assessment with regards to the equipment hereby approved shall be submitted to the Council detailing proposed construction site noise and vibration levels along with proposed site sound acoustic screening and mitigation."

1.1.4 A separate construction management plan, which incorporates Camden's Pro-Forma Construction Management Plan (v2.3), has been prepared by Blue Sky Building construction consultancy. However, control measures specific to the management of noise and vibration are provided in this document.

1.1.5 Details of the site and the proposed development are described in the following section of this report. Risk assessments of potential noise and vibration effects are presented in Sections 3 and 4 respectively. Generic control and site-specific measures are listed in Section 5. Finally, the aforementioned sections are summarised in Section 6. Figures and Tables are presented in Appendices A and B, respectively.

2. SITE DETAILS

2.1 Site Description

2.1.1 Whitestone House is located in Hampstead, within the administrative boundary of the London Borough of Camden (LBC).

2.1.2 Whitestone House is an existing four-storey building situated at the end of Whitestone Lane.

2.1.3 The Whitestone House is adjoined to two three-storey residential properties to the west, 'The Cottage' and 'Gangmoor', the latter of which is grade II listed. The immediate surrounding area is sparsely populated, with the next closest residential properties located in Bellmoor Apartment block approximately 10m away on East Heath Road at its closest point.

2.1.4 Approximately 55m to the south of the site lies Queen Marys Hospital. The Transport for London (TfL) Northern Line runs in a northwest-southeast direction approximately 250m west of the site.

2.1.5 A site location plan is shown in Figure A1 of Appendix A.

2.2 Proposed Development

2.2.1 The development proposal comprises of the demolition and reconstruction of the existing Whitestone House with the construction of a new basement storey below the existing lower ground floor for provision of car parking, music room/library, gym, swimming pool and the erection of single storey enclosure to house car lift at ground floor level.

2.2.2 An architect's plan of the proposal is presented in Figure A2 of Appendix A.

2.2.3 Based on information provided by the client, all deliveries to/from site and the removal of spoil will occur at the site entrance. Hoarding will be erected around the site.

2.2.4 Materials and spoil will be stored on site in skips, within site hoarding. Skip wagons will be used to transfer spoil from the site.

2.3 Sensitive Receptors

2.3.1 The existing site adjoins two residential receptors which are located to the west on Whitestone Lane and is close to residential properties on East Heath Road to the south.

2.3.2 Representative receptors are presented, with relative horizontal distances to site and delivery locations, in Table 2.1 overleaf. A receptor plan is shown in Figure A1 of Appendix A.

Receptor No.	Receptor Address	Receptor Type	Distance, m	
			Site	Road
R1	Gangmoor– east façade [2]	Residential	12	22
R2	The Cottage – south façade [2]	Residential	12	13
R3	Bellmoor – north façade	Residential	20	15
R4	Queen Marys Hospital	Hospital	55	40
R5	The Old Court House – east façade	Residential	135	145
R6	Summit Lodge – east façade	Residential	125	117
R7	Hollycot – west façade	Residential	140	150

TABLE 2.1: REPRESENTATIVE RECEPTOR DISTANCES

Note: [1] receptor types based on desktop survey; and
[2] nominal distance to the centre of site and delivery bay used for properties adjoining Whitestone House.

2.4 Construction Methodology

2.4.1 The development works detailed within this document will be undertaken between 08:00 and 18:00 hrs Monday to Friday and between 08:00 and 13:00 hrs Saturday and no works on Sundays, as outlined in the Camden's Minimum Requirements for Building Construction (CMRBC) [1] document. Deliveries will be limited to between 09:30 to 16:30 hrs Monday to Friday and 08:00 and 13:00 hrs on Saturdays. If feasible, only lighter vehicles for deliveries will operate on Saturdays from 08:00 hrs to 13:00 hrs.

2.4.2 An outline of the construction methodology is presented below based on information provided by the client prior to the appointment of a contractor. The construction sequence provided below will be superseded by the Contractor's final proposals.

2.4.3 It is predicted that there will be 9 no. activities required to complete the construction works at Whitestone House which are to be carried out sequentially. These activities are presented in the following sub-section with further details of plant and expected usage presented in Table B1 of Appendix B.

<u>Site Setup, Deliveries and Spoil Removal</u>

2.4.4 Scaffolding to be set up around the house where necessary and hoarding set up around the site perimeter.

2.4.5 Plant and materials will be delivered to a dedicated loading bay on Whitestone Lane and on to the driveway of Whitestone House. Debris will be stored on site in skips and removed by a skip wagon.

2.4.6 A luffing jib crane will be used during the development to transfer materials around the site.

2.4.7 It is expected that there will be up to a maximum of six vehicle movements per day, depending on the activity.

2.4.8 A traffic management plan will be made available to all potential delivery vehicles and site staff to ensure potential disturbance is minimized.

