

**REPORT TITLE:**

195 – 199 Gray's Inn Road - Noise Survey and Assessment Report

**CLIENT DETAILS:**

European Urban Developments

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# 1. Executive Summary

The prevalent noise levels at the site on Gray's Inn Road, London have been measured over a typical day and night time period to assess the impact of the existing noise sources on the proposed residential development. The potential noise effects of the proposed development on surrounding areas are also considered.

The site is mainly affected by the road traffic noise to the east. It is considered that using guidelines from the World Health Organisation alongside levels provided in BS8233:2014 for noise conditions within dwellings will make sure that 'significant adverse impacts on health and quality of life' are avoided as required by the Noise Policy Statement for England.

Consequently, an adequate level of noise mitigation measures will be required to ensure that future residents of the site are protected from the existing ambient noise.

If mitigation measures are included to achieve the specified internal noise levels, future residents of the proposed development will be protected from the dominant noise sources. Mitigation measures should include the use of appropriate glazing coupled with acoustic trickle ventilation or mechanical ventilation.

## 2. Introduction

Pace Consult was commissioned by European Urban Developments to undertake an assessment of the noise impacts associated with the proposed development on Gray's Inn Road, London.

There is a potential for road traffic noise to have an impact on the proposal. Therefore, the impact of the existing noise levels has been considered in assessing the site's suitability for residential use.

It should be noted that vibration is not assessed in this report as there are no significant sources of vibration in the area. Vibration levels in the proposed development are expected to be well below the relevant standards for residential developments.

The assessment has been undertaken in accordance with national standards and guidelines for residential dwellings.

### 3. The Site

#### 3.1 Location and Description

The site is bounded to the east by Gray's Inn Road, to the west by terraced residential properties and to the north and south by existing garden space. The nearest noise sensitive receivers are the terraced houses to the west.

Figure 1 shows the location of the site relative to the surrounding area with survey locations indicated, however a site plan is presented below for information purposes.



#### 3.2 Proposed Development

The proposal is to develop the existing single storey office building into three terraced houses, all with 2 storeys.

## 4. Assessment Methodology

### ***National Planning Policy Framework and the Noise Policy Statement for England***

The National Planning Policy Framework (NPPF) sets out the general requirements for gaining planning permission. Comments regarding noise found within the document are as follows. The planning system should prevent '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' (paragraph 109). It adds to this by saying that 'planning policies and decisions should aim to avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development' (paragraph 123).

The NPPF references the Noise Policy Statement for England (NPSE) which in turn references two concepts used by the World Health Organisation (WHO) which can be used to ascertain relevant noise levels for individual sites. The concepts are LOAEL (Lowest Observed Adverse Effect Level) and SOAEL (Significant Observed Adverse Effect Level). The NPPF then gives three aims to adhere to:

*Aim 1 – Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*

*Aim 2 – Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*

*Aim 3 – Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*

To avoid 'significant adverse impacts on health and quality of life', by creating a situation where the impact of noise lies below the SOAEL we will refer to both BS8233 : 1999 – Sound Insulation and noise Reduction for buildings and the World Health Organisation (WHO) 'Guidelines for Community Noise' which both provide good criteria for internal noise levels for residential buildings.

### **British Standard BS8233:1999 – Sound Insulation and Noise Reduction for Buildings – Code of Practice**

The scope of BS8233 is the provision of recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new or refurbished buildings undergoing a change of use rather than to assess the effect of changes in the external noise climate.

BS8233 suggests suitable internal noise levels within different types of buildings, including residential dwellings. It suggests that an internal noise level of 30 dB  $L_{Aeq,T}$  within bedrooms is a 'good' standard, whilst 35 dB  $L_{Aeq,T}$  is a 'reasonable' standard. For living areas in the daytime, the standard recommends 30 dB  $L_{Aeq,T}$  as a good standard and 40 dB  $L_{Aeq,T}$  as being a reasonable standard. BS8223 also states that individual noise events should not exceed 45 dB  $L_{AFmax}$  in bedrooms at night.

### **World Health Organisation (WHO) 'Guidelines for Community Noise'**

This document states that, in dwellings, the critical effects of noise are on sleep, annoyance and speech interference. According to this document, to protect the majority of people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 55 dB  $L_{Aeq}$  for a steady, continuous noise. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound pressure level should not exceed 50 dB  $L_{Aeq}$ . To avoid any possibility of sleep disturbance, indoor guideline values for bedrooms are 30 dB  $L_{Aeq}$  for continuous noise and 45 dB  $L_{Amax}$  for single sound events. These indoor noise levels correspond to sound pressure levels at the outside façades of the living spaces of 45 dB  $L_{Aeq}$  and 60 dB  $L_{Amax}$ . These values have been obtained by assuming that the noise reduction from outside to inside with the window partly open is 15 dB.

