SYNTEGRA CONSULTING

Collis Primary School, Teddington, TW11 9BS

Construction Noise and Vibration Assessment

July 2019

Ref: 17-3872 – CNVA

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Revision	*CNVA*
Date	18.07.2019
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1. Executive Summary

This report has been prepared to assess the impact of construction noise and vibration at nearby noise sensitive receptors from the development at **Collis Primary School, Teddington, TW11 9BS**.

The scheme involves the construction of a new build two storey primary school containing twelve classrooms (Reception and Years 1 and 2), a nursery, an art/DT room, a dining hall, a kitchen and various offices and ancillary spaces.

The project will be carried out in four distinct, consecutive phases:

- Site set up;
- Ground works and enabling works;
- Construction of new school building; and
- Demolition of old school building and reinstatement of the land as netball courts.

Construction works will be carried out during weekday daytimes only (0700 hrs – 1900 hrs) and not during evenings, night-time or weekends.

This report has assessed the impact of construction noise and vibration during each of the above phases on the surrounding noise sensitive receptors in line with the recommendations and methodologies of BS 5228:2009+A1:2014 *'Noise and Vibration Control on Construction and Open Sites'* Part 1 (Noise) and Part 2 (Vibration).

It has been identified that the predicted construction noise levels are likely to be significantly above the Threshold Value at the Kingsmead Close receptors during all phases and just above the Threshold Value at the Fairfax Road receptors during the demolition of the old school building phase.

It is noted by Syntegra that the predicted construction noise levels are very much a worst-case, being based on indicative plant, for which a likely worst-case noise level has been applied. Additionally, noise levels are generally likely to be between the levels stated and will only be at the highest level when plant is located at the closest point to the receptors. It is also noted that it is highly unlikely that all plant will be located at the closest position to the receptors at the same time. Finally, it is noted that works will be carried out over a relatively short period (a total of 33 weeks to construct the new school building, including preparation time, with an additional 15 weeks to demolish the old school building and reinstate the land) so the total exposure time for any noise sensitive receptors will be limited.

However, it is recommended by Syntegra that the following good practice measures, in addition to normal Best Practicable Means mitigation measures, are utilised for the boundary of the site facing Kingsmead Close:

- **Selection of quieter equipment (where possible).**
- **Limiting the amount of time where works will be carried out close the boundary to as short as possible.**
- **Erection of noise barriers (e.g. "Echo Barriers" on heras fencing) along the boundary.**

2. Introduction

This report has been prepared to assess the impact of construction noise and vibration at nearby noise sensitive receptors from the development at **Collis Primary School, Teddington, TW11 9BS**.

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Construction works will be carried out during weekday daytimes only (0700 hrs – 1900 hrs) and not during evenings, night-time or weekends.

This report assesses the impact of construction noise and vibration during each of the above phases on the surrounding noise sensitive receptors. A glossary of acoustic terminology is provided in **Appendix 1**.

The locations of the works and nearest noise sensitive receptors are presented in **Figure 2.1**.