Demolition Building Superstructure - Upper Floors and Roof

2.4.9 The existing superstructure will be demolished in reverse order to construction method, retaining only the western boundary wall with the two adjoining properties. Careful consideration to be given to existing roof and attic frame. The cutting of steelworks into manageable lengths will be carried out by angle grinders or powered hand tools. Followed by the demolition of the existing perimeter wall.

Removal of Existing Pin Foundations and Lower Ground Floor Slab

2.4.10 Removal of the existing ground floor will include the break-up of the ground floor concrete slab by breakers and concrete saws. Angle grinders and powered hand tools will be used to cut steel and timber support beams.

2.4.11 Cutting out of the below ground concrete works (retaining walls, underpinned foundations etc) will be carried out by non-percussive means. The exact methodology of this will be agreed with the Party Wall Surveyors to minimise disruption.

Piling

2.4.12 Continuous flight auger piles rather than driven piles will be recommended for use by the specialist piling contractor as to minimise vibration, noise and ground heave.

2.4.13 A mini piling rig will be used to install perimeter contiguous piled walls which follow the perimeter of the new basement space. Piles will also be installed stepped in from the retained party wall on the western boundary and internal piles to carry the vertical load from the structure above. Fixing reinforcement to capping beam, with starter bars for lower ground floor slab, and cast capping beam will be carried out with the assistance of powered hand tools. Finally the tying of capping beam into existing piled wall construction on the South elevation.

2.4.14 Spoil will be removed with the use of a conveyor in to a skip, where it will be removed from site using a skip wagon.

Underpinning

2.4.15 Underpinning will be required to strengthen the foundations of the proposed structure. Bays will be excavated and underpinned in a ‘hit and miss’ sequence. Each bay is to be backfilled until all of the pins are complete prior to commencement of the excavation.

Excavation

2.4.16 Excavation down to new basement level will be carried out primarily by the use of a small excavator and spoil transferred into skips using wheelbarrows and a conveyor. The use of an electric breaker or concrete saw may be required.

2.4.17 Hand tools will be used to prepare basement drainage, fix basement reinforcements and tie to piled wall construction.

Form Reinforced Concrete Structure, Walls and Ground Floor Slab

2.4.18 The basement slab will be cast and tied into the piles to act as permanent horizontal prop to the retaining wall. Internal column frameworks will be placed and the basement columns cast.

2.4.19 Removal any temporary works requirements, including any temporary pile supports to the ground floor slab will be carried out using concrete saws and powered hand tools and transferred out using a conveyor into a skip.

2.4.20 Concrete will be delivered to site ready mixed and pumped onto site using a mobile pump to form new basement slab (ground-bearing slab).

2.4.21 Hand tools and an angle grinder may be used to finish and shape the concrete structure.

2.4.22 The concrete roof will finish the main construction of the basement and will be constructed using the same plant as the walls and stairs.

Superstructure Construction – Upper Floors

2.4.23 The upper floors and roof constructions are to be built in traditional form, comprising of load bearing external wall construction supporting a grillage of steel beams at each floor level that in turn support the timber floor infill construction.

2.4.24 A steel framed roof construction with timber infill has been proposed for Whitestone House.

2.4.25 A hoist will be used to transfer materials to the upper levels of the development.

Finishes & Contingency

2.4.26 This activity includes any minor finishes and decorative works to the property with the use of hand tools and powered hand tools.

3. NOISE RISK ASSESSMENT

3.1 Overview

3.1.1 This section presents an assessment of the risk of construction noise generated by the works due to commence at Whitestone House, and the associated potential adverse effects on the surrounding area.

3.1.2 An assessment of the noise impact has been undertaken based upon the plant and equipment, scheduled construction activities, and the programme of works as presented in this document.

3.2 Calculated Noise Levels

3.2.1 Calculated receptor noise levels have been determined based on the plant listed for each activity in Table B1 of Appendix B, with construction activities being undertaken sequentially.

3.2.2 Construction activity noise levels have been calculated assuming source locations in both the site and delivery areas. Appropriate screening from buildings and other local barriers has been applied, however, barriers will not always screen noise sources from upper storeys as these may overlook the barriers. Worse case receptor construction noise levels are presented.

3.2.3 The calculated construction noise levels during each activity described in Section 2, at potentially sensitive receptors, are presented in Table 3.1 below.

