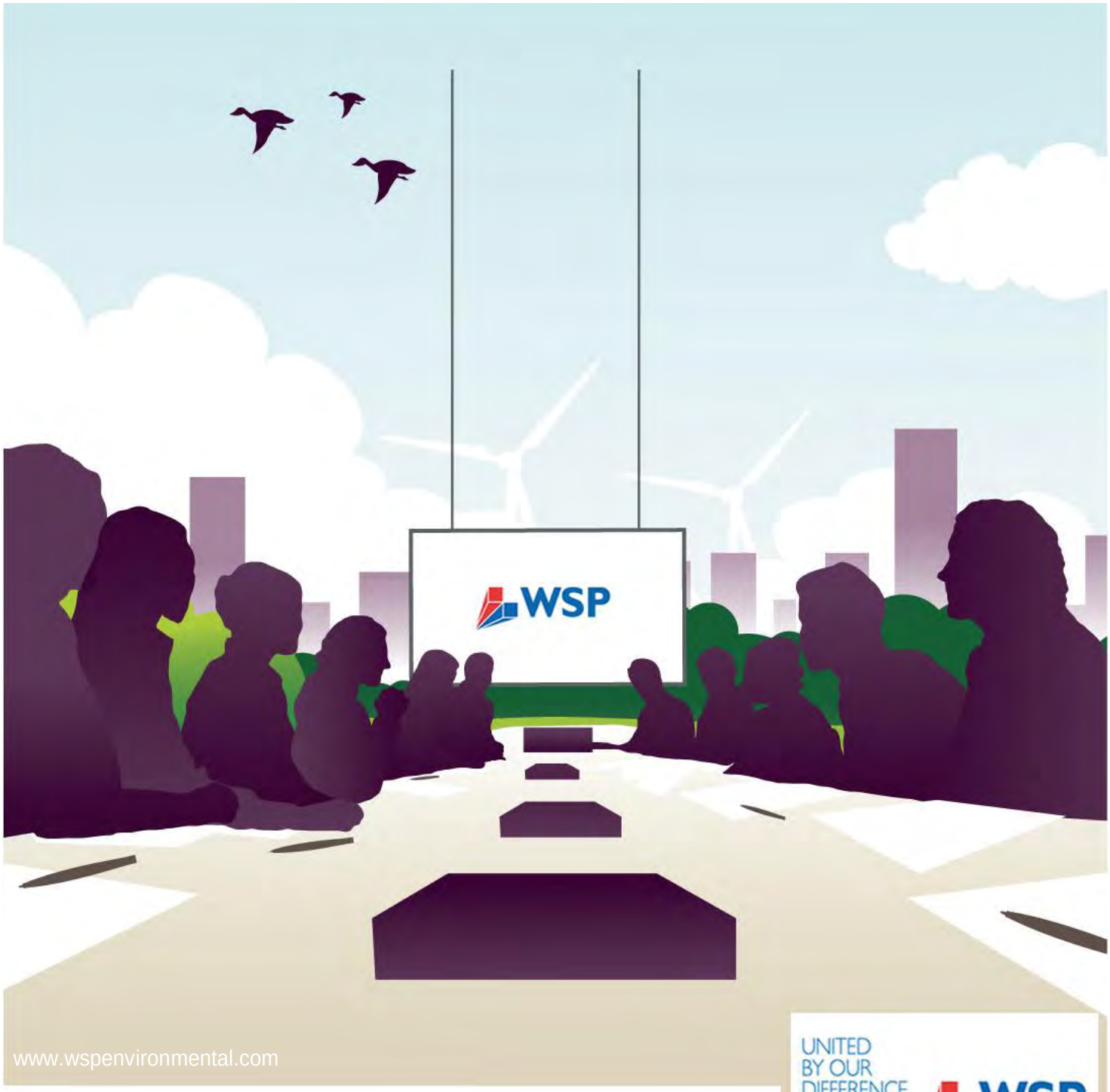

Title: Former Fole Dairy, Fole, Uttoxeter – Environmental Noise Assessment

Client: Co-operative Group

01 February 2013

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CONTENTS

1 Introduction

1.1 FORWORD

1.1.1 This noise assessment has been completed following consultation with the Environmental Health Department of Staffordshire Moorlands District Council (SMDC). Consultation was completed in early 2012. During consultation, it was agreed that the noise assessment should include determination of the on-site Noise Exposure Categories, as defined within Planning Policy Guidance Note (PPG) 24: *Planning and noise*. It was also agreed that any necessary noise mitigation measures should be determined with reference to appropriate noise criteria adopted from BS8233:1999:*Sound insulation and noise reduction for buildings – Code of practice*, as referenced for used in PPG 24.

1.1.2 Since the time of consultation PPG 24 has been superseded by the National Planning Policy Framework (March 2013). However, the new NPPF does not include detailed guidance on noise assessment methodologies, only presenting a number of aims which proposed development should seek to achieve, including aiming to avoid noise giving rise to significant impacts as a result of development. Since the introduction of the NPPF, and in absence this document containing any detailed noise assessment methodologies, it has become common practice continue to apply the former PPG 24 Noise Exposure Categories as a means of quantifying the suitability of on-site road traffic noise levels for residential developments.