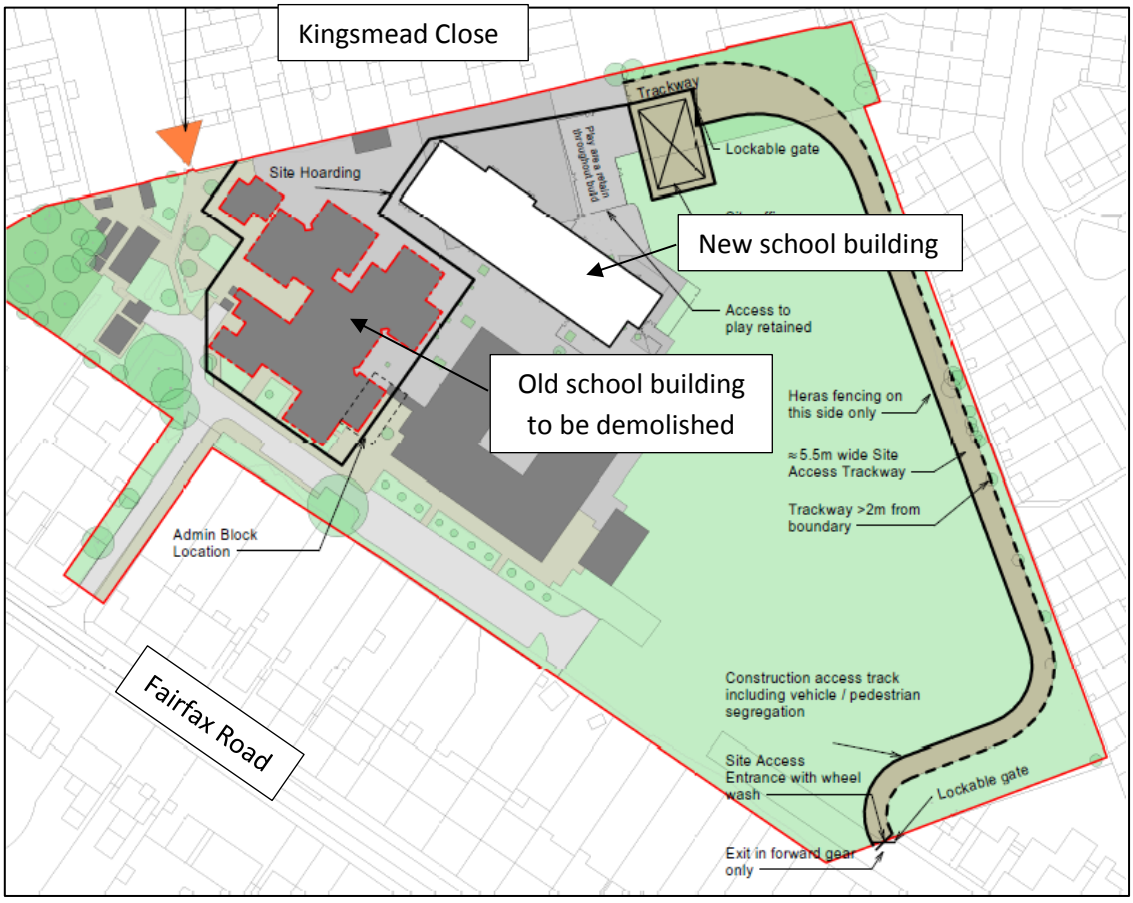

Figure 2.1: Construction Areas and Nearest Noise Sensitive Receptors

3. Local Planning Policy and Guidance Documents

3.1. Local Planning Policy

The site is located within the administrative boundary of the London Borough of Richmond upon Thames (LBRuT). LBRuT have provided, within their Supplementary Planning Document *"Development Control for Noise Generating and Noise Sensitive Development"*, the following advice in respect of construction noise:

"The Control of Pollution Act 1974 is primary legislation which deals with the control of noise from construction sites. However in certain situations, for instance where there is a proposal for a substantial development or infrastructure project, a Demolition Method Statement and Construction Method Statement, detailing the management and control of noise and vibration, will be required as part of planning consent.

The Noise and Vibration Demolition Method Statement (DMS) and Construction Method Statement (CMS) will typically include an acoustic report undertaken by a suitably qualified and experienced consultant and should include all the information opposite".

The list of requirements is provided as follows:

*"**Baseline Noise Assessment** – undertaken for a least 24-hours under representative conditions to determine the pre-existing ambient noise environment.*

***Noise predictions and the significance of noise effects** – Predictions should be included for each phase of the demolition, and construction, vehicle movements and an assessment of the significance of noise effects must be included based on the guidance in BS 5228.*

***Piling** – Where piling forms part of the construction process, a low noise and vibration method must be utilised wherever possible, and good practice guidelines should be followed e.g. BS 5228.*

***Vibration Predictions and the significance of vibration effects** - Predictions should be included for each phase of demolition, and construction, and an assessment of the significance of vibration effects must be included e.g. as per BS 5228.*

***Noise and Vibration Monitoring** – Permanent real time web enabled and/ or periodic noise and vibration monitoring must be undertaken for the duration of the demolition and construction phases which may result in a significant impact. The location, number of monitoring stations and the measurement data must be agreed with the LPA prior to the start of construction.*

***Community engagement** – The steps that will be taken to notify and update residents and businesses that may be affected by the construction of the proposed development."*

3.2. British Standard 5228:2009+A1:2014 Part 1 – Noise

The magnitude of construction noise impacts can be predicted by considering noise emissions data for typical construction equipment based on the expected methods of construction for each phase of work on each worksite. The prediction method follows that recommended in BS 5228 '*Noise and Vibration Control on Construction and Open Sites, Part 1:2009+A1:2014*'. BS 5228 includes two informative methods of guidance for assessing the significance of construction noise and these are "The ABC method" and "5 dBA change method".