Rec.	Address	Calculated Construction Noise Level dB $L_{Aeq,10hr}$				
		Site Setup	Demolition of Existing Building Superstructure - Upper Floors and Roof	Removal of Existing Pin Foundations and Lower Ground Floor Slab	Piling	Underpinning
R1	Gangmoor– east façade	72.2	74.1	73.7	73.7	74.0
R2	The Cottage – south façade	73.2	74.9	74.9	74.5	74.6
R3	Bellmoor – north façade	69.7	71.2	71.6	70.8	70.8
R4	Queen Marys Hospital	61.1	62.5	62.9	62.1	62.0
R5	The Old Court House – east façade	52.2	53.9	53.9	53.5	53.6
R6	Summit Lodge – east façade	53.2	54.8	55.0	54.4	54.4
R7	Hollycot – west façade	51.9	53.6	53.6	53.1	53.3

TABLE 3.1: CALCULATED CONSTRUCTION NOISE LEVELS BY ACTIVITY

Notes:
[1] – Calculated levels 1m from a façade.

Rec.	Address	Calculated Construction Noise Level dB $L_{Aeq,10hr}$			
		Excavation	Form Reinforced Concrete Structure, Walls and Ground Floor Slab	Superstructure Construction – Upper Floors	Finishes & Contingency
R1	Gangmoor– east façade	73.9	73.6	74.6	71.3
R2	The Cottage – south façade	74.7	74.0	74.7	71.6
R3	Bellmoor – north façade	70.9	69.9	70.5	67.4
R4	Queen Marys Hospital	62.2	61.2	61.7	58.6
R5	The Old Court House – east façade	53.6	53.0	53.7	50.5
R6	Summit Lodge – east façade	54.5	53.7	54.4	51.3
R7	Hollycot – west façade	53.3	52.6	53.4	50.2

TABLE 3.1 (CTD): CALCULATED CONSTRUCTION NOISE LEVELS BY ACTIVITY

Notes:
[1] – Calculated levels 1m from a façade.

3.2.4 The higher calculated noise levels at R1 to R3 are due to the close proximity of these receptors to the delivery location and Whitestone House where high impact plant such as powered hand tools, electric breakers, poker vibrators, concrete saws and angle grinders are due to operate.

3.2.5 Due to the calculated noise levels, construction contractors will be required to ensure that BPM is strictly adhered to.

3.2.6 It is noted that the highest calculated daily construction noise level is 74.9 dB $L_{Aeq,10hr}$ at The Cottage (R2) during the demolition of the existing building superstructure and the removal of the existing pin foundations and lower ground floor slab. The higher noise levels at this location is due to the use of noisy plant items, such as electric breakers and powered hand tools, in close proximity to the receptor. This activity should therefore be carefully managed in accordance with the measures presented in Section 5.3.

3.2.7 It should be noted that the noise levels presented in Table 3.1 represent an estimated average value for each activity across the footprint of the worksite. Noise levels are likely to vary over time as the main works location progresses.

4. VIBRATION RISK MANAGEMENT

4.1 Overview

4.1.1 This section presents an assessment of the potential risk regarding vibration generated by the construction works detailed in this document, and the associated adverse effects on buildings and the surrounding area. The surrounding area is predominantly residential and as such the occupants of residential buildings are also likely to be vibration sensitive.

4.1.2 The risk assessment has been based on an appraisal of the plant listed in Table B1 of Appendix B, examining the likelihood of each item generating significant vibration at receptors.

4.2 Guideline Vibration Thresholds

4.2.1 Vibration should be evaluated against guidance presented in relevant British Standards in order to assess the likelihood of both structural damage to neighbouring buildings and the human response of the occupants.

Building Damage

4.2.2 According to BS 7385 Part 2 [2] for residential or light commercial buildings, the threshold for the onset of potential cosmetic damage (i.e. formation of hairline cracks on drywall surfaces or the growth of existing cracks in plaster or drywall surfaces) to buildings varies with frequency. This ranges from a PPV (component) of 15 mms^{-1} at 4 Hz, rising to 20 mms^{-1} at 15 Hz, and to 50 mms^{-1} at and above 40 Hz for transient vibration. BS 7385: Part 2 also states that the probability of building damage tends towards zero at 12.5 mms^{-1} peak component particle velocity.

Subjective Response

4.2.3 According to guidance provided in BS 5228 Part 2 [3], the threshold of vibration perceptible to humans lies around 0.14 to 0.3 mms^{-1}. The Standard also indicates that PPVs of around 1 mms^{-1} in residential environments, as a first estimate, are likely to cause complaints, but can be tolerable provided prior warning and explanation of the works is given to residents. Vibration magnitudes of around 10 mms^{-1} are likely to be intolerable for more than a very brief exposure to this level.

4.2.4 Single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case, values are provided only to give an initial indication of potential effects.

4.3 Vibration Control Plan

4.3.1 To control and minimise vibration effects caused by construction activity, the vibration mitigation measures listed in Section 5 of this report will be adopted at all times.

4.3.2 Works will be controlled on a risk-based approach with attended monitoring used to judge the acceptability of the works, and safe working distances going forward.

4.4 Estimated Vibration Levels

4.4.1 From a review of the schedule of construction plant supplied by the construction consultancy the main vibration generating plant associated with the proposed construction works are from the rotary bored piling rig.