1.1.3 Accordingly, this report includes assessment of the on-site road traffic noise levels by determination of the PPG 24 Noise Exposure Categories. Notwithstanding this, it should be noted that the noise mitigation assessment is based upon achieving noise level criteria for residential dwellings adopted from BS8233:1999. This British Standard remains, in date, current and up-to-date. This assessment confirms that a commensurate level of protection against noise can be afforded to future occupants of the proposed development.

1.1.4 Notwithstanding the above, and for further clarity, a summary of the noise related guidance, as detailed within the NPPF is presented in the Legislation and Guidance section of this report.

1.2 SUMMARY

1.2.1 WSP has been appointed by the Co-operative Group, to undertake an environmental noise assessment of a proposed residential led development, at the site of the former Fole Dairy, in Staffordshire. It is proposed to redevelop the site as residential accommodation comprising approximately 60 two, three and four bedroom dwellings, conversion of the existing Mill building into 7 flats and provision of 300m^2 of employment space.

1.2.2 The site is located approximately 1.5km to the east of Checkley, and 5km to the north-west of Uttoxeter. The site is bounded by the A522 Uttoxeter Road and the Fole Reformed Evangelical Chapel to the north, Fole Lane to the east, and open farm land to the west and south. The A50 (a dual carriageway, which links Derby and Stoke-on-Trent) is located approximately 800m beyond the southern site boundary.

1.2.3 This assessment has been undertaken following consultation with the Environmental Health Department of Staffordshire Moorlands District Council (SMDC). This consultation was undertaken to agree the scope of the required noise assessment, the scope and approach to the baseline noise survey, and the assessment methodology to be adopted.

1.2.4 In accordance with the consultation response from SMDC, the noise and vibration assessment has been undertaken in accordance with Planning Policy Guidance (PPG) 24: 1994: *Planning and noise*, and the documents referenced therein, including *BS8233:1999: Sound insulation and noise reduction for buildings – Code of practice.*

1.2.5 This assessment is based on the results of an environmental noise survey carried out by WSP to determine the prevailing noise climate on the site over the course of a 24 hour weekday period. This survey included determination of the noise levels generated by passing road traffic on both the A522 Uttoxeter Road and the A50.

1.2.6 The results of the baseline noise survey have been used to determine the applicable Noise Exposure Categories (NECs), as defined in PPG24, as a result of local road traffic sources. In addition, consideration has been given to the noise mitigation measures that would be required to ensure a commensurate level of protection against noise for future occupants of the proposed development.

1.2.7 It has been identified that with the due consideration to site layout, building fabrication and the use of localised noise barriers, compliance with internal and external noise level criteria adopted from BS8233:1999: *Sound insulation and noise reduction for buildings - Code of practice* can be achieved, thus ensuring a commensurate level of protection against noise for future residents.

1.2.8 In summary, noise need not be considered a determining factor in granting planning approval for the proposed residential led redevelopment of the site.

1.2.9 This report is necessarily technical in nature so to assist the reader, a glossary of terminology relating to noise is contained in Appendix A.

2 Site Description

2.1 LOCATION

2.1.1 The site is located in the village of Fole, approximately 1.5km to the east of Checkley, and 5km to the north-west of Uttoxeter. The site is currently occupied by vacant buildings and open areas of hard standing associated with the previous use of the site as an operational dairy. Dairy operations at the site ceased in 2009.

2.1.2 The site is bounded by the A522 Uttoxeter Road and the Fole Reformed Evangelical Chapel to the north and Fole Lane to the east (which links Fole with isolated dwellings at Dodsleig, Godstone and beyond to the south). To the west and south the site is bounded by open farm land.

2.1.3 The A50 (a dual carriageway, which links Derby and Stoke-on-Trent) is located approximately 800m beyond the southern site boundary.

2.2 DEVELOPMENT PROPOSALS

2.2.1 It is proposed to redevelop the site as a residential led development comprising approximately 60 two, three and four bedroom dwellings, conversion of the existing Mill building into 7 flats and provision of 300m^2 of employment space.

2.3 LOCAL NOISE ENVIRONMENT

2.3.1 During the baseline noise survey (as detailed below), it was identified that the dominant noise source at the site is road traffic noise from the A522 Uttoxeter Road to the north, and distant road traffic noise from the A50 to the south. Road traffic movements on Fole Lane were identified to be occasional.

2.3.2 No significant noise was observed from the site itself, with dairy operations having ceased some time ago. Whilst some isolated on-site plant items are in operation (such as the effluent plant, and an electrical transformer) these sources were not considered to be significant in comparison to the road traffic noise levels measured using the $L_{Aeq,T}$ and L_{ASmax} noise indices (as required for use in determination of the Noise Exposure Categories across the site, defined within PPG24).

3 Legislation, Guidance and Consultation

3.1 NATIONAL PLANNING POLICY FRAMEWORK

3.1.1 The national planning guidance with respect to noise is that contained within the National Planning Policy Framework.