3.2.1. **The ABC Method**

The ABC method defines threshold noise levels and arranges these threshold levels into categories, as shown in **Table 3.1**.

Assessment Category and Threshold Value Period	Threshold Value ($L_{Aeq,T}$) (dB)		
	Category A[A]	Category B[B]	Category C[C]
Night-time (23:00-07:00)	45	50	55
Evenings and weekends[D]	55	60	65
Day-time (07:00-19:00) and Saturdays (07:00-13:00)	65	70	75
Note 1: A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level. *Note 2: If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise.* *Note 3: Applied to residential receptors only.*			
A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values. B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values. C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values. D) 19:00-23:00 weekdays, 13:00-23:00 Saturdays and 07:00-23:00 Sundays.			

Table 3.1: Noise Categories for the ABC Assessment

3.3. **5 dBA Change**

The 5 dBA change method suggests that noise from construction activities is potentially significant if the total noise during construction (pre-construction ambient noise plus site noise) is greater than the pre-construction noise by 5 dB or more, subject to lower cut-off noise levels of 65 dBA, 55 dBA and 45 dBA, from construction noise alone, during daytime, evening and night-time periods respectively, for a period of one month or more. This criteria is applicable to:

- Residential buildings;
- Hotels and Hostels;
- Buildings in religious use;
- Buildings in educational use;
- Buildings in health and/or community use

The ABC method will be utilised in order to assess the impact of construction noise from each of the proposed developments for consistency and due to its ease of use.

3.4. British Standard 5228:2009+A1:2014 Part 2 – Vibration

BS 5228 Part 2: Vibration; provides guidance for vibration effects including vibration due to piling activities.

There are currently no British Standards that provide a methodology to predict levels of vibration from construction activities, other than those contained within BS 5228-2, which relate to a limited range of construction activities. BS 5228-2 identifies that whilst the human response to vibration is usually based on the Vibration Dose Value (VDV), in accordance with the guidance in British Standard 6472, it is considered more appropriate to provide guidance for construction vibration in terms of the Peak Particle Velocity (PPV) as this parameter is more likely to be measured during construction activities due to the usual concerns over potential building damage. With reference to Table B.1 from Annex B of BS 5228-2 which provides guidance on the effects of vibration levels, it is generally accepted that, for the majority of people, vibration levels in excess of between 0.14 and 0.3 mm/s peak particle velocity are just perceptible depending on the receiving environment. Table B.1 from Annex B of BS 5228-2 has been reproduced in **Table 3.2**.

Vibration Level (A),(B),(C)	Effect
0.14 mms^{-1}	Vibration might be just perceptible in the most sensitive situation for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mms^{-1}	Vibration might be just perceptible in residential environments.
1.0 mms^{-1}	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10 mms^{-1}	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.

(A) The magnitudes of the values presented apply to a measurement position that is representative of the point of entry into the recipient.

(B) A transfer function (which relates an external level to an internal level) needs to be applied if only external measurements are available.

(C) Single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. The values are provided to give an initial indication of potential effects, and where these values are routinely measured or expected then an assessment in accordance with BS 6472-1 or -2 and/or other available guidance, might be appropriate to determine whether the time varying exposure is likely to give rise to any degree of adverse comment.

Table 3.2: Guidance on Effects of Vibration Levels – Table B.1, Annex B, BS 5228-2

Table 3.3 below gives typical maximum distances at which certain activities may give rise to a 'just perceptible' level of vibration. These figures are based on historical field measurements.

Construction Activity	Maximum distance from activity when vibration may just be perceptible (m)
Excavation	10-15
Vibratory Compaction	25-40 (depending on weight of drum and specific equipment used)
Heavy Vehicles (e.g. dump trucks)	5-15
Hydraulic Breaker	15-20
Auger Piling (e.g. Continuous Flight Auger Piling)	5-10
Vibratory Piling	30-40

Table 3.3: Distances at which Construction Vibration may just be Perceptible

A qualitative construction vibration assessment has been carried out, having regard to the distances between construction activities and the nearest sensitive receptors.

