
PLANNING NOISE ASSESSMENT

LAND AT LITTLE MEADOWS, YAPTON

ANN TAYLOR

MAY 2021

PLANNING NOISE ASSESSMENT LAND AT LITTLE MEADOWS, YAPTON

Our Ref: 5020_002R_2-0_PA



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Date: **5 May 2021**

Project No: **5020**
Status: **ISSUED**

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REVISION HISTORY

Version	Comments	Changes made by	Approved by
1.0	First issued version	PA	PS
2.0	Minor updates.	PA	PA

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CONTENTS

1	INTRODUCTION	6
2	NOISE UNITS, POLICY AND CRITERIA	7
3	SITE DESCRIPTION	12
4	NOISE MEASUREMENTS	15
5	ACOUSTIC MODELLING	19
6	PREDICTED INTERNAL NOISE LEVELS	27
7	CONCLUSIONS	29
8	REFERENCES	30

1 INTRODUCTION

Anderson Acoustics Ltd was commissioned by Nova Planning on behalf of Ann Taylor in January 2021 to undertake an outline acoustic assessment for the proposed residential development of the land at Little Meadows, Yapton, West Sussex; to aid the design of the site to minimise the impacts of noise on the proposed development and support an outline planning application.

The proposed development includes the construction of additional commercial units to the east of the existing commercial estate, as well as new residential dwellings to the south and east. The wider development is located in a semi-rural area, mainly agricultural land with residential properties. The plot of land proposed for development is located to the west of Bilsham Road.

The extension of the existing commercial estate will provide 3 additional units, as well as 73 new residential dwellings.

Noise units, acoustic terminology and environmental noise criteria relevant to the assessment have been presented and briefly discussed in Section 2 of this report.

A brief description of the site and proposed development is given in Section 3.

The methodology and results of an environmental noise survey undertaken at the site are given in Section 4.

Section 5 provides details of the design of the building envelope against environmental noise.

The report is summarised in Section 6.

2 NOISE UNITS, POLICY AND CRITERIA

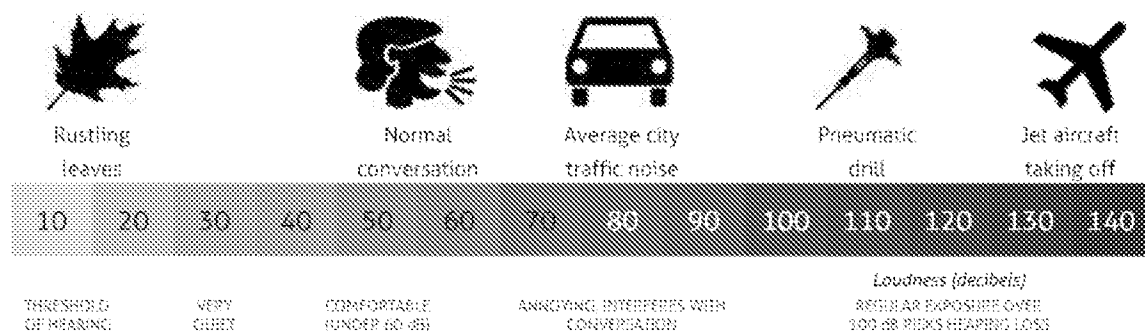
2.1 Noise Units

There is a ten million to one ratio between the threshold of hearing and the highest tolerable sound pressure. Noise is therefore measured using a logarithmic scale, to account for this wide range, called the decibel (dB). Noise is defined as unwanted sound and the range of audible sound varies from around 0 dB to 140 dB.

The human ear is capable of detecting sound over a range of frequencies from around 20 Hz to 20 kHz, however its response varies depending on the frequency and is most sensitive to sounds in the mid frequency range of 1 kHz to 5 kHz. Instrumentation used to measure noise is therefore weighted across the frequency bands to represent the sensitivity of the ear. This is called 'A weighting' and is represented as dB(A).

It is generally accepted that under normal conditions humans are capable of detecting changes in steady noise levels of 3 dB, whilst a change of 10 dB is perceived as a doubling or halving of the noise level. An indication of the range of noise levels commonly found in the environment is given below.

Figure 2.1: Typical noise levels



A number of different indices are used to describe the fluctuations in noise level over certain time periods. The main indices include:

- L_{A90,T}** This is the noise level exceeded for 90% of the measurement period and provides a measurement of the quieter 'lull' periods in between noise events. It is often referred to as the background noise level.
- L_{Aeq,T}** This is the "equivalent continuous A weighted sound pressure level" and is the level of a notional steady sound which has the same acoustic energy as the fluctuating sound over a specified time period. It is often used for measuring all sources of noise in the environment, which can be referred to as the ambient noise.
- L_{Amax,F}** This is the maximum sound pressure level measured in a given time period with the sound level meter set to 'fast' response.

Reference is often made to acoustic measurements being undertaken in 'free-field' or 'façade' locations. Free-field measurements represent a location away from vertical reflecting surfaces, normally by at least 3.5 metres. A façade measurement is undertaken, or calculated to a position 1 metre from an external façade and a correction of up to 3 dB can be applied to account for the sound reflected from the façade. This latter position is often used when assessing the impact of external noise affecting residents inside properties.

2.2 Relevant Guidance

2.2.1 British Standard 8233

British Standard BS 8233: 2014: Sound insulation and noise reduction for buildings – Code of practice [1] provides guideline values for internal noise levels within a number of building types including residential dwellings.

In general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values in Table 2.1:

Table 2.1: British Standard 8233 Indoor Noise Levels

Activity	Location	Daytime	Night-time
Resting	Living room	35 dB $L_{Aeq, 16\text{hour}}$	-
Dining	Dining room/area	40 dB $L_{Aeq, 16\text{hour}}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq, 16\text{hour}}$	30 dB $L_{Aeq, 8\text{hour}}$

Notes: Daytime assessment period – 07:00 to 23:00 hrs
Night-time assessment period – 23:00 to 07:00 hrs

BS 8233 also provides guidance on calculating the sound insulation performance requirements for the external envelope or facade of a building where this is made up of a number of different elements.