3.1.2 Published in March 2012, that document sets out the Government's planning policies for England and supersedes a number of previous Planning Policy Guidance Notes and Planning Policy Statements (amongst other documents), including Planning Policy Guidance Note 24: Planning and noise. In contrast to PPG 24, reference to noise is scant within the new NPPF. However it does make the following references to noise in the section entitled Conserving and enhancing the natural environment:

> *"The planning system should contribute to and enhance the natural and local environment by:… [a number of points including]…preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability".*
>
> and
> *"Planning policies and decisions should aim to:*
>
> ● *avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
>
> ● *mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
>
> ● *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
>
> ● *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."*

3.1.3 The NPPF also cross references to the Noise Policy Statement for England where reference is made to 'adverse impacts'. However, this report acknowledges that "*further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise*".

3.2 PLANNING POLICY GUDIANCE NOTE 24: PLANNING AND NOISE

3.2.1 Planning Policy Guidance Note (PPG) 24 *Planning and noise*, published in September 1994, set out the Government's policies on noise related planning issues. It gave guidance to local authorities in England on the use of their planning powers to minimise the adverse impact of noise. Specifically, it:

- outlined the considerations to be taken into account when determining planning applications for both noise-sensitive developments and for those activities which will generate noise;
- set out Noise Exposure Categories for residential development, encourages their use and recommended appropriate levels for exposure to different sources of noise; and
- advised on the use of planning conditions to minimise the impact of noise.

3.2.2 The four Noise Exposure Category (NEC) bands set out in PPG 24 were designed to assist local planning authorities in evaluating applications for residential development in noisy areas. Table 1 summarises the planning guidance for each NEC band. Table 2 sets out the 'open site' noise levels relating to each NEC band for road traffic noise as present in the case of this site.

TABLE 1 PLANNING ADVICE FOR EACH NOISE EXPOSURE CATEGORY

NEC	Planning Advice
A	Noise need not be considered as a determining factor in granting planning permission, although noise

	at the high end of the category should not be regarded as a desirable level.
B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise.
C	Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
D	Planning permission should normally be refused.

TABLE 2 NOISE LEVELS CORRESPONDING TO THE NECS FOR NEW DWELLINGS $L_{AEQ,\,T}$ dB

NEC	Road Traffic Noise Sources NECs	
	Day 07:00-23:00	**Night 23:00-07:00**
A	<55	<45
B	55-63	45-57
C	63-72	57-66
D	>72	>66

3.2.3 In addition to the above, PPG 24 also stated that during the night, (2300-0700 hours):

"*Sites where individual noise events regularly exceed 82 dB L_{Amax} (slow) several times in any hour should be treated as being in NEC C, regardless of the L_{Aeq} (8 hour) (except where the L_{Aeq} (8 hour) already puts the site into NEC D).*"

3.2.4 Where the advice within PPG 24 was that conditions should be imposed to ensure a commensurate level of protection against noise, reference was made to other standards that establish suitable internal and external noise levels, such as BS8233:1999: *Sound insulation and noise reduction for buildings – Code of practice.* A summary of BS8233 is presented below. This standard remains current and up-to-date.

3.3 BS8233: SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS – CODE OF PRACTICE

3.3.1 The scope of this Standard 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 buildings or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise climate.

3.3.2 The standard suggests suitable internal noise levels within different types of buildings, including 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. BS8233 also states that individual noise events should not normally exceed 45 dB L_{AFmax} in bedrooms at night.

3.3.3 With regards to external amenity areas, BS8233 states that:

"*In gardens and balconies etc, it is desirable that the steady state noise levels does not exceed 50 dB $L_{Aeq,T}$ and 55 dB $L_{Aeq,T}$ should be regarded as the upper limit*".

3.4 WORLD HEALTH ORGANISATION (WHO) 1999: GUIDELINES FOR COMMUNITY NOISE

3.4.1 As with the 'good' and 'reasonable' criteria in BS8233, the L_{AFmax} criterion in BS8233 is largely concordant with the World Health Organisation (WHO) guidance: 1999: *Guidelines for Community Noise*. This document draws upon guidance from Vallet and Vernay, which states:

"For good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10-15 times per night"

3.5 CALCULATION OF ROAD TRAFFIC NOISE MEMORANDUM (CRTN)

3.5.1 The CRTN document, published in 1988 by the then Department of Transport and The Welsh Office, sets out standard procedures for calculation and measurement of noise levels from road traffic.

3.5.2 CRTN permits a shortened measurement procedure to be utilised to determine road traffic noise levels, subject to certain limits. The shortened measurement procedure is for determination of the $L_{A10,3hour}$ noise level, which is defined as the arithmetic average of three consecutive $L_{A10,1hour}$ noise levels determined between 10:00 and 17:00 hours. It is stated that the derived $L_{A10,3hour}$ noise minus 1 dB is approximately equal to the $L_{A10,18hour}$ noise level.

