

LONDON CONCRETE LIMITED

PROPOSED CONCRETE BATCHING PLANT
AT CRANFORD WAY,
FERME PARK,
HORNSEY

Prepared by:

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1.0 Introduction

- 1.1 The Sharps Redmore Partnership (SRP) was instructed by London Concrete Limited to undertake an assessment of a proposed concrete batching plant at Ferme Park, Hornsey. This assessment, in the form of a report dated 22nd April 2003, accompanied a planning application submitted in January 2004. The application was appealed on the grounds on don-determination in December 2004. At the same time, a duplicate application was submitted which was again accompanied by SRP's report of the 22nd April 2003. This forms the application currently before Haringey Borough Council (ref: HGY/2005/0007).
- 1.2 Amendments have now been made to this current application. These were submitted to the lpa by letter dated the 27th June 2005. These amendments have implications in terms of noise and in relation to SRP's previous findings set out in its report of April 2003. This addendum report considers the impact of the amendments and the revised scheme.
- 1.3 Section 2.0 of this addendum report summarises the findings of our report of the 22nd April 2003 in relation to a previous scheme (this report is reproduced at appendix A).
- 1.4 Section 3.0 of this report contains an analysis of the main revisions to the scheme in relation to noise and contains an assessment of noise emissions levels and consequent impact from the revised scheme.
- 1.5 The assessment conclusions are set out at section 4.0 of this report.
- 1.6 A Glossary of terms is provided at the end of the body of this addendum report.

2.0 Summary of findings in relation to a previous proposal

2.1 SRP's report relating to a previous scheme is reproduced at appendix A of this addendum report.

2.2 The site layout and location plan relating to the previous scheme is shown at appendix B.

2.3 The main findings of the report relating to the previous scheme were as follows:

- i. that the World Health Organisation guideline values of $L_{Aeq16hr} = 50/55$ dB are the most useful assessment criteria in this case (appendix A6);
- ii. that the typical background noise level and ambient noise level of the area for assessment purposes may be taken to be $L_{A90} = 52$ dB and $L_{AeqT} = 57$ dB (appendix A8);
- iii. that the two main noise sources are a) lorry movements and b) lorry fill operation (appendix A11);
- iv. the noise emission level at Chettle Court of lorry movements would be $L_{Aeq12hr} = 37.5$ dB (appendix A11);
- v. the noise emission level at Chettle Court (the most affected property) of lorry fill operations would be $L_{Aeq12hr} = 52.1$ dB (appendix A11);
- vi. the noise emission level at Chettle Court of combined lorry movements and fill operations would be $L_{Aeq12hr} = 52.1$ dB rounded to 52 dB (dominated by lorry fill operations) (appendix A11);
- vii. that this noise emission level is accurate to ± 3 dB (appendix A11);
- viii. that this noise level (of 52 dB ± 3 dB) is within the WHO guideline values of 50 to 55 dB where annoyance effects can be assumed to be negligible (appendix A12); and
- ix. thus, noise from operation of the (previously) proposed batching plant would not harm the amenities of residents of Chettle Court - the most affected property (appendix A12).

3.0 Changes in the scheme in relation to the previous proposal and an assessment of the revised scheme

3.1 The principal revisions to the scheme are as follows:

- i. a reorientation of the batching plant so that it faces away from Chettle Court and Uplands Road properties, and across the rail tracks;
- ii. the provisions of an acoustic barrier to screen the mixer lorry during the fill operation;
- iii. removal of a section of rail sidings to allow more efficient manoeuvring of the mixer lorry; and
- iv. further enclosure of the conveyors, particularly at the aggregate bins.

3.2 Of these, the most important in terms of noise reduction is the re-orientation of the batching plant through 90° and the screening, from Chettle Court, of the mixer lorry during the fill operation (the noisiest activity).

3.3 The site layout plant for the previous scheme and for the revised scheme that is the subject of this assessment report are shown at appendix B and C respectively.