### **BS4142:1997 Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas**

BS4142 is intended to be used for assessment of whether noise from factories, industrial premises or fixed installations and sources of an industrial nature is likely to give rise to complaints from people residing in nearby dwellings. The Standard states that:

*'It (BS4142) may be found helpful in certain aspects of environmental planning and may be used in conjunction with recommendations on noise levels and methods of measurement published elsewhere.'*

The procedure contained in BS4142 for assessing the likelihood of complaints is to compare the measured or predicted noise level from the source in question, the 'specific noise level', at the assessment position with the background noise level. Where the noise contains a 'distinguishable, discreet, continuous note (whine, hiss, screech, hum etc.) or if there are distinct impulses in the noise (bangs, clicks or clatters), or if the noise is irregular enough to attract attention' then a correction of 5 dB is added to the specific noise level to obtain the 'rating level'. British Standard, BS7445: Part 2: 1991: Description and measurement of environmental noise - Guide to the acquisition of data pertinent to land use contains a more objective method of assessing whether a sound is tonal. It states:

*'In some practical cases, a prominent tonal component may be detected in one-third octave spectra if the level of a one-third octave band exceeds the level of the adjacent bands by 5dB or more.'*

To assess the likelihood of complaints, the measured background noise level is subtracted from the rating noise level. BS4142 states:

*'A difference of around 10 dB or higher indicates that complaints are likely. A difference of around 5 dB is of marginal significance. At a difference below 5 dB, the lower the value the less likelihood there is that the complaints will occur. A difference of -10 dB is a positive indication that complaints are unlikely.'*

However, in addressing the potential for noise intrusion the standard also states that: *'For the purposes of this standard, background noise levels below about 30 dB and rating levels below about 35 dB are considered to be very low.'*

### **Camden Council DP28 & DP29**

Camden Council provide thresholds for both existing external noise levels and proposed plant noise levels; these are as follows:

**Table A: Noise levels on residential sites adjoining railways and roads at which planning permission will not be granted**

Noise description and location of measurement	Period	Time	Sites adjoining railways	Sites adjoining roads
Noise at 1 metre external to a sensitive façade	Day	0700-1900	74 dB L <sub>Aeq</sub> 12h	72 dB L <sub>Aeq</sub> 12h
Noise at 1 metre external to a sensitive façade	Evening	1900-2300	74 dB L <sub>Aeq</sub> 4h	72 dB L <sub>Aeq</sub> 4h
Noise at 1 metre external to a sensitive façade	Night	2300-0700	66 dB L <sub>Aeq</sub> 8h	66 dB L <sub>Aeq</sub> 8h



**Table B: Noise levels on residential streets adjoining railways and roads at and above which attenuation measures will be required**

Noise description and location of measurement	Period	Time	Sites adjoining railways	Sites adjoining roads
Noise at 1 metre external to a sensitive façade	Day	0700-1900	65 dB $L_{Aeq}$ 12h	62 dB $L_{Aeq}$ 12h
Noise at 1 metre external to a sensitive façade	Evening	1900-2300	60 dB $L_{Aeq}$ 4h	57 dB $L_{Aeq}$ 4h
Noise at 1 metre external to a sensitive façade	Night	2300-0700	55 dB $L_{Aeq}$ 1h	52 dB $L_{Aeq}$ 1h
Individual noise events several times an hour	Night	2300-0700	>82dB $L_{Amax}$ (S time weighting)	>82dB $L_{Amax}$ (S time weighting)

**Table E: Noise levels from plant and machinery at which planning permission will not be granted**

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 $L_{Aeq}$

It should be noted that DP29 does not apply to this assessment.

## 5. Survey Method and Equipment

### 5.1 Survey

The noise survey was carried out between Thursday 18<sup>th</sup> and Friday 19<sup>th</sup> September 2014 to measure representative noise levels at the site of the proposed development during a typical weekday period.