Furthermore, the Standard notes that, “Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$ depending on the character and number of events per night. Sporadic noise events could require separate values.” No thresholds/criteria are provided within the Standard, however.

The previous, 1999 version of the Standard included the note that, “For a reasonable standard in bedrooms at night, individual noise events (measured with F time-weighting) should not normally exceed 45 dB L_{Amax} ”.

This is the same threshold (i.e. 45 dB) given in the World Health Organization (WHO) Guidelines for Community Noise [2], and it is, therefore, considered to remain relevant and is described in the following sub-section.

In respect of external noise levels, the guidance in BS 8233:2014 suggests that “it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments”. BS 8233:2014 however acknowledges that “these guideline values are not achievable in all circumstances where development might be desirable”, and that “...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, BS 8233:2014 states that “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".

BS 8233:2014 suggests 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 circumstances 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.

2.2.2 World Health Organisation Guidelines

The following guideline values for community ambient noise levels in specific environments are presented in the World Health Organization (WHO) Guidelines for Community Noise.

Table 2.2: WHO Guideline Noise Values

Specific Environment	Critical Health Effect(s)	dB $L_{Aeq,T}$	Time Base hours	dB $L_{Amax,F}$
Dwelling indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
Inside bedrooms	Sleep disturbance, night-time	30	8	45

The 45 dB $L_{AF,max}$ criterion applies to "single sound events" within bedrooms at night. This guideline is generally interpreted as the value that individual noise events should not normally exceed more than 10 times a night.

2.3 Planning Noise Advice Document: Sussex

The Planning Noise Advice Document: Sussex [3] does not provide any specific guidance for acoustic criteria for new residential developments, however references design criteria of BS 8233:2014 (described above), as well as World Health Organisation Night Noise Guidelines for Europe (2009) [4], detailed in the following sub-section.

2.4 WHO Noise Guidelines for Europe

To ensure compliance with Planning Noise Advice Document: Sussex, night-time max levels should not exceed the L_{Amax} level recommended in WHO Night Noise Guidelines for Europe. The document states "42 dB(A) is proposed as the currently best estimate of the threshold for conscious awakening by transportation noise. This would mean that the no observed effect level (NOEL L_{Amax}) for transportation noise events is at most 42 dB(A). The most sensitive instantaneous effect that has been studied extensively in field studies is motility. A single interval with (onset of) noise-induced motility by itself cannot be considered to be adverse".

2.5 ProPG: Planning & Noise

ProPG (Professional Practice Guidance: Planning and Noise) [5] was jointly developed by the Institute of Acoustics (IOA), the Association of Noise Consultants (ANC) and the Chartered Institute of Environmental Health (CIEH) to guide Local Planning Authorities (LPA's) and Practitioners in assessing the suitability for residential development on sites predominantly exposed to airborne transport noise.

ProPG introduced a sequential 2-stage approach allowing for early consideration of noise issues at Stage 1 followed by more detailed consideration of noise issues at Stage 2, should this be identified as necessary in Stage 1.

Stage 1 introduces the concept of noise risk categories ranging from Negligible Risk to High Risk to help LPAs in making accelerated straightforward decisions for low risk sites and to provide guidance for more detailed consideration associated with challenging higher risk sites.

Following the outcome of Stage 1, Stage 2 then applies to sites assessed as low to high risk. This stage should not be necessary for sites assessed as negligible risk.

Stage 2 requires consideration be given to four key elements:

- Element 1: Good Acoustic Design Process
- Element 2: Internal Noise Level Guidelines
- Element 3: External Amenity Area Noise Assessment
- Element 4: Other Relevant Issues

Further details on these elements are discussed in the acoustic design section of this report. Table 2 provides a summary of ProPG's noise risk categories and their associated free-field noise levels, along with the assessment implications.

Table 2-3: Stage 1 - Initial Site Noise Risk Assessment

Risk Category	Indicative Daytime Noise Levels $L_{Aeq,16hr}$	Indicative Night-time Noise Levels $L_{Aeq,8hr}$	Pre-Planning Application Advice
Negligible Risk	< 50 dB	< 40 dB	Indication that the development site is likely to be acceptable from a noise perspective and application need not normally be delayed on noise grounds.
Low Risk	50 - 60 dB	40 - 50 dB	Indication that the development site is likely to be acceptable provided a good acoustic design process is followed and is confirmed in a detailed Acoustic Design Statement confirming how noise will be mitigated.
Medium Risk	60 - 70 dB	50 - 60 dB	
High Risk	> 70 dB	> 60 dB	Indication that the development site may be refused on noise grounds unless a good acoustic design process and detailed Acoustic Design statement can demonstrate the significant noise risk can be mitigated.

Notes

1. Noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures.
2. Noise levels are the combined free-field noise level from all sources of transport noise and may also include industrial/commercial noise where this is present, but not dominant.
3. $L_{Aeq,16hr}$ is for daytime 07:00-23:00, $L_{Aeq,8hr}$ is for night-time 23:00 to 07:00.
4. An indication that there may be more than ten noise events at night (23:00-07:00) with $L_{Amax,F} > 60$ dB means the site should not be regarded as negligible risk.

2.6 Summary of environmental noise criteria

Having considered the above criteria, a design limit of 35 dB $L_{Aeq,T}$ is to be achieved in living rooms and 30 dB $L_{Aeq,T}$ in bedrooms at night. In addition, individual noise events should not normally exceed 42 dB $L_{AF,max}$ within bedrooms at night.

With regard to external noise criteria in amenity areas, it is desirable that noise levels do not exceed 50dB(A) $L_{Aeq,16\text{ hours}}$, with an upper limit of 55 dB(A) $L_{Aeq,16\text{ hours}}$ for noisier environments close to major infrastructure.

3 SITE DESCRIPTION

3.1 Existing Site

The proposed development is located to the East of Bilsham Road, on disused agricultural land. The site location and boundary of the site are highlighted in red in Figure 3.1 below. The acoustic environment is dominated mainly by road traffic on Bilsham Road to the west, and the A259 approximately 300m to the south east.