3.4 A detailed section through the mixer lorry and acoustic screen is shown at appendix D.

3.5 During the fill operation the engine of the mixer lorry must run at a speed above idle in order to generate the power necessary to rotate the mixer barrel as it receives materials. It is the noise of the vehicle engine operating at speed that is the main source of noise during the fill operation. The main noise source is casing radiation from the engine itself (diesel “knock”) with effective silencers making noise from the exhaust a secondary source.

3.6 Appendix E1 and E2 show the calculation sheets for screening effect from the engine = 18.2 dBA (height = 1 metre) and exhaust = 11.5 dBA (height = 3.2 metres).

3.7 In our judgement, a reasonable screening attenuation to ascribe to the joint noise sources is 13 dB. This screening loss is understated in order to provide for a safety margin in the calculations.

- 3.8 A further reduction in applicable for source directivity. The previous scheme showed the batching plant directly facing Chettle Court. In such a case the directivity effect is 0 dB. The revised scheme shows the plant facing 90° to Chettle Court. The directivity loss in such a case would be a minimum of 5 dB. However, because it is difficult to be precise about this loss, it has been ignored in this assessment. This does mean that the resultant noise levels, shown below, will be overstated.
- 3.9 This, it is concluded that the noise of the fill operation would be reduced by 13 dB relative to the previous scheme, that is $L_{Aeq12hr} = 52.1 - 13 = 39.1$ dB (see paragraphs 2.3v and 3.7 above).
- 3.10 The combined noise level of the fill operation and of vehicle movements would be $L_{Aeq12hr} = 39.1 + 37.5 = 41.4$ rounded to 41 dB.
- 3.11 This noise emission level, applicable at Chettle Court, may be considered to be maximum.
- 3.12 The noise emission level of the revised scheme of 41 dB is 11 dB lower than that of the original scheme ($L_{Aeq12hr} = 52$ dB - see paragraph 2.3vi above).
- 3.13 A 10 dB difference is around a halving of loudness (ref. PPG 24 Glossary).
- 3.14 In preparation of this assessment report, the opportunity was taken to survey noise levels within the grounds of Chettle Court. Previously we were unable to gain access to this property and so had to rely on measurements of background and ambient noise levels outside the grounds of the property.
- 3.15 The findings of two surveys are set out in detail at appendix F of this addendum report. However, in summary, it was found that noise levels between the original survey conducted in April 2003 and recent surveys conducted in June 2005 have reduced markedly. This may be in part due to the wind direction. However, it is also possible that this reduction is due to the significant reduction in activity on that part of the commercial estate nearest to Chettle Court. In particular, the substantial TNT operations have moved off the commercial estate in the interim period between the surveys.

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PROPOSED CONCRETE BATCHING PLANT
AT CRANFORD WAY,
FERME PARK,
HORNSEY

ENVIRONMENTAL NOISE ASSESSMENT

Project No: 034798

Report prepared by:

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22nd April 2003

Acoustic Consultant,
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1.0 Introduction

- 1.1 The Sharps Redmore Partnership (SRP) has been instructed by London Concrete Limited to undertake an assessment of a proposed concrete batching plant at Ferme Park, Hornsey.
- 1.2 The objective of the assessment is to determine the degree of impact to residents of Chettle Court some 132 metres from the plant.
- 1.3 The impact of road traffic noise is discussed in the Transport Assessment report prepared by Bellamy Roberts.
- 1.4 In this assessment consideration has been given to the appropriate assessment methodology and criteria (section 2.0), details are provided of the existing noise climate of the area (section 3.0) and predictions have been made of noise emissions from the site (section 4.0).
- 1.5 The conclusions of the noise assessment are set out in section 5.0 of this report.
- 1.6 Appendix B provides a description of the acoustic terminology employed.