The noise survey comprised of two unattended monitoring positions at the site which are described in detail below;

- North-east (MP1): Unattended continuous monitoring position recorded the noise levels from the roof of the existing building. This position is representative of the position of the proposed top floor window and recorded worst case noise levels that would be incident on the proposed development.
- South-east (MP2): Unattended continuous monitoring position recorded the noise levels from the roof of the existing building. This position is representative of the position of the proposed top floor window and recorded worst case noise levels that would be incident on the proposed development.

Noise monitoring was carried out at a height greater than 1.5m above local ground level.

Noise measurements were made with a calibrated precision grade sound level meter which achieves the requirements of BS EN 61672:2003. The survey was carried out in accordance with the principles of BS 7445:1997 Parts 1-3, 'Description and Measurement of Environmental Noise', British Standard BS4142: 1997, Method for Rating Industrial Noise affecting Mixed Residential and Industrial Areas, and following the guidance given in PPG 24 'Planning and Noise'.

### 5.2 Measurement Parameters

Human ears are able to respond to sound over the frequency range of about 20 Hz to 20 kHz and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude, and is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates to the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear. The most widely used weighting mechanism that corresponds to the response of the human ear is the A-weighting scale. This is widely used

for environmental noise measurement, and the levels are denoted as dB(A) or  $L_{Aeq}$ ,  $L_{A90}$ , etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) of a steady source is generally regarded as the minimum difference needed to perceive a change.

Environmental noise has been measured in the following indices;

$L_{Aeq, T}$  - The A-weighted equivalent continuous sound pressure level. A representation of a continuous sound level containing the same amount of sound energy as the measured varying noise over the measurement period, t.

$L_{A90, T}$  - The A-weighted sound pressure level that is exceeded for 90% of the measurement period, t. This is commonly used as the 'Background Noise Level' for assessing the effects of industrial noise in the UK.

$L_{Amax}$  - The highest A-weighted noise level recorded during a noise measurement period.

### **5.3 Equipment**

Norsonic Nor131 precision grade sound level meter

Cirrus CR811B precision grade sound level meter

Norsonic Nor1251 calibrator

Environmental wind shield

The sound level meters were calibrated before and after the survey. No drift was noted between the two reference checks.

### **5.4 Weather**

The climatic conditions during the noise surveys were warm with light winds (< 2m/s). Conditions were considered conducive to environmental noise measurement.

## 6. Survey Results

The measurement survey at all monitoring locations comprised of consecutive measurement periods in terms of the most relevant standards and guidelines.

The tables below show the period noise levels measured at all monitoring locations. These have subsequently been used as a basis establishing dominant noise levels across the site.

Table 6.1: Measured continuous noise level at MP1 (dB)

Period	Time	Period $L_{Aeq, T}$ (Log Average)	$L_{Amax, T}$	$L_{A90, T}$ Minimum Background
Weekday	16hr (07:00 – 23:00)	67.0	N/A	46.0
	8hr (23:00 – 07:00)	62.7	75.2 (Mean) 78.9 (90th Percentile) 85.5 (Max)	42.0

Table 6.2: Measured continuous noise level at MP2 (dB)

Period	Time	Period $L_{Aeq, T}$ (Log Average)	$L_{Amax, T}$	$L_{A90, T}$ Minimum Background
Weekday	16hr (07:00 – 23:00)	66.5	N/A	45.7
	8hr (23:00 – 07:00)	62.4	74.1 (Mean) 77.6 (90th Percentile) 85.2 (Max)	41.1

In accordance with Camden Council's DP28, the noise levels measured indicate that attenuation measures will be required.

## 7. Site Suitability for Residential Development

### 7.1 Noise Assessment

External noise levels have been predicted for the sensitive façades of the proposed development that will be exposed to the highest levels of noise. All calculations are based on the results of the noise monitoring exercise.

It is clear that the development may be affected by road traffic noise due to the positioning of the site.

Whilst it is assumed that no significant changes to the sources of the noise are likely, the reduction of noise from the road is beyond the control of the developer. Therefore, the developer will need to provide sufficient mitigation through the detailed design of the proposed dwellings. This could include suitable sound attenuating measures in construction and optimising the layout of the development.

It will be important to construct the envelope of the building using materials with adequate sound insulating properties as to provide good internal noise conditions. If the envelope is built to a high enough standard, it will be possible to achieve the appropriate internal noise levels recommended for noise-sensitive developments.

The noise levels used in the building envelope assessment are shown below. Note that the maximum night-time noise levels are based on the 90<sup>th</sup> percentile of the levels measured during the survey.