4.4.2 To estimate the potential groundborne vibration that could arise during the use of the piling rig, measured data, presented in BS 5228-2, obtained at various distances from a rotary bored piling rig have been used to estimate potential PPV vibration magnitudes. A summary of the sensitive receptor estimated vibration levels is presented below in Table 4.1

Rep. ID	Address	Rotary Bored Piling[1]	
		Separation Distance (m)	Estimated PPV mms^{-1}
R1	Gangmoor– east façade	12	<0.4 and >0.1
R2	The Cottage – south façade	12	<0.4 and >0.1
R3	Bellmoor – north façade	20	<0.1 and >0.02
R4	Queen Marys Hospital	55	<0.02
R5	The Old Court House – east façade	135	<0.02
R6	Summit Lodge – east façade	125	<0.02
R7	Hollycot – west façade	140	<0.02

TABLE 4.1: ESTIMATED CONSTRUCTION VIBRATION AT RECEPTORS

Note: [1] - PPVs estimated using the empirical data presented in BS 5228-2 for a rotary bored piling (measured levels of 0.4 mms^{-1} at a distance of 10m, 0.1 mms^{-1} at a distance of 15m and 0.02 mms^{-1} at a distance of 26m).

4.4.3 Based on the guidance from BS 5228 Part 2 and in accordance with CMRBC, the estimated vibration levels presented in Table 4.1 are below the 1 mms^{-1} tolerable threshold for residential environments and therefore are unlikely to cause complaints at the closest sensitive receptors.

4.4.4 Particular care should also be taken to reduce the use of the breaker along the western party walls of the site due to the close proximity of two adjoined properties.

4.4.5 At the commencement of any potentially disturbing phases of works such as breaking out it is proposed that attended vibration measurements will be obtained to ensure receptor levels remain below appropriate thresholds.

5. NOISE AND VIBRATION CONTROL MEASURES

5.1 Control Measures

5.1.1 The control measures detailed in this section have been developed in accordance with the proposed plant list, detailed in Table B1 of Appendix B. Plant assumptions and control measures have been derived in liaison with the construction consultancy in the absence of an appointed principal contractor at this stage. Plant assumptions and control measures are to be agreed with the principal contractor and LBC prior to the commencement of works.

5.1.2 Generic and specific control measures have been developed in accordance with LBC's CMRBC.

5.2 Site Personnel

5.2.1 All operatives on site will be trained to ensure that noise minimisation is implemented at all times. Operatives will also be trained in line with Best Practicable Means (BPM), as defined in Section 72 of the Control of Pollution Act 1974) [4]. Works will be checked regularly by site management to ensure that BPM are being undertaken and where necessary corrective actions implemented.

5.2.2 Employees must show consideration to the sensitive receptors, including residential neighbours, and must not generate unnecessary noise at any time when travelling to and from the site.

5.3 General Noise and Vibration Control Measures

5.3.1 As required by LBC's CMRBC: "*A noise and vibration reduction philosophy shall be adopted to reduce noise and vibration wherever is reasonably possible during demolition and construction works throughout the site and during the duration of these works.*"

5.3.2 BPM will be used to reduce noise and vibration levels at all times. Where practicable the control measures set out in BS 5228:2009 + A1:2014 Part 1 [5], BS 5228:2009 + A1:2014 Part 2 Section 8 and LBC's CMRBC will also be implemented.

5.3.3 Generic noise and vibration control measures, where appropriate, include:

<u>Community Engagement</u>

- details of the site personnel responsible for noise and vibration, the head office, the duration of the project and site working hours, will be displayed on the site boundary;
- letter drops to neighbouring residents before work begins;
- liaison with neighbouring construction sites to co-ordinate works as far as practicable, particularly off-site vehicle movements, to avoid waiting vehicles (outside of the scope detailed within the CTMP);
- site will keep an observations, investigations and complaints log, to be made available to LBC on request; and
- all complaints will be responded to.

Plant Choice and Management

- choice of methodology/technique for operations (including site layout) will be considered in order to eliminate or reduce emissions at sensitive locations;
- fixed items of construction plant will be electrically powered where practicable in preference to diesel or petrol driven;
- noisy plant will be kept as far away as possible from sensitive areas;
- each item of plant used will comply with the noise limits quoted in the relevant European Commission Directive 2000/14/EC/United Kingdom Statutory Instrument (SI) 2001/1701 [6] where reasonably available;
- equipment will be well-maintained and will be used in the mode of operation that minimises noise;
- any noisy operations will be limited to working between 09:00 to 18:00 hrs Monday to Friday and 08:00 and 13:00 hrs on Saturdays; and
- a temporary builder's power supply will be applied for in advance if no existing supply is available onsite.