2.0 Assessment methodology and criteria

2.1 The impact of noise from a new source may be assessed by several generic methods that may be summarised as follows:

- i. the effect may be determined by comparing the noise level of the source with recommended, absolute, noise limits contained within guidance documents;
- ii. the effect may be gauged by considering the change in noise level, that would result from the proposal, against advice in guidance documents;
- iii. the impact may be determined by considering the noise level that would result from the proposal relative to pre-existing background noise level of the area (a BS 4142 approach).

2.2 Each of these methods of assessment has advantages and disadvantages in relation to the assessment of a particular noise source in a particular area.

2.3 The use of fixed limits (method i, above) is appropriate for the assessment of sources that are contained within a finite boundary, particularly where noise sensitive receptors are few or are grouped together. This assessment method has been employed in this assessment for the analysis of noise from activity on the appeal site.

2.4 The assessment of impact against changes in noise level (method ii, above) is well suited to the analysis of road traffic since such analysis is normally determined entirely by calculation (using the “with scheme” and “without scheme”, traffic flows). This is the method usually employed for the assessment of traffic noise but this is not applicable in this case.

2.5 The use of BS 4142 type assessment (method iii, above) is only appropriate to the analysis of noise that is industrial in nature. Moreover, BS 4142 is better suited to the assessment of steady noise. The use of BS 4142 is not applicable here.

Fixed limits

2.6 There are a number of guidance documents that contain recommended fixed limits. These are discussed below.

2.7 Planning Policy Guidance (PPG) 24 “Planning and Noise” contains comprehensive advice on the subject of noise both in the circumstances of a residential development or a noise producing development.

2.8 In relation to proposed residential development, PPG 24 sets noise limits in terms of “noise exposure levels” (NECs). At the lowest NEC (NEC A) where noise is not a determining factor, the PPG 24 limit for day (0700 – 2300 hours) is $L_{Aeq,16hr} < 55$ dB, and for night (2300-0700 hours) is $L_{Aeq8hr} < 45$ dB.

2.9 PPG 24 Annex 3 paragraphs 19 and 20 address the subject of commercial and industrial development. In this section, reference is made to BS 8233:1987 (now superseded by BS 8233:1999).

2.10 This Standard is principally intended to assist in the design of new dwellings; however the Standard does state that it may be used in the assessment of noise from new sources being brought to existing dwellings.

2.11 The BS 8233:1999 limits may be summarised as follows:

Gardens	$L_{Aeq,16hr}$	= 50 to 55 dB
Living rooms (internal)	$L_{Aeq,16hr}$	= 30 to 40 dB
Bedrooms (internal)	$L_{Aeq,8hr}$	= 30 to 35 dB

- 2.12 BS 8233:1999 was based on the advice contained in a draft of World Health Organisation document "Community Noise". This document was released in final form in 1999.
- 2.13 The WHO advice is the most useful, comprehensive, and pertinent advice in this case, because it is not specific to the circumstances of the assessment. Instead, it provides guidance on acceptable noise values in for example schools, dwellings and offices.
- 2.14 The WHO guideline values are appropriate to what are termed "critical health effects". This means that they are at the lowest noise level that would result in any psychological, physiological or sociological effect. A report written by the National Physical Laboratory and commissioned by the DETR summarises the status of the WHO values thus "*In essence, the WHO guidelines represent a consensus view of international expert opinion on the lowest threshold noise levels below which the occurrence rates of particular effects can be assumed to be negligible*" (NPL report CMAM 16).
- 2.15 In this respect the guideline values are much more robust than the national planning policy objective, this being to "avoid demonstrable [i.e. real] harm to interests of acknowledged importance" (ref PPG 1, paragraph 40).
- 2.16 The WHO criteria for daytime (moderate or serious annoyance) are $L_{Aeq,16hr} = 50$ to 55 dB.