Table 7.1 – Octave noise levels used for building envelope calculations

Freq. Hz	63	125	250	500	1 k	2 k	4 k	Average
Day-time $L_{eq}$	71	65	64	61	63	61	54	67 dB(A)
Night-time $L_{eq}$	67	60	59	57	59	56	50	63 dB(A)
Night-time $L_{max}$	87	80	78	74	73	72	67	79 dB(A)

## 7.2 Building Envelope Sound Insulation

The envelope construction at façades worst affected by mixed noise sources could achieve the internal noise levels through a combination of measures such as those presented below:

Table 7.2 – Specification for the building envelope (MP1).

Freq. Hz	63	125	250	500	1 k	2 k	4 k	Average
Glazing (Bedrooms)	24	29	31	37	37	39	45	38 dB $R_w$
Glazing (Living Rooms)	17	22	20	26	36	39	31	31 dB $R_w$
Trickle Ventilators (Bedrooms)	40	39	42	43	43	39	40	42 dB $D_{n,e,w}$
Trickle Ventilators (Living Rooms)	32	31	34	35	35	31	32	34 dB $D_{n,e,w}$
Wall	35	39	41	45	51	49	50	49 dB $R_w$
Roof	35	35	41	47	52	56	56	51 dB $R_w$

Note that indicative glazing specifications have been provided. Window suppliers must ensure that the sound insulation performance of the proposed glazing meets the performance requirements above in every octave.

Bedrooms require acoustic trickle ventilators or mechanical ventilation. Living rooms require trickle ventilators or mechanical ventilation.

By employing the above attenuating measures it will be possible to attain the ‘good’ internal noise level within bedrooms and the ‘reasonable’ level within living rooms recommended in British Standard BS 8233: 1999 ‘Sound Insulation and Noise Reduction for Buildings – Code of Practice’. Night time noise levels resulting from single sound events are not expected to

exceed 45 dB  $L_{Amax}$  in bedrooms more than 10 – 15 times per night in accordance with WHO guidelines.

Note. If ‘good’ indoor ambient noise levels are required in living rooms then upgraded specifications for both the windows and the trickle ventilators will be required.

Potential suppliers of construction elements must be able to satisfy the design team that the acoustic performance information supplied must relate to the products on offer for this project and should show laboratory test acoustic information measured in accordance with BS EN ISO 140-3.

## 8. Noise from Fixed Installations and Mechanical Plant

Noise levels generated by mechanical plant and experienced by local receptors depends upon a number of variables, the most significant of which are considered to be as follows.

- Noise generated by plant or equipment used on site, generally expressed as sound power levels (SWL)
- Distance between the noise source and the receptor
- Attenuation due to ground absorption, atmospheric and barrier effects
- Periods of operation of the plant on the site, known as its “on-time”

It is possible that the proposal will include installations of ventilation and mechanical plant. However, at this stage, no information is available with regard to the fixed installations and mechanical plants that are to be installed as part of the proposed development.

Consequently, it is not possible to present an inclusive assessment of the noise effects of such plant. However, in order to ensure that background noise levels at the nearest noise sensitive receptors do not increase significantly as a result of the development, design noise limits for electrical and mechanical plant have been provided.

The noise limits have been based on achieving 5dB below the quietest background noise level recorded during the 24 hour survey.

Location	Daytime	Night-time
MP1/MP2	41	36

Note: if plant noise is tonal or has distinct impulses then the limits shown above will reduce by 5dBA.

If fixed installations and mechanical plant are designed to achieve the above mentioned noise limits at the nearest residential receivers complaints will be minimised.

There are a number of measures that can be introduced to control noise from the mechanical and fixed plant installation associated with the proposed development. Consideration should be given to reducing noise at point of generation (e.g. by selecting quieter plant) or containment of noise generated (e.g. by insulating buildings which house machinery and/or providing purpose-built barriers around the site).

## 9. Conclusions

The effect of noise associated with the proposed development at 195 – 199 Gray's Inn Road, London has been assessed. Throughout, the assessment has been undertaken with reference to British Standards and national and international guidance on noise impacts.

The noise levels have been assessed with consideration to the National Planning Policy Framework and the Noise Policy Note for England. Following these policies, figures from the WHO's 'Guidelines for Community Noise' and BS8233 'Sound Insulation and Noise Reduction for Buildings' have been used to assure that 'significant adverse impacts on health and quality of life' are avoided. To achieve these internal noise levels envelope constructions have been suggested which should achieve 'good/reasonable' internal noise conditions.

Plant noise limits have been provided in accordance with BS4142:1997 and Camden Council's DP28.