3.5.3 The $L_{A10,18hour}$ noise level determined following the shortened measurement procedure needs to be corrected to provide the daytime $L_{Aeq,16hour}$ for comparison with the NECs defined in PPG 24. PPG 24 states that for road traffic noise in NECs C and D, the $L_{Aeq,16hour}$ noise level is approximately equal to the $L_{A10,18hour}$ noise level minus 2 dB.

3.5.4 This shortened measurement procedure has been used in conjunction with the -1dB correction (to the $L_{A10,18hour}$ noise index), and -2dB correction (to the $L_{Aeq,16houir}$ noise level), to establish the noise levels used in the determination of the daytime NEC.

3.6 CONSULTATION

3.6.1 At the outset of the project, consultation was undertaken with the Environmental Health Department of Staffordshire Moorlands District Council (SMDC) to establish their requirements for the noise assessment., This consultation was undertaken to agree the approach to the baseline noise survey, and the assessment methodology to be applied.

3.6.2 It was agreed during consultation that a 24 hour weekday noise survey would be appropriate, including a full night-time 8-hour noise measurement undertaken adjacent to the A522, and a 3 hour daytime road traffic noise measurement also undertaken adjacent to this route (with the results corrected to the $L_{Aeq,16hour}$ noise index as described above).

3.6.3 It was agreed that road traffic movements on Fole Lane were likely to be sufficiently low to not require consideration. It was also agreed that the A50 was sufficiently well removed from the site such that detailed consideration to noise from this route would also not be required. Notwithstanding this the completed noise measurements included 8 hour night-time road traffic noise measurements close to both the northern site boundary (adjacent to the A522 Uttoxeter Road), and the southern boundary (that closest to the A50). Three hour road traffic noise measurements were also undertaken at both locations during the daytime.

3.6.4 It was also agreed, that where consideration to noise mitigation measures is warranted, the attenuation measures required to ensure compliance with the internal and external noise level criteria specified with BS8233 for residential development (as summarised above), should be determined.

4 Baseline Noise Survey.

4.1 SUMMARY

4.1.1 To inform the assessment, a detailed baseline noise survey has been undertaken on the site. This survey was undertaken to determine the current prevailing noise climate at the site as a result of passing road traffic on both the A522 Uttoxeter Road (immediately beyond the northern site boundary), and the A50 (800m beyond the southern site boundary).

4.1.2 The noise survey included continuous noise measurements over the course of a weekday 8 hour night-time period, as well as 3 hour daytime noise measurements. The baseline noise survey included the following periods of continuous monitoring:

- 23:00 hours on Wednesday the 8th June, until 07:00 hours on Thursday the 9th of June; and
- 10:00 hours on Thursday the 9th June, until 13:00 hours the same day.

4.1.3 The daytime measurement period was selected for compliance with the periods stated in CRTN for the shortened measurement procedure for road traffic noise.

4.2 MEASUREMENT LOCATIONS

4.2.1 The following measurement locations were adopted during both the daytime and night-time measurement periods:

- Measurement Location 1: On the site, adjacent to the northern site boundary, at a distance of 6.5m from the nearside kerb edge of the A522 Uttoxeter Road. The microphone was mounted approximately 1.5m above local ground and was subject to free-field conditions; and
- Measurement Location 2: On the site, adjacent to the southern site boundary, at a distance of 825m from the nearside carriageway of the A50. The microphone was mounted approximately 1.5m above local ground and was subject to free-field conditions.

4.2.2 The noise environment at Measurement Location 1 was subjectively dominated by road traffic noise from the A522 Uttoxeter Road, with distant road traffic noise from the A50 being present between local pass-bys. The noise environment at Measurement Location 2 was subjectively dominated by distant road traffic from the A50, with some contribution also present from the A522 Uttoxeter Road. There is an underground pumping station in the south-western corner of the site, but the contribution of noise from this facility was minimal at the adopted measurement location over the course of the noise survey.

4.2.3 The adopted measurement locations are depicted in Figure B1 of Appendix B.

4.3 METEOROLOGICAL CONDITIONS

4.3.1 For the majority of the noise survey, weather conditions remain conducive to environmental noise measurements, being dry with measured wind speeds ranging from still conditions to 3m/s from the south-west at worst. A heavy rain shower was noted in the middle of the night-time, but this period of rain would only have served to increase measured noise levels above that which would otherwise have been the case, thus leading to a worst case assessment.

4.4 MEASUREMENT EQUIPMENT

4.4.1 The noise survey was carried out using the following type 1 specification noise measurement equipment;

TABLE 3 NOISE MEASUREMENT EQUIPMENT

Equipment	Make and Model	Serial Number
Sound Level Meter	01dB-Stell Solo Master	10712
Pre-amplifier	01dB-Stell PRE 21 S	11447
Microphone	Microtech Gefell GmbH MK250	51863

Sound Level Meter	01dB-Stell Solo Master	10706
Pre-amplifier	01dB-Stell PRE 21 S	11662
Microphone	Microtech Gefell GmbH MCE212	57606
Acoustic Calibrator	01dB Cal 21 Sound Calibrator	35293350
Acoustic Calibrator	01dB Cal 21 Sound Calibrator	51031263

4.4.2 The noise meters had been calibrated to traceable standards within the preceding two years and the portable calibrators within the preceding 12 months. The noise meters were calibrated both prior to and upon completion of both the night-time and daytime survey periods and no significant drifts were noted.