5.4 Site Specific Noise and Vibration Control Measures

5.4.1 Control measures detailed below, and in sub-section 5.5 have been developed following consideration of the site plans and relevant documentation provided by the client:

- where breakers are required, multiple breakers will be employed such that the total period of exposure is reduced;
- The breaking-up of concrete and the removal of floor slabs should be carried out using non-percussive techniques where practicable;
- where percussive breaking techniques are required, concrete slabs will be cut, where possible, to isolate the slab, thus reducing the transmission of vibration;
- where powered tools are required, they are to be screened as far as reasonably practicable to reduce potential impact;
- compressors and generators will be isolated from the floor where reasonably practicable;
- noise attenuation screening to be used if deemed appropriate. Screening is to be free of significant holes or gaps as far as reasonably practicable;
- where spoil is to be transported into tipper lorries, vehicles being loaded are to sit with their engines off to minimise noise emitted;
- spoil will be loaded into lorries in a such a manner as to minimise impact noise;
- where possible softer materials (such as soils) will be loaded into lorries first to form a cushioning barrier to rubble and other hard materials to reduce impact noise;
- static dewatering plant will be located in semi-permanent enclosures;
- robust vehicle management procedures will be required to avoid vehicles arriving in an unscheduled manner, to ensure only one vehicle is at site at any one time. Deliveries to site will be restricted between 09:30 and 16.30 hrs Monday to Friday and between 08:00 and 13:00 on Saturdays; and

- inspections to be carried out during works to ensure the condition of surrounding buildings is not impaired.

5.5 Monitoring Regime

5.5.1 Audits on BPM will be undertaken with respect to noise and vibration. BPM audits will be scheduled to coincide with attended noise and vibration site survey visits. Site contact details will be made available to the consultant to provide proactive feedback to site operatives on best practice.

Noise

5.5.2 Attended noise measurements will be made by suitably qualified personnel with a precision integrating sound level meter fitted with a windshield where required. The noise meter will be fully BS EN 61672-1 [7] Class 1 compliant. Measurements will be made by a competent person who is a member of the Institute of Acoustics.

5.5.3 Attended noise measurements will be obtained using the 'F' time weighting and A-weighting frequency network. The sound level meter will be calibrated before and after the survey period using a Class 1 Acoustic Calibrator.

5.5.4 Continuous 5 minute $L_{Amax,F}$, $L_{Aeq,T}$, $L_{A10,T}$, and $L_{A90,T}$ noise levels will be measured at each of the sensitive locations.

5.5.5 As required by LBC's CMRBC "*Noise monitoring shall be undertaken using a combination of semi-permanent (continuous) and attended monitoring methods. The locations of the semi-permanent (continuous) and attended monitoring and the frequency of the sampling will be agreed with London Borough of Camden in writing. Where the measured noise levels are more than 3 dB (A) above the predicted noise levels or in the event of a complaint of noise an investigation shall be carried out to ascertain the cause of the exceedance or the complaint and to check that Best Practicable Means are being used to control the noise in accordance with the steps set out in the application for 'prior consent'. Noise levels shall be reduced further if it is reasonably practicable to do so*."

Vibration

5.5.6 At the commencement of any potentially disturbing phases of works such as demolition it is proposed that attended vibration monitoring will be undertaken to ensure receptor levels remain below appropriate thresholds.

5.5.7 The location of the vibration monitoring will be selected so that the measured vibration levels are representative of those experienced by the most affected premises. It is recommended that at least 1 no. continuous unattended vibration monitor is installed along the party wall with either Gangmoor or The Cottage properties during potentially disturbing phases of works. The monitor will need to be installed prior to the commencement of the demolition works and remain in-situ until after the excavation is completed.

5.5.8 Works will be controlled on a risk-based approach with attended monitoring used to judge the acceptability of the works, and to establish safe working distances for individual items of vibration inducing plant.

5.5.9 As required by LBC's CMRBC "*In the case of vibration, measured vibration levels shall be compared with the criteria in BS 5228: 2009 part 2 (i.e. 1mms^{-1} PPV for potential*

disturbance in residential and using a suggested trigger criteria of 2mms^{-1} for commercial). Lower limits must be agreed with the Council if there is a risk that vibration levels may interfere with vibration sensitive equipment or other vibration sensitive objects."

6. SUMMARY & CONCLUSIONS

6.1.1 A noise and vibration assessment has been prepared on behalf of Graham Edwards to identify and assess the risk associated with the construction works at Whitestone House, Hampstead.

6.1.2 Construction methodologies have been prepared in consultation with project specific documentation and the client's appointed construction consultancy prior to the appointment of the contractor.