Bilsham Road is a main road feeding onto the A259 to the south east of the site. Grevatt's Lane West, which currently bisects the land, is a quiet country lane providing access to agricultural land, commercial estate and several homes near the junction with Bilsham Road.

Observations during site visits indicated that the noise climate across the site is consistently dominated by the combination of road traffic on Bilsham Road and the A259. Little Meadows commercial estate contributes little to the acoustic environment at the development site, mainly due to sporadic vehicle movements and to minor noisy works undertaken on the estate.

The wider area is generally of agricultural use, and would therefore seasonally introduce noise from the associated activities such as tilling fields, planting crops and harvesting, etc. Agricultural activities are sporadic and highly dependant upon seasonality, so have a low likelihood of potential significant noise impact given typical noisy activities are of short duration and infrequent occurrence.

Little Meadows commercial estate is a small estate and from discussions with some tenants it is mainly used by businesses for storage, which was corroborated by observations during our time on site. Vehicles access the site generally between 07:00 and 19:00 hours. Operational hours of each business vary but are mainly limited to the above times. Vehicle movements to and from the commercial estate are typically associated with the transportation of goods. Observations during site visits indicated there are up to 4 heavy vehicle movements per hour (2 arrivals and 2 departures). There are also light good vehicles and car movements to and from the estate in addition to the 4 HGVs, which we observed as 4 movements per hour. It has been assumed that these could occur at any time between the hours of 07:00 and 19:00. This gives rise to a total of 8 vehicle movements per hour.

The main source of noise from businesses on the estate, other than the vehicle movements noted above, is from Hyams Autolift, a sales and hire of forklift vehicles business open between 08:00 and 18:00 hours. They also operate a small workshop undertaking forklift maintenance and re-painting. The maintenance workshop mainly utilises manual hand tools, and small powered tools such as electric drills, small electric grinders and a pneumatic compressor to power pneumatic tools. Outside the workshop, testing of the forklifts may be undertaken for short periods of time (a few minutes at a time), on the west side of the building. Noise from the operation of the workshop was not audible above road traffic until relatively close to the estate.

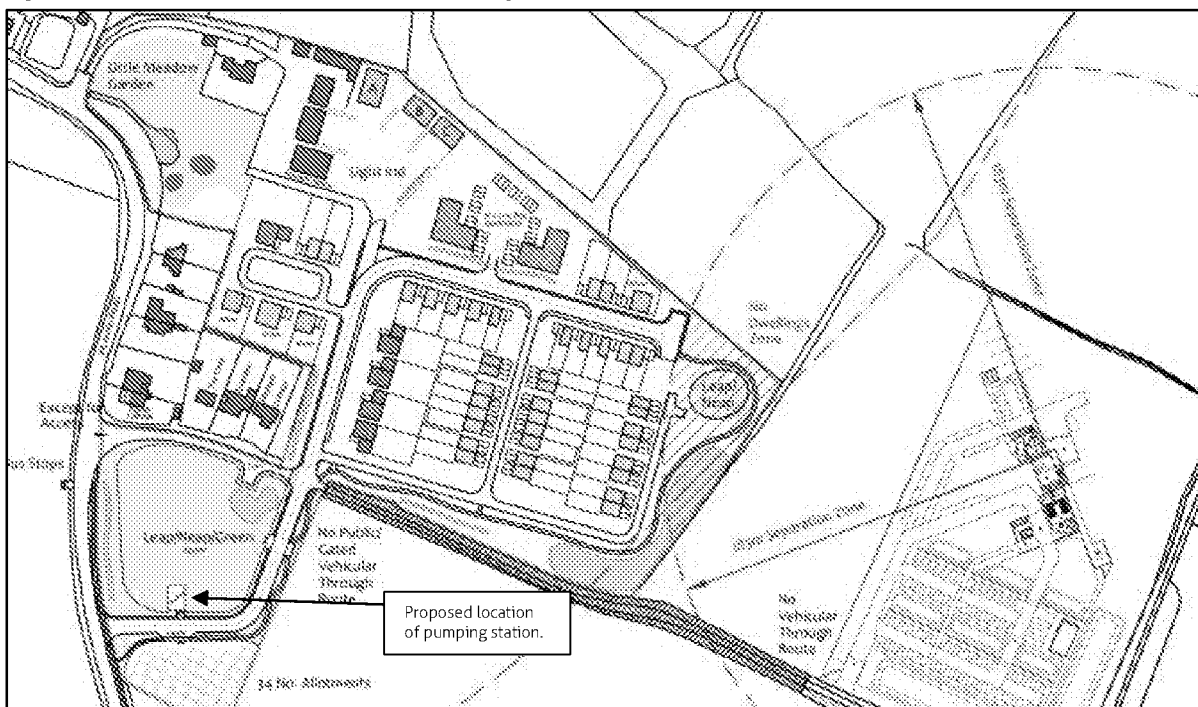
Figure 3.1 – Site Boundary Plan



3.2 Proposed Development

The proposed development is a mixed-use commercial and residential development comprising the construction of 73 new residential properties, and the extension of the existing commercial estate to provide additional units to the east. As part of the development, it is proposed that a new access road leading from Bilsham Road to the south of Grevatt's Lane West is created for access to both the residential development and the industrial estate.

Figure 3.2 - Proposed General Development Layout



It should be noted that planning permission has recently been granted for a crematorium to the east of the site (planning reference Y/103/18/PL), at a distance of greater than 183m from the crematorium building itself. Documents on Arun District Council's planning portal relating to the proposed crematorium have been reviewed, and no specific discussion or assessment of potential noise emissions have been provided with the planning application submission. For the purposes of this assessment, it has therefore been assumed that noise emissions would therefore be compliant with the requirements of Arun District Council, in line with guidance detailed within the "Planning Noise Advice Document: Sussex", due to the existing residential receptors within the area.