4. Baseline Noise Levels

The ambient noise levels at the site have previously been obtained by measurement by Mott Macdonald on the 20th and 21st September 2016 and have been previously reported in their report *'Collis Primary School – Acoustic Feasibility Assessment'* dated October 2016 with reference 374941 | 1 | A | 26 October 2016.

All measurements were undertaken by consultants competent in environmental noise monitoring and completed in accordance with the principles of BS 7445:2003 *Description and measurement of environmental noise* (BSI, 2003). All acoustic measurement equipment used during the noise survey was designed to be in conformance with the Class 1 standard. All meters and field calibrators used held current calibration certificates obtained under laboratory conditions traceable to UK and International Standards. Before and after the measurement session the reference calibration level of the sound level meter was checked using a field calibrator.

During teaching hours, the local noise climate at the site was dominated by air traffic associated with Heathrow Airport, which is located 5 miles to the north-west of the site and occasional road traffic noise.

The sound level meters were positioned at ground floor level with the microphone at a height of 1.5m above local ground level.

An unattended noise logger was deployed for 24 hours in a façade location from 1023 hrs on Tuesday 20th September 2016 to 1630 hrs on Wednesday 21st September 2016 at the southern boundary of the site at one metre from the rear façades of the nearest residential receptors. This measurement position (referenced LT1) was selected to be representative of the background sound level at the nearest noise sensitive receptors, as well as recording the noise levels incident upon that part of the school site.

The weather conditions during the survey were dry with temperatures in the range 17°C to 22°C. Wind speeds were measured at <5m/s. Road surfaces were dry throughout the measurement days. Cloud cover during the measurement periods ranged from 30% to 90%. The conditions were considered suitable for noise measurement.

A summary of the results of the baseline noise survey are displayed in **Table 4.1**

Measurement Position	Daytime $L_{Aeq,30min}$ (dB)
LT1	57

Table 4.1: Summary of Measured Noise Levels

It can be identified, by comparison of the measured noise levels presented within Table 4.1 with the ABC noise level criteria presented in Table 3.1, that the site falls within Category A during the daytime. Accordingly, the maximum noise levels in Category A of the ABC method will apply for the nearest noise sensitive receptors.

5. Construction Noise Levels

5.1. Plant

The type and make of plant and machinery (including heavy vehicles), along with the sound power level utilised in the assessment are provided in **Table 5.1**. The sound power levels have all been taken from the historical measurement data provided within BS 5228:2009+A1:2014 Part 1.

Construction Phase (duration)	Equipment	BS 5228-1:2009 reference	Sound Power Level L_{wA} (dB)
Site Set Up (approx. 4 weeks)	Excavator	Table D.3 No.24	108
	Delivery Lorries	Table D.3 No.59	105
Ground Works and Enabling Works (approx. 10 weeks)	Excavator	Table D.3 No.24	108
	Dump Truck	Table D.3 No.52	109
	Concrete Wagon	Table D.6 No.5	102
Construction of new School Building (approx. 19 weeks)	Excavator	Table D.3 No.24	108
	Dump Truck	Table D.3 No.52	109
	Roller	Table D.3 No.114	108
	Telehandler	Table D.7 No.93	105
	Hand held tools	Table D.7 No.79	109
	Delivery Lorries	Table D.3 No.59	105
Demolition of old school building and reinstatement of the land as netball courts (approx. 15 weeks)	Demolition Excavator	Table D.2 No.4	119
	Dump Truck	Table D.3 No.52	109
	Delivery Lorries	Table D.3 No.59	105
	Crusher	Table C.1 No.15 (84 dB L_{Aeq} at 10m)	112[1]
	Roller	Table D.3 No.114	108

Table 5.1: Plant List

Note: (1) Calculated by Syntegra assuming standard point source attenuation

5.2. Receptor Noise Levels

Noise level predictions have been carried out for each of the four stages of construction at both noise sensitive receptors. A summary of the very worst-case noise level predictions is provided in the tables set out below, based on the equipment list provided above. A reasonably worst-case percentage on-time has been assumed, based on Syntegra's experience.