6.1.3 Noise predictions using the methodology presented in Section 3.2 have shown that the calculated noise levels are between 50.2 dB and 74.9 dB $L_{Aeq,10hr}$ at the closest residential receptors throughout the development of Whitestone House. The highest calculated noise levels were 74.9 dB $L_{Aeq,10hr}$ at The Cottage (R2) measured during the demolition of the existing building superstructure and removal of existing pin foundation and lower ground floor slab. BPM will be fully implemented at all times during the development to restrict noise impacts.

6.1.4 Vibration estimations using the methodology presented in Section 4.3 have shown that the estimated vibration levels at the adjoining properties, Gangmoor and The Cottage, range between 0.4 and 0.1 PPV mms^{-1}.

6.1.5 Generic control measures have been presented for noise and vibration control in Section 5.3. Attended and unattended monitoring should be undertaken at sensitive receptors and to ensure BPM is being adhered to during sensitive phases of construction.

6.1.6 With the control measures described in this noise and vibration assessment, the potential for significant noise and vibration related adverse effects will be reduced.

7. REFERENCES

1. London Borough of Camden. Camden Minimum Requirements for Building Construction. February 2019.

2. British Standards Institution. BS7385: 1993 Evaluation and Measurement for Vibration in Buildings; Part 2 guide to damage levels from groundborne vibration. 1993.

3. British Standards Institution BS 5228: 2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites; Part 2 Vibration. 2014.

4. Her Majesty's Stationary Office. Control of Pollution Act. 1974.

5. British Standards Institution. BS 5228: 2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites; Part 1 Noise. 2014.

6. The European Commission. 2000/14/EC/United Kingdom: The Noise Emission in the Environment by Equipment for use Outdoors Regulations. 2001.