4.5 MEASUREMENT RESULTS

4.5.1 A summary of the measurement results can be seen in Table 4 below

TABLE 4 SUMMARY OF MEASURED ROAD TRAFFIC NOISE LEVELS AT MEASUREMENT LOCATIONS 1 AND 2, FREE-FIELD (DBA)

Meas. Location	Period	Meas. Time Period	$L_{A10,3hour}$	$L_{Aeq,16hour}$	$L_{Aeq,8hour}$	Typical L_{ASmax} [1]	Typical L_{AFmax} [2]
1	Daytime	See noise index	68.2[3]	65.2[4]	-	-	-
	Night-time	8 hours	-	-	60.9	81.4	82.5
2	Daytime	3 hour	-	50.8[5]	-	-	-
	Night-time	8 hours	-	-	49.0	58.6	59.7

[1] Typical L_{ASmax} taken as 3rd highest L_{ASmax} in any hour between 23:00 and 07:00, in accordance with PPG 24.

[2] Typical L_{AFmax} noise level taken as the 10th highest L_{AFmax} during the night-time in accordance with guidance referenced by the WHO

[3] Road traffic noise measurements undertaken in accordance with the shortened measurement procedure defined in CRTN.

[4] Calculated by application of the -1dB and -2dB corrections to the $L_{A10,3hour,}$ noise level to derived the $L_{Aeq,16hour}$ noise level (stipulated in CRTN and PPG24).

[5] Measured $L_{Aeq,3hour}$ noise levels considered indicative of the $L_{Aeq,16hour}$ noise level.

5 Assessment

5.1 PPG24 NOISE EXPOSURE CATEGORISATION

5.1.1 Comparing the measured noise levels as presented in Table 4, with the PPG24 Noise Exposure Categories (NECs) as detailed within Table 1, the applicable NECs at Measurement Locations 1 and 2 can be determined. It should be noted that the daytime classification at Location 2 is only indicative. Whilst it was agreed with SMDC that the noise levels in the vicinity of Measurement Location 2 did not require detailed consideration, a short-term daytime measurement was undertaken and has been included for indicative purposes.

TABLE 5 APPLICABLE NOISE EXPOSURE CATEGORY AT MEASUREMENT LOCATIONS 1 AND 2, FREE-FIELD (dBA)

Location	Period	Noise Index	Noise Level dB(A)	Applicable NEC	Overall NEC
Measurement Location 1	Daytime	$L_{Aeq,16hour}$	65.2	C	C
	Night-time	$L_{Aeq,8hour}$	60.9	C	
	Night-time	L_{ASmax}	81.4	Does not exceed 82dB	
Measurement Location 2	Daytime	$L_{Aeq,16hour}$	50.8[1]	A	B
	Night-time	$L_{Aeq,8hour}$	49.0	B	
	Night-time	L_{ASmax}	58.6	Does not exceed 82dB	

[1] Indicative 16 hour noise level

5.1.2 It can be seen from Table 5 above that at Measurement Location 1, which was close to the northern site boundary (6.5m from the nearside kerb edge of Uttoxeter Road), NEC C applies as a result of both the daytime and night-time $L_{Aeq,T}$ noise levels. At measurement Location 2, NEC B applies during the night-time and the measured daytime 3 hour noise level suggests that NEC A would apply during the daytime. The L_{ASmax} noise levels at both locations did not regularly exceed the 82dB threshold specified in PPG24 and therefore do not affect the NEC categories across the site.

5.1.3 Given that NEC C has been identified at Measurement Location 1, consideration has been given to the distances into the site at which NEC B would apply. These distances have been calculated by application of the standard acoustic distance correction of a 3dB loss per doubling of distance from a line source. The source location has been taken as 3.5m into Uttoxeter Road from the nearside kerb edge, in accordance with CRTN. It has been calculated that NEC B applies at approximately 13m from the kerb edge during the daytime, and approximately 21m from the kerb edge during the night-time.

5.1.4 The guidance contained in PPG 24 to the local planning authority for areas of the site identified as falling within NEC C is:

> *"Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.".*

5.1.5 The guidance contained in PPG 24 to the local planning authority for areas of the site identified as falling within NEC B is:

> *"Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise.".*

5.1.6 The guidance contained in PPG 24 to the local planning authority for areas of the site identified as falling within NEC A is:

> *"Noise need not be considered as a determining factor in granting planning permission, although noise at the high end of the category should not be regarded as a desirable level."*

5.1.7 Given that areas of the site have been identified as falling within Noise Exposure Categories B and C, consideration has been given to noise mitigation measures in Section 6 below, to demonstrate how a commensurate level of protection could be afforded to future residents against the prevailing noise environment.

6 Mitigation

6.1.1 The site has been assessed in accordance with PPG24 and it has been identified that the site is categorised as NEC C adjacent to Uttoxeter Road, up to distances of approximately 13m from the nearside kerb edge during the daytime and 21m from the nearside kerb edge during the night-time.