Noise level predictions for Kingsmead Close are presented as **Table 5.2** and the predicted noise levels from Fairfax Road are presented as **Table 5.3**.

Construction Phase (duration)	Equipment	SWL (dBA)	% on-time	No. of items of equipment	Distance to Receptor (m)	Predicted SPL at receptor (dBA)
Site Set Up (approx. 4 weeks)	Excavator	108	25	1	15-65	56-70
	Delivery Lorries	105	10	1	15-65	49-63
					Total Site Set Up	**57-71**
Ground Works and Enabling Works (approx. 10 weeks)	Excavator	108	25	1	15-65	56-70
	Dump Truck	109	25	1	15-65	57-71
	Concrete Wagon	102	10	1	15-65	46-60
				Total Ground Works and Enabling Works		**59-74**
Construction of new School Building (approx. 19 weeks)	Excavator	108	25	1	15-65	56-70
	Dump Truck	109	25	1	15-65	57-71
	Roller	108	5	1	15-65	49-63
	Telehandler	105	25	1	15-65	53-67
	Hand held tools	109	5	1	15-65	50-64
	Delivery Lorries	105	10	1	15-65	49-63
					Total Construction of New Building	**61-76**
Demolition of old school building and reinstatement of the land as netball courts (approx. 15 weeks)	Demolition Excavator	119	5	1	15-80	57-74
	Dump Truck	109	25	1	15-80	54-71
	Delivery Lorries	105	10	1	15-80	46-63
	Crusher	112	5	1	15-80	50-67
	Roller	108	5	1	15-80	46-63
					Total Demolition of Old School Building and Reinstatement	**60-77**

Table 5.2: Predicted Noise Levels at Kingsmead Close

Construction Phase (duration)	Equipment	SWL (dBA)	% on-time	No. of items of equipment	Distance to Receptor (m)	Predicted SPL at receptor (dBA)
Site Set Up (approx. 4 weeks)	Excavator	108	25	1	110	40[1]
	Delivery Lorries	105	10	1	110	33[1]
					Total Site Set Up	**41[1]**
Ground Works and Enabling Works (approx. 10 weeks)	Excavator	108	25	1	110	40[1]
	Dump Truck	109	25	1	110	41[1]
	Concrete Wagon	102	10	1	110	30[1]
					Total Ground Works and Enabling Works	**44[1]**
Construction of new School Building (approx. 19 weeks)	Excavator	108	25	1	110	40[1]
	Dump Truck	109	25	1	110	41[1]
	Roller	108	5	1	110	33[1]
	Telehandler	105	25	1	110	37[1]
	Hand held tools	109	5	1	110	34[1]
	Delivery Lorries	105	10	1	110	33[1]
					Total Construction of New Building	**45[1]**
Demolition of old school building and reinstatement of the land as netball courts (approx. 15 weeks)	Demolition Excavator	119	5	1	45-100	55-64
	Dump Truck	109	25	1	45-100	52-61
	Delivery Lorries	105	10	1	45-100	44-53
	Crusher	112	5	1	45-100	48-57
	Roller	108	5	1	45-100	44-53
					Total Demolition of Old School Building and Reinstatement	**58-66**

Table 5.2: Predicted Noise Levels at Fairfax Road

Note: (1) Includes a 10 dB reduction to the predicted noise level due to shielding from the existing school building, which will still be in place during the specific phases of work.

5.3. Construction Noise Assessment

The results of the construction noise predictions presented in **Tables 5.1** and **5.2** have been compared against the criteria identified in **Section 4**. A summary of that comparison is presented in **Table 5.3**.