7. British Standards Institution. BS EN 61672-1: 2013 Electroacoustics. Sound level meters. Specifications. 2013.

APPENDIX A: FIGURES

FIGURE A1: WHITESTONE HOUSE SITE LOCATION AND SENSITIVE NOISE RECEPTOR PLAN

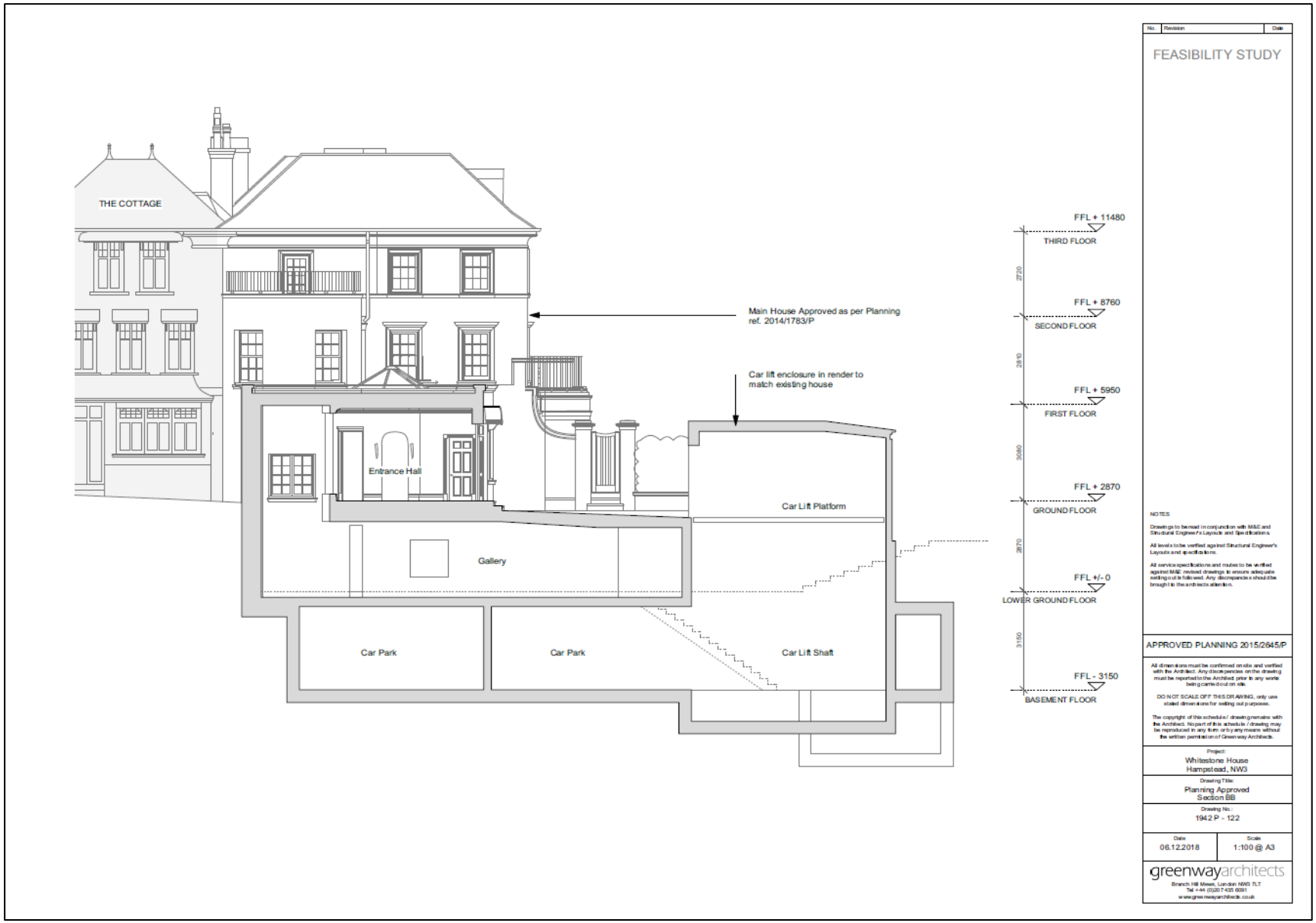

FIGURE A2: PROPOSED ARCHITECT PLANS FOR WHITESTONE HOUSE, LONDON

APPENDIX B: TABLES

Activity ID	Activity	Plant Name	BS Ref	Lw	% On	No. Plant	Location
1	Site Setup	Hand Tools	BS 5228-1:2009 Table C.1:19	97	50	4	Site
		Powered Hand Tools [4]	Measured	112	10	3	Site
		Scaffolding	BS 5228-1:2009+A1:2014+A1:2014 Table D.7:2	98	50	1	Road
		Delivery Vehicle Arrive/Depart	BS 5228-1:2009+A1:2014 Table D.7:121	98	5	6	Road
2	Demolition of Existing Building Superstructure - Upper Floors and Roof	Hand Tools	BS 5228-1:2009 Table C.1:19	97	30	5	Site
		Powered Hand Tools [4]	Measured	112	10	3	Site
		Concrete Saw [4]	BS 5228-1:2009+A1:2014 Table C.4:72	107	10	2	Site
		Angle Grinder [4]	BS 5228-1:2009+A1:2014 Table C.4:93	108	20	2	Site
		Electric Breaker [4]	BS 5228-1:2009+A1:2014 Table C.1:6	111	15	2	Site
		Crane	BS 5228-1:2009+A1:2014 Table C.4:48	104	15	1	Site
		Delivery Vehicle Arrive/Depart	BS 5228-1:2009+A1:2014 Table D.7:121	98	5	5	Road
		Skip Wagon	BS 5228-1:2009+A1:2014 Table C.8:21	106	5	2	Road
3	Removal of Existing Pin Foundations and Lower Ground Floor Slab	Hand Tools	BS 5228-1:2009 Table C.1:19	97	35	5	Site
		Powered Hand Tools [4]	Measured	112	10	3	Site
		Concrete Saw [4]	BS 5228-1:2009+A1:2014 Table C.4:72	107	25	2	Site
		Electric Breaker [4]	BS 5228-1:2009+A1:2014 Table C.1:6	111	20	2	Site
		Skip Wagon	BS 5228-1:2009+A1:2014 Table C.8:21	106	5	4	Road
		Delivery Vehicle Arrive/Depart	BS 5228-1:2009+A1:2014 Table D.7:121	98	5	2	Road
4	Piling	Hand Tools	BS 5228-1:2009 Table C.1:19	97	50	5	Site
		Mini Piling Rig	BS 5228-1:2009+A1:2014 Table C.3:18	103	40	1	Site
		Excavator	BS 5228-1:2009 Table C.4:68	93	20	1	Site
		Conveyor	BS 5228-1:2009+A1:2014 Table C.10:23	81	30	1	Site
		Skip Wagon	BS 5228-1:2009+A1:2014 Table C.8:21	106	5	2	Road
		Delivery Vehicle Arrive/Depart	BS 5228-1:2009+A1:2014 Table D.7:121	98	50	4	Road

TABLE B1: PLANT ASSUMPTIONS

Notes: [1] due to the varying levels of screening at each source/receiver path, screening has been dealt with in a separate calculation;
[2] 5 dB attenuation assumed for sources of noise with only partial line of sight over local screening in accordance with the principles of BS 5228-1:2009+A1:2014;
[3] 10 dB attenuation assumed for external sources without a line of sight to the receptor; and
[4] static noise emitting components, screened to reduce noise propagation path.