6.1.2 Given that parts of the site have been identified as falling within NECs B and C, consideration has been given to appropriate acoustic attenuation measures to provide a commensurate level of protection against noise for future occupants.

6.1.3 In its explanation of the noise limits that define the boundary between NEC B and NEC C, PPG 24 states that:

> "*Because noise should be taken into account when determining planning applications in NEC B, it has been assumed that the minimum amelioration measure available to an occupant at night will be to close bedroom windows*".

6.1.4 Therefore, in order to assess the noise mitigation measures required to ensure an adequate level of protection against noise, it is appropriate to explore in the first instance the protection that could be afforded by the sound insulation performance of the external building fabric, and in particular the glazing elements.

6.1.5 In order to determine the noise mitigation requirements, it is first necessary to determine the noise levels that would be generated at the closest proposed residential development to Uttoxeter Road and the A50. A proposed development layout can be seen in Figure B2 of Appendix B. By comparing Figures B1 and B2, it can be seen that Measurement Location 1 is located at a similar set back distance from Uttoxeter Road as the closest proposed dwellings (Assessment Location A). Likewise, Measurement Location 2 is located a similar set back distance from the A50 as residential development on the south side of the site (Assessment Location B). Accordingly, it has not been necessary to apply any distance correction to the measured noise levels to establish the levels that would arise at Assessment Locations A and B.

6.1.6 Table 6 below compares the noise levels determined for Assessment Locations A and B with the internal noise level criteria for residential development specified within BS82233. Also presented are the sound insulation performances that will be required for the proposed building fabric to ensure that the adopted criteria will be achieved.

TABLE 6 REQUIRED SOUND INSULATION PERFORMANCE FOR DWELLINGS EXPERIENCING SIMILAR NOISE LEVELS TO THOSE AT ASSESSMENT LOCATIONS A AND B, dB

Assessment Location	Period	Noise Level	Internal Target Noise Levels "*good*" – "*reasonable*" L_{Aeq}	Required Sound Insulation Performance
A	Daytime $L_{Aeq,16hour}$	65	30 – 40	25 - 35
	Night-time $L_{Aeq,8hour}$	61	30 – 35	26 - 31
	Night-time L_{AFmax}	83	45	38
B	Daytime $L_{Aeq,16hour}$	51[1]	30 – 40	11 – 21
	Night-time $L_{Aeq,8hour}$	49	30 – 35	14 - 19
	Night-time L_{AFmax}	60	45	15
[1] $L_{Aeq,3hour}$ noise level considered Indicative of $L_{Aeq,16hour}$ noise level				

6.1.7 It is assumed that the proposed buildings will be of a masonry construction and, as such, the glazing will be the acoustic weak link in the sound reduction performance of the façade. PPG24 sets out generic data relating to the typical noise reduction performance of three glazing types, namely single, thermal double and secondary. The performance values for typical road traffic noise spectra are set out in the Table 7 below.

TABLE 7 SOUND INSULATION PERFORMANCES OF DIFFERENT GLAZING TYPES FOR ROAD TRAFFIC NOISE, AS SET OUT IN PPG24, dB.

Noise Source	Difference between dB(A) levels outside and inside		
	Single Glazing	Thermal Double Glazing	Secondary Glazing
Road Traffic	28	33	34
The thermal insulation requirements of the Building Regulations require that double glazing be installed as a minimum.			

6.1.8 Comparing the required performances for Assessment Location B set out in Table 6, with the typical sound insulation performance values for road traffic from Table 7, it can be seen that the use of glazing units with a similar acoustic performance to the example of well-sealed single glazing given in PPG24 would be sufficient to meet the "*good*" criterion during both daytime and night-time periods. Such glazing units would also be capable of meeting the L_{AFmax} criterion. In practice it is anticipate that thermal double glazing will be required as a minimum to ensure compliance with the thermal insulation requirements of the building regulations, thus affording additional noise mitigation above that necessary for acoustic purposes.

6.1.9 Making the same comparison for Assessment Location A, it can be seen that in order to achieve the night L_{AFmax} criterion, sound insulation performance up to 38 dB, i.e. 5dB better than the example of '*typical thermal double glazing'* presented within PPG24 will be required. However, there are many different enhanced double glazing options which could be employed. It is assumed that a 'typical' thermal double glazing unit (as referenced within PPG24) would comprise a 4/12/4 or 4/16/4 unit (two 4mm glass panes either side of a 12 or 16mm air gap). Published sound reduction data for Pilkingtons 4/12/4 insulight units identifies an R_w performance of 31dB. Therefore, accounting for the additional 5dB performance requirement dictates a glazing configuration with a minimum sound attenuation performance of 36dB R_w. Published performance values suggest that this could be achieved, for example, with the use of 10/12/4, 10/12/6 or 10/12/6.4PVB (Polyvinyalbutyral Laminate) units or similar/better. Complying with the L_{AFmax} criterion would also ensure complying with the daytime and night-time $L_{Aeq,T}$ "*good*" criteria.