In order to satisfy requirements for sewerage for the proposed development, a pumping station is required to be installed and connected to Southern Water foul drainage. The proposed location for the pumping station is between the development and Grevatt's Lane West (see Figure 3.2). The pumping station will be a minimum distance of 85m from the nearest residential property (located on Grevatt's Lane West).

4 NOISE MEASUREMENTS

4.1 Unattended Noise Survey

Continuous unattended noise measurements were obtained over an approximate 5-day period to obtain data on the variation in noise levels along Bilsham Road.

Continuous monitoring of ambient noise levels was undertaken at approximately 2.5 m above local ground level under 'free-field' conditions. The first monitoring position (MP1) was located along the southern boundary of the development area along Bilsham Road. The approximate monitoring position is indicated on Figure A1 of Appendix A.

This position captured the most significant consistent noise sources at the development.

Ambient sound levels at MP1 were measured using a Rion NL-52 1/3 octave precision integrating sound level meter. The microphone was fitted with a weatherproof windshield.

Measurements were obtained using the 'F' time weighting and A-weighting frequency network. Five-minute consecutive measurements of $L_{Amax,F}$, $L_{Aeq,T}$, $L_{A10,T}$, and $L_{A90,T}$ noise levels were obtained between approximately 14:00 hrs on Monday 30th November and Saturday 5th December 2020.

The equipment was calibrated before and after the survey using a Rion NC-74 sound calibrator to generate a calibration level of 94.0 dB at 1 kHz. No significant calibration drifts were observed.

4.2 Weather Conditions

Weather conditions during the unattended noise survey period have been obtained from internet sources www.wunderground.com (Weather station at Gatwick Airport), which indicates 2 days of light rain and the remainder having dry conditions with light to moderate wind speeds. At the time of set-up and collection of the noise monitor, the weather conditions were cool and dry, with negligible wind.

It is considered that the weather conditions did not significantly affect the noise measurements.

4.3 Attended Noise Measurements

To supplement the unattended monitoring survey, an additional short-term attended survey was undertaken at monitoring position MP2 to capture the contribution of noise arising from the A259. This was undertaken on Wednesday 9th December 2020.

Additionally, attended measurements were also undertaken to provide understanding of the activities and noise emissions from the commercial estate using a Rion NL-52 precision 1/3 octave sound level meter. The locations of the measurement positions are shown on Figure A1 in Appendix A.

Measurements were obtained using the 'F' time weighting and A-weighting frequency network. The equipment was calibrated before and after the survey using a Rion NC-74 sound calibrator to generate a calibration level of 94.0 dB at 1 kHz. No significant calibration drifts were observed.

4.4 Noise Survey Results

Unattended Survey

The results of the continuous noise monitoring survey are presented in graphical form in Figure 4 of Appendix A. A summary of the daytime ambient $L_{Aeq,16hr}$ and night-time ambient $L_{Aeq,8hr}$ sound levels is presented below in Table 4.1, along with the typical highest $L_{Amax,F}$ level that was not exceeded more than 10 times during the night. Modal background noise levels are also presented within the table. Measured noise levels were dominated by road traffic on Bilsham Road.

Table 4.1: Unattended Monitoring Summary Data – MP1

Monitoring Period	Daytime		Night-time		
	$L_{Aeq,16hr}$	Modal $L_{A90,1hr}$	$L_{Aeq,8hr}$	Modal $L_{A90,15mins}$	Typical $L_{Amax,5min}^2$
Mon 30/11/2020 ¹	61 ¹	48	52	28	74
Tue 01/12/2020	61	44	54	28	74
Wed 02/12/2020	61	46	55	27	74
Thu 03/12/2020	64	55	54	40	76
Fri 04/12/2020	63	48	53	39	75
Sat 05/12/2020 ¹	64	57	-	-	-
Typical free-field level	62	48 ³	54	28 ³	75

Notes:

1. Data obtained during the daytime was not full a 16 hour measurement period.
2. Tenth highest 5 minute night-time L_{Amax} value for a night period of 8 hours.
3. Most frequently occurring modal background noise level.

The unattended noise survey results indicate that the site is exposed to average free-field daytime and night-time ambient noise levels of 62 dB $L_{Aeq,16hr}$ and 54 dB $L_{Aeq,8hr}$, respectively; with a typical L_{Amax} level of 75 dB not being exceeded more than 10 times per night.

Attended survey results

Table 4.2 shows the results of the measurements carried out at the attended position MP2, shown in Figure A1 in Appendix A. For each measurement position, the $L_{Aeq,5min}$ noise levels have been obtained. Measured noise levels were dominated by road traffic on the A259, with a minor contribution from Bilsham Road.

Table 4.2: Daytime Attended Survey Results

Measurement start date & time	$L_{Aeq,5mins}$ dB	$L_{Amax,5mins}$ dB	$L_{A90,5mins}$ dB	Dominant Source
09/12/2020 10:53	47	58	46	Road noise A259
09/12/2020 10:58	49	57	46	Road noise A259
09/12/2020 11:03	49	55	47	Road noise A259
09/12/2020 11:08	50	59	47	Road noise A259
09/12/2020 11:13	49	54	47	Road noise A259
09/12/2020 11:18	49	56	47	Road noise A259
09/12/2020 11:23	49	57	47	Road noise A259
09/12/2020 11:28	49	54	47	Road noise A259

Measurement start date & time	L _{Aeq} , 5 mins dB	L _{Amax} , 5 mins dB	L _{A90} , 5 mins dB	Dominant Source
09/12/2020 11:33	48	53	47	Road noise A259
09/12/2020 11:38	48	70	46	Road noise A259
09/12/2020 11:43	48	55	46	Road noise A259
09/12/2020 11:48	47	52	46	Road noise A259
09/12/2020 11:53	48	55	47	Road noise A259
09/12/2020 11:58	48	56	47	Road noise A259
09/12/2020 12:03	49	55	47	Road noise A259
09/12/2020 12:08	49	57	47	Road noise A259
09/12/2020 12:13	49	68	47	Road noise A259
09/12/2020 12:18	49	53	47	Road noise A259
09/12/2020 12:23	50	55	48	Road noise A259
09/12/2020 12:28	49	55	47	Road noise A259
09/12/2020 12:33	49	58	45	Road noise A259
09/12/2020 12:38	48	52	47	Road noise A259
09/12/2020 12:43	48	52	46	Road noise A259
09/12/2020 12:48	48	51	46	Road noise A259
09/12/2020 12:53	48	52	46	Road noise A259
Summary levels, dB(A)	49¹	55²	47³	Road noise A259

¹ L_{Aeq}(2 hours)

² Typical L_{Amax}, 5 mins.