Activity ID	Activity	Plant Name	BS Ref	Lw	% On	No. Plant	Location
5	Underpinning	Hand Tools	BS 5228-1:2009 Table C.1:19	97	40	5	Site
		Concrete Saw [4]	BS 5228-1:2009+A1:2014 Table C.4:72	107	10	1	Site
		Electric Breaker [4]	BS 5228-1:2009+A1:2014 Table C.1:6	111	20	2	Site
		Poker Vibrator	BS 5228-1:2009+A1:2014 Table C.4:33	106	5	1	Site
		Water Pump - Contingency [4]	BS 5228-1:2009+A1:2014 Table C.4:23	89	20	1	Site
		Crane	BS 5228-1:2009+A1:2014 Table C.4:48	104	20	1	Site
		Cement Mixer and Pump	BS 5228-1:2009+A1:2014 Table C.4:24	95	30	1	Road
		Delivery Vehicle Arrive/Depart	BS 5228-1:2009+A1:2014 Table D.7:121	98	5	4	Road
		Skip Wagon	BS 5228-1:2009+A1:2014 Table C.8:21	106	5	1	Road
6	Excavation	Hand Tools	BS 5228-1:2009 Table C.1:19	97	40	5	Site
		Electric Breaker [4]	BS 5228-1:2009+A1:2014 Table C.1:6	111	25	2	Site
		Water Pump – Contingency [4]	BS 5228-1:2009+A1:2014 Table C.2:45	93	20	1	Site
		Concrete Saw [4]	BS 5228-1:2009+A1:2014 Table C.4:72	107	5	1	Site
		Excavator	BS 5228-1:2009 Table C.4:68	93	20	1	Site
		Conveyor	BS 5228-1:2009+A1:2014 Table C.10:23	81	30	1	Site
		Crane	BS 5228-1:2009+A1:2014 Table C.4:48	104	20	1	Site
		Skip Wagon	BS 5228-1:2009+A1:2014 Table C.8:21	106	5	2	Road
		Delivery Vehicle Arrive/Depart	BS 5228-1:2009+A1:2014 Table D.7:121	98	5	4	Road
7	Form Reinforced Concrete Structure, Walls and Ground Floor Slab	Hand Tools	BS 5228-1:2009 Table C.1:19	97	50	3	Site
		Powered Hand Tools [4]	Measured	112	10	3	Site
		Concrete Saw [4]	BS 5228-1:2009+A1:2014 Table C.4:72	107	5	1	Site
		Poker Vibrator	BS 5228-1:2009+A1:2014 Table C.4:33	106	5	1	Site
		Angle Grinder [4]	BS 5228-1:2009+A1:2014 Table C.4:93	108	20	1	Site
		Crane	BS 5228-1:2009+A1:2014 Table C.4:48	104	20	1	Site
		Delivery Vehicle Arrive/Depart	BS 5228-1:2009+A1:2014 Table D.7:121	98	5	4	Road
		Cement Mixer and Pump	BS 5228-1:2009+A1:2014 Table C.4:24	95	30	1	Road

TABLE B1 (CTD): PLANT ASSUMPTIONS

Notes: [1] due to the varying levels of screening at each source/receiver path, screening has been dealt with in a separate calculation;
[2] 5 dB attenuation assumed for sources of noise with only partial line of sight over local screening in accordance with the principles of BS 5228-1:2009+A1:2014;
[3] 10 dB attenuation assumed for external sources without a line of sight to the receptor; and
[4] static noise emitting components, screened to reduce noise propagation path.

Activity ID	Activity	Plant Name	BS Ref	Lw	% On	No. Plant	Location
8	Superstructure Construction – Upper Floors	Hand Tools	BS 5228-1:2009 Table C.1:19	97	40	3	Site
		Powered Hand Tools [4]	Measured	112	25	3	Site
		Small Cement Mixer	BS 5228-1:2009+A1:2014 Table C.4:23	89	20	1	Site
		Poker Vibrator	BS 5228-1:2009+A1:2014 Table C.4:33	106	5	1	Site
		Angle Grinder [4]	BS 5228-1:2009+A1:2014 Table C.4:93	108	20	1	Site
		Crane	BS 5228-1:2009+A1:2014 Table C.4:48	104	15	1	Site
		Hoist	BS 5228-1:2009+A1:2014 Table C.4:61	96	20	1	Site
		Delivery Vehicle Arrive/Depart	BS 5228-1:2009+A1:2014 Table D.7:121	98	5	4	Road
9	Finishes & Contingency	Hand Tools	BS 5228-1:2009 Table C.1:19	97	60	3	Site
		Powered Hand Tools [4]	Measured	112	10	2	Site
		Delivery Vehicle Arrive/Depart	BS 5228-1:2009+A1:2014 Table D.7:121	98	5	3	Road

TABLE B1 (CTD): PLANT ASSUMPTIONS

Notes: [1] due to the varying levels of screening at each source/receiver path, screening has been dealt with in a separate calculation;
[2] 5 dB attenuation assumed for sources of noise with only partial line of sight over local screening in accordance with the principles of BS 5228-1:2009+A1:2014;
[3] 10 dB attenuation assumed for external sources without a line of sight to the receptor; and
[4] static noise emitting components, screened to reduce noise propagation path.