Receptor	Construction Phase (Duration)	Predicted Construction Noise Level $L_{Aeq,T}$ (dB)	ABC Method Category	Threshold Value $L_{Aeq,T}$ (dB)	Maximum Noise Level below Threshold?
Kingsmead Close	Site Set Up (approx. 4 weeks)	57-71	A	65	**X**
	Ground Works and Enabling Works (approx. 10 weeks)	59-74	A	65	**X**
	Construction of new School Building (approx. 19 weeks)	61-76	A	65	**X**
	Demolition of old school building and reinstatement of the land as netball courts (approx. 15 weeks)	60-77	A	65	**X**
Fairfax Road	Site Set Up (approx. 4 weeks)	41	A	65	✓
	Ground Works and Enabling Works (approx. 10 weeks)	44	A	65	✓
	Construction of new School Building (approx. 19 weeks)	45	A	65	✓
	Demolition of old school building and reinstatement of the land as netball courts (approx. 15 weeks)	58-66	A	65	**X**

Table 5.3: Construction Noise Assessment

It can be identified, from **Table 5.3**, that the predicted worst-case construction noise levels are likely to be significantly above the Threshold Value at the Kingsmead Close receptors during all phases and just above the Threshold Value at the Fairfax Road receptors during the demolition of the old school building phase. The predicted noise levels at the Fairfax Road receptors during the first three phases of construction are significantly below the Threshold Value.

It is noted by Syntegra that the predicted construction noise levels are very much a worst-case, being based on indicative plant, for which a likely worst-case noise level has been applied. Additionally, noise levels are generally likely to be between the levels stated and will only be at the highest level when plant is located at the closest point to the receptors. It is also noted that it is highly unlikely that all plant will be located at the closest position to the receptors at the same time. Finally, it is noted that works will be carried out over a relatively short period (a total of 33 weeks to construct the new school building, including preparation time, with an additional 15 weeks to demolish the old school building and reinstate the land) so the total exposure time for any noise sensitive receptors will be limited.

The receptors at Fairfax Road will therefore not require any specific noise mitigation measures, other than normal Best Practicable Means mitigation.

However, it is recommended by Syntegra that the following good practice measures are utilised for the boundary of the site facing Kingsmead Close:

- **Selection of quieter equipment (where possible).**
- **Limiting the amount of time where works will be carried out close the boundary to as short as possible.**
- **Erection of noise barriers (e.g. "Echo Barriers" on heras fencing) along the boundary.**

The above specific mitigation measures should assist in reducing noise levels. A 5 dB – 10 dB reduction would be expected from the use of noise barriers alone and therefore the combination of the above measures along with normal Best Practicable Means mitigation measures should reduce noise levels by at least 10 dB, meaning that noise levels at the Kingsmead Close receptors should remain within acceptable levels.

6. Construction Vibration Assessment

With respect to construction vibration, the nearest vibration sensitive receptors are the existing residential dwellings which surround the site at Kingsmead Close and Fairfax Road. The nearest receptors are generally located at a distance of at least 15m from the works.

Vibration due to heavy vehicle movements is unlikely to be perceptible by inhabitants of nearby dwellings unless site accesses or on-site routes are located in close proximity to existing receptors. It is unlikely that vibration due to activities such as excavation and breaking will be perceptible by inhabitants of nearby dwellings, however, as the maximum distances stated in **Table 3.3** are similar to the distances of receptors from the works, vibration from these activities may be just perceptible to some residents for short periods of times. No piling works are proposed for the development.

The time spent carrying out vibration-inducing activities in close proximity to any vibration sensitive receptor is likely to be relatively short compared to the total construction period. People are generally more tolerant of vibration levels if they know that they are only going to be of a short duration and if they have been informed in advance of the relevant activity.

Having regard to the above, construction vibration on existing receptors is not expected to have any significant effects.

7. Mitigation and Monitoring

7.1. Best Practicable Means

Best practicable means should be used to minimise construction noise through the implementation of the recommendations set out in BS 5228-1. In particular, the following noise mitigation measures should be implemented:

- All vehicles and mechanical plant will be fitted with effective exhaust silencers and will be maintained in good efficient order;
- Inherently quiet plant should be used where appropriate – all major compressors and generators will be 'sound reduced' models fitted with properly lined and sealed acoustic covers, which will be kept closed whenever the machines are in use, and all ancillary pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers;
- Machines in intermittent use will be shut down in the intervening periods between use or throttled down to a minimum;
- All ancillary plant such as generators and pumps will be positioned so as to cause minimum noise disturbance, and where necessary, acoustic enclosures will be provided;
- Where practicable, the use of noisy plant will be limited to core daytime periods;
- Channels of communication will be established between the contractor / developer, local authority and residents;
- A Site representative will be appointed responsible for matters relating to noise;
- Typical levels of noise will be monitored during critical periods and at sensitive locations;
- Localised noise barriers will be erected as necessary around items such as generators or high duty compressors; and
- Construction compounds will be laid out so as to minimise noise impacts to neighbouring noise sensitive receptors, by locating noisy operations well away from receptors and using on-Site structures and materials to screen noise where practicable and necessary.