³ Modal average, L_{A90}, 5 mins

4.5 Commercial estate attended source measurements

Source measurements of activities on the Little Meadows commercial site were undertaken to establish the contribution of noise emissions from the existing estate. The existing commercial estate is mainly used for business storage/distribution or container storage, with the exception of Hyams Autolift which runs small workshop on the estate, undertaking minor repairs and re-painting. Source measurements have been undertaken of typical plant which may be used within the workshop. These are presented in Table 4.3 below. It is understood that a tenant on the commercial estate undertakes vintage vehicle repairs, mostly using hand tools. The area in which this tenant works is a temporary structure formed from scaffolding and wrapped with tarpaulins without access to mains power. For this reason, it has not been possible to quantify potential noise arising from these commercial activities. Based upon the information available, it is considered there is a low probability of noise impact associated with the works the tenant undertakes on the proposed development, and unlikely to have a greater influence on the proposed development considered in the context of the rest of the commercial estate.

Table 4.3: Attended Source Noise Measurement Data

Source	Measurement distance (m)	Measurement Time (s)	Measured level $L_{Aeq,T}$ (dB)	Notes
Powered sander	2	50	75	Could be used within or outside workshop
Pneumatic compressor	2	10	86	Internal reverberant level (operational only within workshop)
Small electric Grinder	2	15	85	Could be used within or outside workshop
Start-up and testing fork lift engine	2	2	61	Tests always undertaken outside of workshop

5 ACOUSTIC MODELLING

5.1 Assessment of Road Traffic

In order to assess the impact of ambient noise sources in the vicinity of the site, an acoustic 3D model has been produced using proprietary acoustic modelling software CadnaA. Inputs to the model include proposed outline site plan as well as aerial imagery of the surrounding area. Measured noise levels have been used to calibrate the model and provide noise contours across the site.

The model has been developed to guide the layout design of the proposed development, and identify potential needs for specific acoustic design requirements (site layout, glazing, ventilation or acoustic fencing) to comply with local and national acoustic criteria.

Predicted noise contours for the proposed site are presented at two heights, firstly at ground level i.e. generally where living rooms are located (1.5m), and secondly at first floor level (4.5m) to represent impact on bedrooms. Contours are presented for daytime at 1.5m, and 4.5m within Figure 5.1 and Figure 5.2 respectively, and contours at night at 1.5m and 4.5m within Figure 5.3 and Figure 5.4 respectively. These contours predict the likely propagation of noise from the local roads (Bilsham Road and A259).

From the noise contours, it can be seen that the proposed site layout show, the proposed residential properties are within or below the threshold of "Low Risk" in accordance with ProPG Stage 1 assessment.

Figure 5.1 – Acoustic model ground level - Daytime (1.5m above local height)



Figure 5.2 – Acoustic model ground level – Daytime (4.5m above local height)



Figure 5.3 - Acoustic model ground level - Night-time (1.5m above local height)



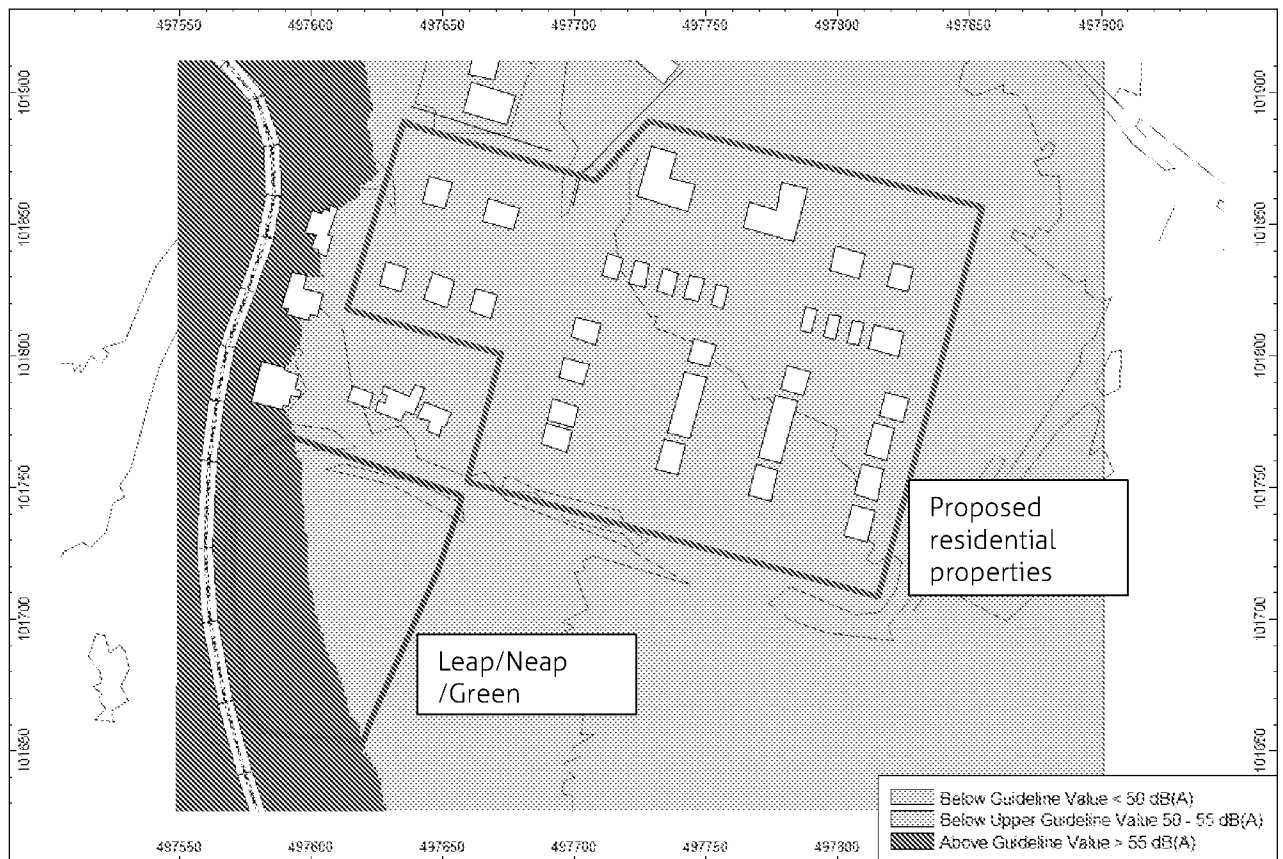
Figure 5.4 - Acoustic model ground level - Night-time (4.5m above local height)