6.1.10 The above glazing calculations are intended to be for planning purposes only. More detailed calculations may be required for the procurement of the glazing units, once the site layout and housing floor plans/elevations have been finalized.

6.1.11 Furthermore, the above calculations do not make any allowance for the incorporation of permanent ventilation to the dwellings. On ventilation, BS8233 advises that:

> "*The Building Regulations on ventilation recommend that habitable rooms in dwellings have background ventilation. Trickle ventilators can provide this, and sound attenuating types are available. Where sound insulation requirements preclude opening windows for rapid ventilation and cooling, acoustic ventilation units incorporating fans are available for insertion in external walls; these can provide sound reduction comparable with domestic secondary glazing*."

6.1.12 Where appropriate, the preferred choice of ventilation is through the use of natural ventilation openings such as trickle vents, air-bricks and passive ventilation devices. Such ventilators can be used to meet the requirements of the Building Regulations Approved Document F for background ventilation. The future occupants would then have the option of keeping windows closed for most of the time and opening windows for rapid ventilation and summer cooling.

6.1.13 The Building Research Establishment (BRE) has published an Information Paper on the acoustic performance of such passive ventilation systems. IP4/99: 1999: *Ventilators: Ventilation and Acoustic Effectiveness* details a study into the sound reduction performance of fourteen different window mounted trickle ventilators and seven different through-wall passive ventilators. The measured sound reduction performance, after taking into account flanking sound paths (i.e. sound paths that do not travel directly through the vent) and the effective area of the ventilator were as follows.

TABLE 8 RANGE OF MEASURED SOUND REDUCTION PERFORMANCE OF PASSIVE VENTILATORS, WITH VENTS OPEN, dB(A)

Window Mounted Trickle Vents (open)	Passive Through-Wall Ventilators (open)
From 14 to 40 (depending on model)	From 30 to 46 (depending on model)
Figures corrected for effective area of ventilator	

6.1.14 It can be seen from the above figures that trickle ventilators or passive through wall ventilators are available that meet the requirements of the Building Regulations Approved Document F for background ventilation and also provide a sound reduction performance that meets or exceeds that required from the glazing elements.

6.1.15 Where opening windows would give rise to a significant exceedance of the internal noise criteria, (e.g. within NEC C) an alternative option is the provision of a mechanical/whole house ventilation system. Such a system would allow a means of rapid ventilation without the need for opening. Systems are available that have better acoustic performance than available trickle / passive through wall ventilators.

6.1.16 With regards to external living spaces, it can be seen that the measured daytime noise level of 51 dB(A) for Assessment Location B meets the upper allowable 55dB(A) $L_{Aeq,T}$ criterion specified within BS8233 for external habitable areas. For Assessment Location A, a noise reduction of 10dB will be required to meet the same 55dB(A) criterion. This level of attenuation can be afforded by means of attenuation due distance (locating gardens set back from Uttoxeter Road), the incorporation of acoustic screening, or combination thereof. This has been accounted for in the development of the scheme layout. It can be seen from Figure B2 that no external habitable spaces are proposed adjacent to Uttoxeter Road, with main garden areas being located set back from this route, and screened from this route by the proposed dwellings.

6.1.17 With regards to attenuation over distance, a 3dB loss is afforded by every doubling of distance from a road traffic noise source. With regards to acoustic screening, both the *Calculation of road traffic noise* memorandum and BS5228:2009: *Code of practice for noise and vibration control on construction and open sites Part 1: Noise* present methods for the calculation of noise attenuation that can be afforded by noise barriers. In summary, a noise barrier that just cuts the line of sight between source and receiver point will give rise to a noise attenuation of approximately 5dB. A noise barrier that fully obscures the line of sight between source and receiver will typically give rise to a noise attenuation of between 10dB and 20dB depending upon geometry including barrier height. In order to ensure that the screening effect of the proposed dwellings is not compromised, it will be necessary to ensure that there is no line of sight from standing head height within the proposed garden areas to Uttoxeter Road. This could be achieved with the incorporation of localised acoustic barriers, as shown within Figure B.

6.1.18 With the proposed acoustic barriers in place, it is anticipated that the 55dB(A) criterion specified within BS8233 for residential gardens would be achieved.

6.1.19 Such noise barriers should be of sufficient height to fully obstruct the line of sight from standing head within the proposed garden areas to Uttoxeter Road. To ensure acoustic integrity, acoustic barriers should be imperforate, continuous, sealed at the base, and have a surface/mass density of 12.5kg/m^2.

7 Conclusion

7.1.1 WSP has been appointed by the Co-operative Group, to undertake an environmental noise assessment of a proposed residential led development, at the site of the former Fole Dairy in Staffordshire. It is proposed to redevelop the site as residential accommodation comprising approximately 60 two, three and four bedroom dwellings, conversion of the existing Mill building into 7 flats and provision of 300m^2 of employment space.

7.1.2 The site is located approximately 1.5km to the east of Checkley, and 5km to the north-west of Uttoxeter. The site is bounded by the A522 Uttoxeter Road and the Fole Reformed Evangelical Chapel to the north, Fole Lane to the east, and open farm land to the west and south. The A50 (a dual carriageway, which links Derby and Stoke-on-Trent) is located approximately 800m beyond the southern site boundary.