## 10. References

1. National Planning Policy Framework
2. Noise Policy Statement for England
3. World Health Organisation Criteria – Environmental criteria
4. BS8233:1999 "Sound insulation and noise reduction for buildings"
5. British Standard BS4142: 1997, Method for Rating Industrial Noise affecting Mixed Residential and Industrial Areas



Figure 1: Site Location Plan and Monitoring Position

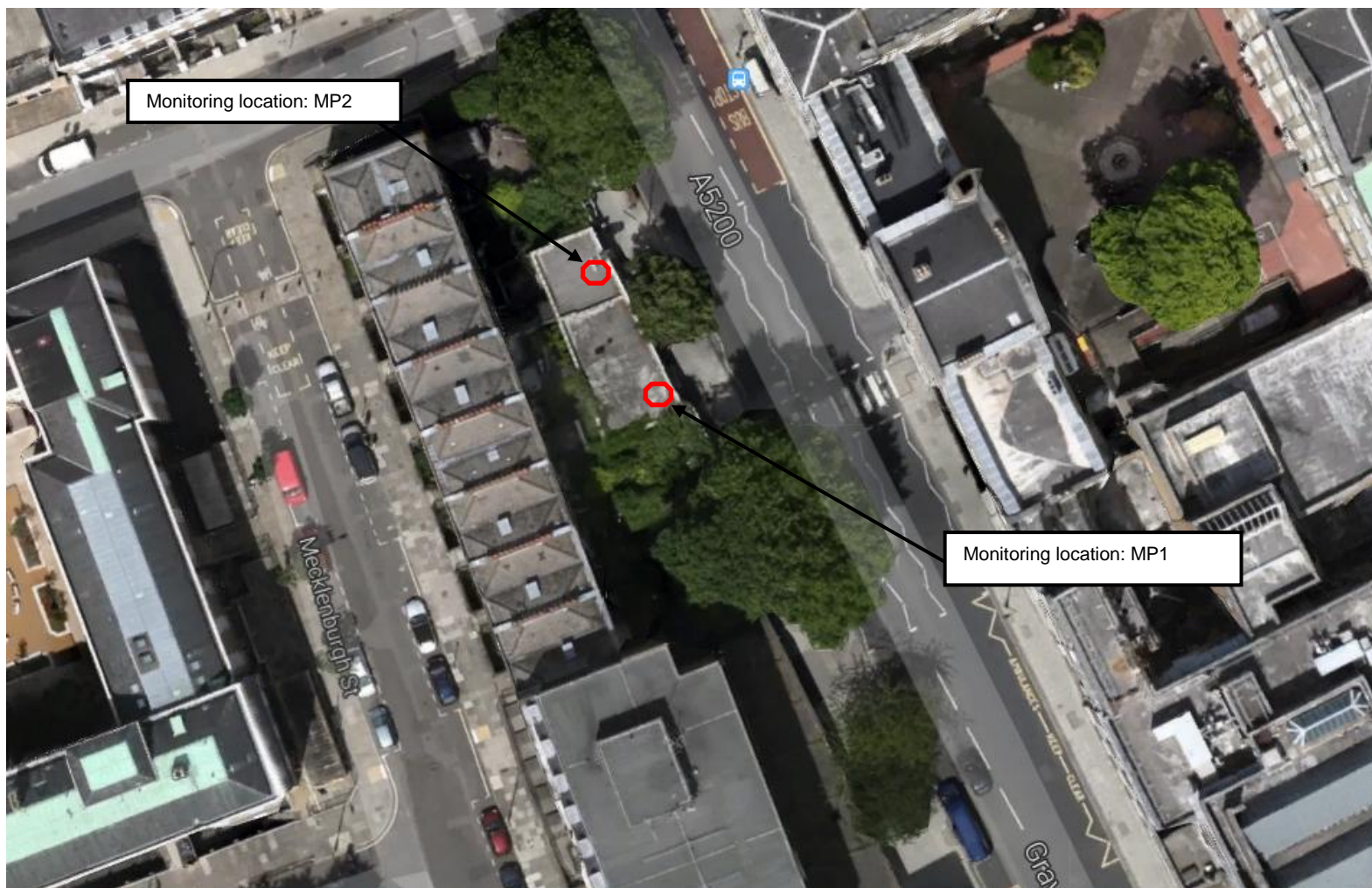


Figure 2: Site Photo



## Appendix 1 – ANC Accreditation