5.2 Noise levels in external amenity areas

The WHO guidelines state that the noise level at which moderate annoyance is caused in any outdoor living areas between 07:00 - 23:00 hrs should not exceed 50 dB $L_{Aeq,T}$ free field. Figure 5.5 below presents a noise contour calculated at 1.5m above ground to show external noise levels in amenity areas of the scheme. Noise contours indicate generally that external amenity areas in private spaces are below the guideline value of 50dB A $L_{Aeq,16\text{ hours}}$.

Figure 5.5 WHO guidance contour for external amenity areas



Predicted noise contour (Figure 5.5) also identifies that the public amenity space named Leap Neap Green will be moderately adversely impacted due to road traffic on Bilsham Road. This area will experience noise levels between 50 and 60dB $L_{Aeq,16\text{hrs}}$ during the daytime.

5.3 Sources from commercial activities

From site visits, the activities on the commercial estate are generally quiet, with only Hyams Autolifts being noticeable. The frequency of vehicle arrivals and departures was also observed to be very low, no more than 4 lorry movements per hour (two arrivals and two departures). A similar number of small sized vehicles (cars or light vehicles) were also observed. Considering the size of the estate, this is likely to be the maximum number of vehicle movements in a single hour (4 large vehicle movements and 4 light-vehicles). The opening hours of Hyams Autolifts are 07:00 to 19:00. An assessment of works has therefore been undertaken between these hours.

Operational noise levels of the commercial estate activity have been predicted at the proposed development receptors, based upon measured source noise levels and reasonable assumptions on the duration these works were undertaken over. During our site visit, maintenance (sanding and

grinding works) were observed to be undertaken in an area outside the front door of the workshop building, which have been modelled accordingly. Calculations have been undertaken to estimate operational noise levels of these commercial works at a distance of 2 metres outside the front of the building, which have later been used to predict levels at the nearest residential receptors. The assumptions of the activities present on site are as described within Table 5.1 below.

Table 5.1: Hyams Autolifts activity assumptions

Activity	Plant	Typical operational time (mins)	Source level (dB), at 2m	Equivalent noise level over 1 hour (dB LAeq,1 hour)	Total activity noise level over 1 hour, at 2m (dB LAeq,1 hour)
Sanding down metal	Power sander	45	75	73	73
Grinding metal	Electric grinder	10	85	77	77
Vehicle repairs and engine testing	Vehicle engine	5	61	50	55
	Impact driver and hand tools (typical manufacturers source data, undertaken within shed)	15	79 (-20) ¹	53	
	Electric compressor (within shed, reverberant level)	2	86 (-20) ¹	44	

Note 1 20dB sound reduction performance of the building façade.

The noisiest predicted activity has been found to be grinding. This activity (77 dB LAeq,1h) has been used to assess the impact at the newly proposed residential properties.

Table 5.2: Hyams Autolift commercial noise assessment

Activity	Level (dB)
[1] Worst case noisy activity, source noise level at 2m, dB(A)	77
[2] Distance attenuation (dB), $20 \cdot \log(2/r)^1$	-24
[3] Façade correction	+3
[4] Correction for barrier attenuation (2.4m height)	-10
[4] Resulting calculated rating level at receptor, sum of [1] to [4]	45
[5] Background noise level when plant could be operating (day), dB(A) (taken from attended monitoring location, see Table 4.2)	47
[6] Rating level – Background level [4] – [5]	-2

¹ Minimum distance to receptor (r), 30 m

The predicted rating level at the closest residential property of the proposed development does not exceed the background noise level. In the context of the noise source being present during the daytime, when it is considered most people would not be sleeping, and assuming a typical window partially open for ventilation provides 15 dB of attenuation, anticipated internal noise levels would be at most 32dB(A) LAeq,1 hour. Assuming a window of a habitable room exists on the façade facing the

commercial estate, predicted internal noise levels during the daytime would be anticipated to be below the maximum internal guideline noise levels within BS8233, as reproduced within Table 2.1.

5.4 Proposed Sewerage pumping station

A sewerage pumping station has been proposed for the site in order to assist flow of foul water into Southern Water infrastructure. This will require the installation of a pumping station with electrically powered pumps and associated plant. Southern Water has requirements for the maximum noise levels of pumping equipment which the plant will be designed to. It is understood the plant location will be a minimum of approximately 85m from the nearest proposed residential property on Grevatt's Lane West. The following assessment is based upon the assumption that the pumping equipment achieves the maximum noise level as stipulated under Southern Water requirement (maximum noise level of 80 dBA at 1m). In order to comply with Planning Noise Advice Document: Sussex 2015, noise levels from fixed plant should not be above typical background noise levels at residential receptors.