7.1.3 At the outset of the project, consultation was undertaken with the Environmental Health Department of Staffordshire Moorlands District Council (SMDC). In line with the results of this consultation, the completed noise assessment has considered the potential noise impact on the proposed residential aspects of the development from local road traffic sources including the A522 Uttoxeter Road and the A50 (which is at distance from the site to the south).

7.1.4 To inform the noise assessment, a detailed baseline noise survey has been undertaken. In agreement with SMDC, this baseline noise survey has included measurements adjacent to both the northern and southern site boundaries. The measurements undertaken included 3 hour daytime road traffic noise measurements, and 8 hour night-time road traffic noise measurements. The results of the 3 hour road traffic noise measurement adjacent to the northern site boundary (Uttoxeter Road), have been converted into an $L_{Aeq,16hour}$ noise level (i.e. full daytime period) following guidance contained with the *Calculation of road traffic noise* memorandum, and Planning Policy Guidance Note (PPG) 24:*Planning and noise*.

7.1.5 The results of the baseline noise survey have been assessed in accordance with PPG24, to determine the applicable Noise Exposure Categories (NECs) across the site (as defined within PPG24).

7.1.6 It has been identified that adjacent to Uttoxeter Road, Noise Exposure Category (NEC) C applies at 13m and 21m from the nearside kerb edge of Uttoxeter Road during the daytime and night-time respectively. The remainder of the site is classified as NEC B and A. Given that parts of the site have been identified as falling within NEC B and C, consideration has been given to appropriate noise mitigation measures.

7.1.7 It has been identified that with the due consideration to site layout, building fabrication and the use of localised noise barriers, compliance with internal and external noise level criteria adopted from BS8233:1999: *Sound insulation and noise reduction for buildings - Code of practice* can be achieved, thus ensuring a commensurate level of protection against noise for future residents.

7.1.8 In summary, noise need not be considered a determining factor in granting planning approval for the proposed residential led redevelopment of the site.

Appendix A Glossary Of Acoustic Terminology

NOISE

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) 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, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates 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.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

The most widely used weighting mechanism that best 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) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

An indication of the range of sound levels commonly found in the environment is given in the following table.

TYPICAL SOUND LEVELS FOUND IN THE ENVIRONMENT

Sound Level	Location
0 dB(A)	Threshold of hearing
20 to 30 dB(A)	Quiet bedroom at night
30 to 4 0dB(A)	Living room during the day
40 to 50 dB(A)	Typical office
50 to 60 dB(A)	Inside a car
60 to 70 dB(A)	Typical high street
70 to 90 dB(A)	Inside factory
100 to 110 dB(A)	Burglar alarm at 1m away
110 to 130 dB(A)	Jet aircraft on take off
140 dB(A)	Threshold of pain

ACOUSTIC TERMINOLOGY

dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ($2x10^{-5}$ Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq\ T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L_{Amax}	L_{Amax} is the maximum A - weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L_{10} & L_{90}	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally as measured outside and away from buildings.
Façade Level	A sound field determined at a distance of 1m in front of a large sound reflecting object such as a building façade.
Sound Pressure Level	The sound pressure level at a point is measured in decibels (dB) and is equal to 20 times the logarithm to the base 10 of the ratio of R.M.S. sound pressure to the reference sound pressure. The reference sound pressure in air is taken to be $2x10^{-5}$ Pa.

Appendix B Site Location and Measurement Location Plan

FIGURE B1 SITE LOCATION AND ADOPTED NOISE MEASUREMENT LOCATIONS

Street Green (similar to Millenium Cottages)

Historic hedges replace existing

Mews Parking

Pond

Garage

Folecrest

Hillside

Fole Bank Cottage

Fole Spring Farm

St David's Cottage

Hawthorndene

Milleaigna

112.2m

UTTOXETER ROAD

GP

LB

The Square

Twisted building form (Fole Spring

Terraced row and green space (similar to Millenium Cottages)

Fole

Potential SUDS

Retained pumping station

Courtyard Space and form (similar to Mill Farm)

Total 300sqm employment space

Mill Farm

Play space - secured with fencing

Stream opened up into green space

Mill House

Building converted to residential use

110.0m

Fole Bridge

SCHEDULE

60 houses comprising:
22 - small 2 bed units
33 - 3 bed units
5 - 4 bed units

Existing Mill Building converted residential use (Approx 7 flats)

300sqm Employment

Project: Fole Dairy		Dwg. Title: Masterplan				Planit-ie ltd 2 Back Grafton Street Altrincham Cheshire WA14 1DY Tel: 0161 928 9281 Fax: 0161 928 9284 E-mail: mail@planit-ie.com
		Dwg. No.: PL1119.1M100 REV H		Status:		
		Scale: A1 1:500 / A3 -	Date: 20.01.12	Drawn: AR	Appd.	
	Date / Drawn / Appd / Rev / Description					

Appendix C Limitations

NOTES ON LIMITATIONS

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