People are generally more tolerant of higher noise levels if they know that they are only going to be of a short duration. Therefore, it is important to maintain good communication with the local residents.

The identified mitigation measures will be implemented through the Construction Environmental Management Plan (CEMP).

7.2. Communications

Prior to the commencement of the works the neighbouring properties, commercial and residential shall be leafleted. The leaflet will contain a contact name and number for enquiries and complaints, details of the works and their likely duration.

7.3. Noise Monitoring

Due to the relatively short construction period, it is proposed to carry out noise monitoring only in the event of complaints.

Noise monitoring would then be carried out for at least a one hour period during the noisiest of the proposed activities to determine the construction noise levels (L_{Aeq}) at the nearest noise sensitive receptors.

8. Conclusion

This report has been prepared to assess the impact of construction noise and vibration at nearby noise sensitive receptors from the development at **Collis Primary School, Teddington, TW11 9BS**.

The scheme involves the construction of a new build two storey primary school containing twelve classrooms (Reception and Years 1 and 2), a nursery, an art/DT room, a dining hall, a kitchen and various offices and ancillary spaces.

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It is noted by Syntegra that the predicted construction noise levels are very much a worst-case, being based on indicative plant, for which a likely worst-case noise level has been applied. Additionally, noise levels are generally likely to be between the levels stated and will only be at the highest level when plant is located at the closest point to the receptors. It is also noted that it is highly unlikely that all plant will be located at the closest position to the receptors at the same time. Finally, it is noted that works will be carried out over a relatively short period (a total of 33 weeks to construct the new school building, including preparation time, with an additional 15 weeks to demolish the old school building and reinstate the land) so the total exposure time for any noise sensitive receptors will be limited.

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- **Selection of quieter equipment (where possible).**
- **Limiting the amount of time where works will be carried out close the boundary to as short as possible.**
- **Erection of noise barriers (e.g. "Echo Barriers" on heras fencing) along the boundary.**

9. Appendix 1: Glossary of Acoustic Terminology

Term	Description
'A'-Weighting	*This is the main way of adjusting measured sound pressure levels to take into account human hearing, and our uneven frequency response.*
Decibel (dB)	*This is a tenth (deci) of a bel. The decibel can be a measure of the magnitude of sound, changes in sound level and a measure of sound insulation. Decibels are not an absolute unit of measurement but are an expression of ratio between two quantities expressed in logarithmic form.*
$L_{Aeq,T}$	*The equivalent steady sound level in dB containing the same acoustic energy as the actual fluctuating sound level over the given period, T. T may be as short as 1 second when used to describe a single event, or as long as 24 hours when used to describe the noise climate at a specified location. $L_{Aeq,T}$ can be measured directly with an integrating sound level meter.*
L_{A10}	*The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 10 per cent of a given time and is the L_{A10T}. The L_{A10} is used to describe the levels of road traffic noise at a particular location.*
L_{A50}	*The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 50 per cent of a given time and is the L_{A50T}.*
L_{A90}	*The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 90 per cent of a given time and is the L_{A90T}. The L_{A90} is used to describe the background noise levels at a particular location.*
L_{Amax}	*The 'A'-weighted maximum sound pressure level measured over a measurement period.*

10. Appendix 2: Professional Statement

David Yates

David Yates is a full member of the Institute of Acoustics (MIOA) and has approximately ten years' experience in acoustic consultancy. David has particular expertise in environmental noise providing acoustic consultancy for residential and mixed use planning applications, plant noise and vibration, construction noise and the design of acoustic, noise and vibration control. David is also experienced in providing sound insulation testing and design advice. David is familiar with the application of all relevant standards associated with his work, including but not limited to, BS 4142, BS 8233, BS 7445, BS 6472, BS 5228, BS 140 series, BS 16283 series and BS 717 series. David manages the acoustic department and is responsible for maintaining Syntegra's ANC membership.