Table 5.3: Sewerage pumping station assessment

Activity	Level
[1] Sound pressure level at 1m from pumping equipment, dB(A)	80
[2] Distance attenuation (dB), $20 \cdot \log(1/r)^{*1}$	-39
[3] Façade correction	+3
[4] Resultant sound pressure level at receptor, sum of [1] to [3]	44
[5] Background noise level when plant could be operating (night), dB(A)	28
[6] Rating level – Background level (dB), [4] – [5]	+16
*1 Minimum distance to receptor (r), 85 m	

Table 5.3 identifies that the rating noise level is predicted to exceed the background level by approximately 16dB at the closest residential receptor at night. Based upon the information available for this assessment, an acoustic enclosure providing a minimum insertion loss of 16dB will be required in order to mitigate the noise from the proposed foul water pump plant on local residential properties equal with the background.

It is recommended that following the finalisation of the plant design, an assessment to guide mitigation measures is undertaken based upon the actual plant proposed noise emission levels.

5.5 Results Summary & Discussion

The noise contours shown within Figure 5.1 to Figure 5.4 indicate that typical façade levels at receptors from transport noise sources, principally from road traffic on Bilsham Road and the A259; are no greater than 51 dB $L_{Aeq,16h}$ for the day and 43 dB $L_{Aeq,8}$ at night. Typical predicted L_{Amax} at night are based upon difference between the predicted night-time noise level (43 dB $L_{Aeq,8h}$) at the most exposed receptor, and the typical night-time measured noise level noise adjacent to Bilsham Road (54 dB L_{Amax}). The difference between these noise levels 11dB. The measured night-time L_{Amax} level has been adjusted by subtracting 11dB to represent the likely level at the worst exposed receptor, giving a typical night-time (10th highest) noise level of 64 dB L_{Amax} .

Daytime ambient noise levels within gardens of the proposed development comply with the WHO criterion for external spaces 55 dB $L_{Aeq,16h}$ used for relaxation or recreation (as shown in Figure 5.5). Noise contours show that the recreation area to the south of the development, named Leap Neap Green is adversely affected by noise from Bilsham Road. Installation of a bund, or acoustic fencing alongside Bilsham Road, could potentially would reduce noise levels from road traffic in line with WHO guidance values for outdoor spaces.

Potential noise impact of noisy activities on the commercial estate, namely works from Hyams Autolift, has been assessed. A 2.4m high acoustic fence has been proposed along the southern and eastern boundaries of the commercial estate to protect the amenity of residential receptors. Predicted rating level at the closest residential receptor located approximately 30m to the south of Hyams Autolift building are 0dB below background. We propose that when the commercial estate is extended, the combined rating level of noise sources on the commercial estate does not exceed the background level at residential receptor, 47dB(A).

The assessment of potential noise from foul water pumping plant, assuming worse case noise emissions from pumping plant, indicated that such plant will need to be fitted with an enclosure, which would need to be designed to achieve a minimum insertion loss of 16dB based upon the assumptions within this assessment. Should noise emissions from the plat change it is recommended the requirements of the noise enclosure is based upon the actual noise emissions of the designed plant.

6 PREDICTED INTERNAL NOISE LEVELS

In order to assess the requirements for window and ventilation, it is necessary to estimate internal noise levels with windows closed using standard glazing and ventilation products.

The assessment assumptions are set out below together with the calculated minimum sound insulation requirements. Example glazing specifications are given where relevant to indicate the glazing type that would typically achieve the performance requirements.

The assessed ambient noise levels incident on the site are taken from Section 5 of this report.

Assuming the sound insulation performance of the entire façade, inclusive of ventilation, achieves a minimum of 22 dB, internal ambient noise levels within habitable spaces will comply with guidance detailed within BS8233, and WHO Noise Guidelines for Europe that Planning Noise Advice Document: Sussex references for L_{Amax} noise levels within bedrooms at night.

Using standard double glazing and System 1 as defines within Approved Document F would achieve the minimum 22 dB performance criterion. Internal noise levels may be achieved by opening windows for ventilation in the day-time during the summer assist controlling overheating.

Table 6.1: Assessment of external noise from road traffic on internal noise levels

Predicted	Room type	Predicted internal noise level, dB	Internal criteria, dB	Criteria compliance achieved (Y/N)
Day-time, ($L_{Aeq, 16h}$)	Living rooms / bedrooms	$(51-22) = 31$	35 dB L_{Aeq}	Y
Night-time, ($L_{Aeq, 8h}$)	Living rooms	$(43-22) = 23$	35 dB L_{Aeq}	Y
	Bedrooms	$(43-22) = 23$	30 dB L_{Aeq}	Y
Night-time L_{Amax}	Bedrooms	$(64-22) = 42$	42 dB $L_{Amax,F}$	Y

7 CONCLUSIONS

A noise assessment has been undertaken to assess the impact of noise on the proposed mixed use development at the land at Little Meadows, Yapton, West Sussex. Site observations indicated that the noise climate on site is mainly dominated by road traffic on Bilsham Road, cultivation of the surrounding agricultural land, and commercial activities at the existing adjacent commercial estate.

A long-term unattended survey was undertaken to establish existing ambient noise levels at the proposed development from road traffic on Bilsham Road. Additional attended noise measurements of road traffic on the A259 were also undertaken at the eastern perimeter of the development. Source measurements of works undertaken at Hyams Autolifts were undertaken to estimate the likely impact of noise from their activities on proposed development.

Predicted noise levels across the proposed development site (based upon drawings within this application) show that guideline internal noise levels as described within BS8233, can be achieved with windows partially open for ventilation. Noise levels in external private amenity areas are expected to comfortably comply with the relevant guidance values.

Predicted noise levels have been calculated including the proposed acoustic fence along the southern and eastern boundaries of the commercial estate. Noise levels from existing operations on the commercial estate do not exceed the guidance levels as described within Planning Noise Advice Document: Sussex. For future tenants of the proposed new commercial estate buildings, resulting noise from their operations and existing operations should be limited to a cumulative level of 47 dB $L_{Aeq,1\text{ hour}}$ during the daytime at any of the proposed residential properties. It has been assumed that the opening hours of the commercial estate will not change in the future, which are currently 07:00 – 19:00 hours.

The impact of noise from the proposed foul water pumping station has been assessed. Guidance has been provided to reduce the experienced noise levels from pumping equipment on the nearest residential receptor to the pump, which it is understood could operate at any time, day or night, and ensure compliance with Planning Noise Advice Document: Sussex.

A review of the planning application for the consented planning assessment for a crematorium on land to the south east of the site has been undertaken. No assessment has been made for the potential noise impact from the operation of the crematorium. It has been assumed for the purposes of this assessment that noise levels from the crematorium will therefore be no greater than existing background noise levels at the nearest residential receptors of the proposed residential development.

A summary of the proposed measures to control noise impacts on the proposed development are as follows:

- Installation of acoustic hoarding on the southern and eastern boundaries of the commercial estate to a height of 2.4m
- Enclosure of pumping station equipment to achieve 16dB insertion loss. Based upon maximum noise level emissions for Southern Water plant (80 dB L_{Aeq} at 1m). This may be revised based upon selection of quieter plant.
- Cumulative noise levels from existing any future operation of commercial units at residential properties should not exceed 47 dB $L_{Aeq,1\text{ hour}}$ at nearby properties on the proposed development.

Advice has been given on the design of the building envelope to ensure that internal noise levels inside habitable rooms lie within guideline limits recommended in WHO and BS8233:2014, and guidance for external amenity spaces. With proposed measures in place, BS8233 and Planning Noise Advice Document: Sussex guidance levels should be met.

8 REFERENCES

- 1 British Standards Institution. Sound Insulation and Noise Reduction for Buildings – Code of Practice. BS 8233: 2014.
- 2 World Health Organisation - Guidelines for Community Noise. 2000.
- 3 Planning Noise Advice Document: Sussex. 2015.
- 4 World Health Organization - Night Noise Guidelines for Europe. 2009.
- 5 Institute of Acoustics (IOA), Association of Noise Consultants (ANC) and Chartered Institute of Environmental Health (CIEH). Professional Practice Guidance on Planning & Noise. 2017.

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APPENDIX A

FIGURES

Figure A1: Site Location and Monitoring Positions

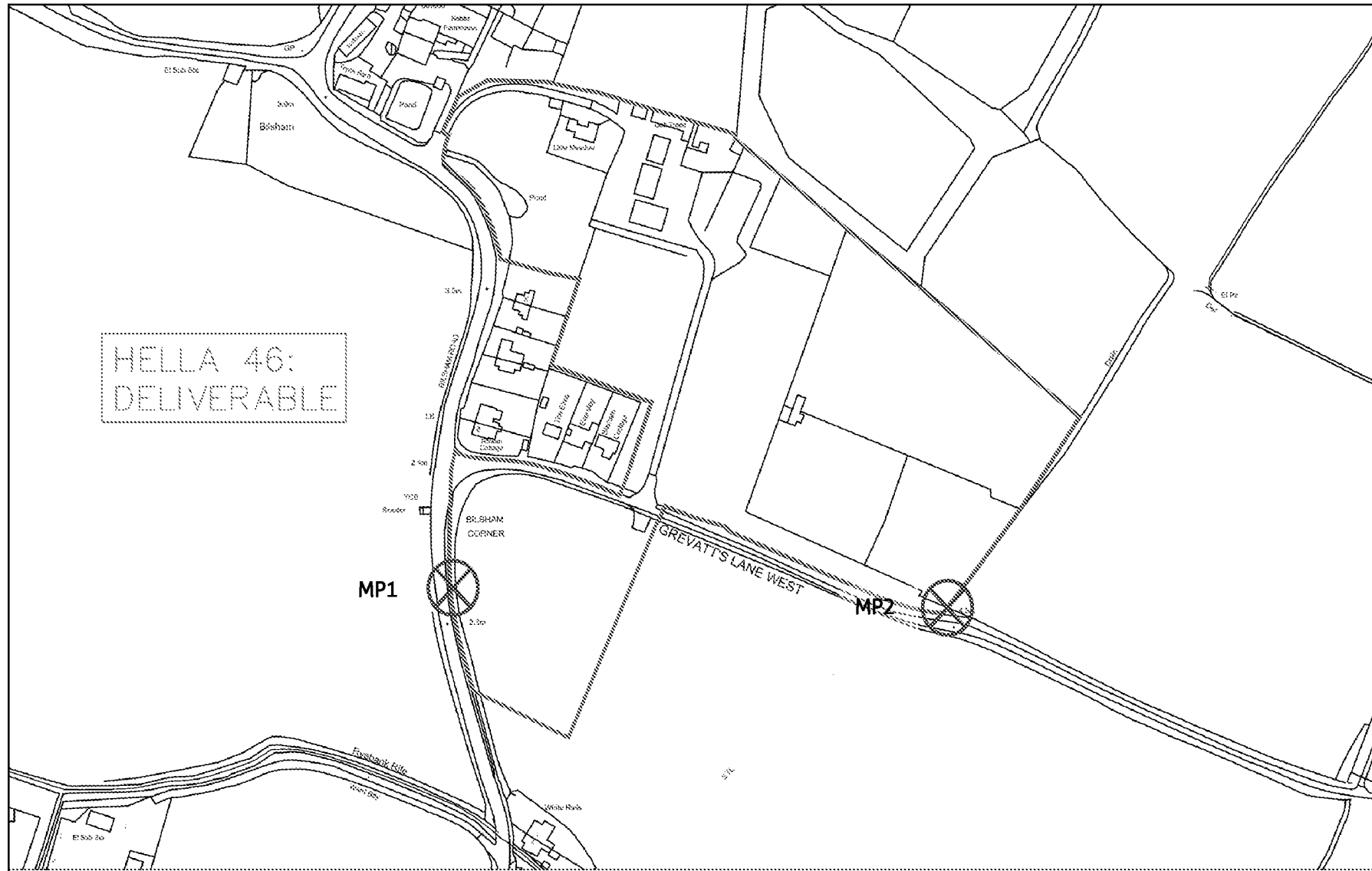


Figure A4: Unattended Survey Results