3.0 Survey results

3.1 A survey was undertaken of noise levels in the area on the 17th April 2003 from 0600 to 1345 hours.

3.2 Initially measurements were undertaken at Chettle Court. However, this complex of flats has security gates and so it was not possible to gain access to the grounds facing the site. Thus, instead, measurements were undertaken at the entrance gate to Chettle Court and at the entrance to the application site. The background noise levels in these locations were found to be the same and so the longer term survey was undertaken entirely at the entrance to the application site. Only those measurements are displayed below.

3.3 All levels were recorded using a precision grade sound level meter, type: Bruel and Kjaer 2231. The meter was fitted with a statistical module allowing the direct measurement of the three indices shown (see appendix B for a full description of these indices).

3.4 The weather during the survey was very good being dry, warm (8-16°C) and no wind.

3.5 The following sound levels were recorded and are rounded to nearest 0.5 dB:

Time period (hrs)	Sound level (dB)		
	L _{A90}	L _{AeqT}	L _{AMAX}
0700-0745	49.5	53.0	62.5
0800-0845	51.5	56.5	69.5
0900-0945	53.0	57.5	71.0
1000-1045	52.0	57.0	70.0
1100-1145	52.0	57.5	69.5
1200-1245	54.0	58.0	71.5
1300-1345	52.5	59.0	72.0

3.6 A typical background noise level (L_{A90}) for the area may be taken to be the average of the 7 readings shown at $L_{A90} = 52.0$ dB. A typical ambient noise level (L_{AeqT}) may be taken to be the logarithmic average of the values shown at $L_{AeqT} = 57.0$ dB.

3.7 The background noise level of the area is dictated by traffic on the surrounding roads, as well as distant plant. Ambient noise levels were dictated by a multitude of sources: rail traffic, local road traffic and noise from the nearby commercial development.

4.0 Calculations of site noise emissions

4.1 The main sources of noise on a concrete batching plant site are: a) vehicle movements, and b) the concrete fill operation. Of these, the fill operation is the noisier due to the requirement for the vehicle engine to operate at fast idle, in order to power the rotating mixing barrel on the vehicle during the pour.

4.2 A series of measurements were made at a similar London Concrete facility at Wembley. These measurements were undertaken on the 23rd April 2003 using a Bruel and Kjaer type 2260 precision sound level meter. This meter enabled the collection of noise data in octave bands for a subsequent ISO 9613 prediction of environmental noise levels.

Lorry movements

4.3 The following data tables show:

- a) the typical SEL value at 10 metres (minimum) from a moving vehicle over a 180° arc of view. These values were determined by measurement of 6 events of vehicle arrival/departure and passby.
- b) the typical sound power level (in terms of SEL also) for a moving vehicle (based on a duration time of nominally 20 seconds).

a)

63	125	250	500	1k	2k	4k	8k	dBA
66	71	75	80	83	83	75	66	88

- i. this is slightly higher than SRP standard for 6/8 wheel tipper lorry accelerating from rest of $L_{AE} = 85$ dB.

- ii. the sound power level (SEL) for use in ISO 9613 calculation may be taken to be:

b)

63	125	250	500	1k	2k	4k	8k	dBA
96	101	105	110	113	113	105	96	118

Loading of vehicle

4.4 The following data tables show:

- a) the average measured $L_{Aeq5min}$ level at a distance of 15 metres (6 records);
and
- b) the derived sound power level (SEL).

a)

63	125	250	500	1k	2k	4k	8k	dBA
56	60	67	71	74	74	69	59	79

b)

63	125	250	500	1k	2k	4k	8k	dBA
113	117	124	128	131	131	126	116	136

4.5 The above sound power levels of 118 and 136 dB, expressed as an SEL ($L_{Aeq1sec}$) were employed to calculate noise levels at Chettle Court using a program based on the provisions of ISO 9613.

4.6 The following assumptions were employed:

- a) distance to receptor = 132 metres (Chettle Court); and
- b) source area = hard ground; middle area = soft ground; receiver area = hard ground.

4.7 The summary calculation sheets are produced at appendix C. The SEL values at Chettle Court are calculated at: lorry fill = 84.5 dBA; lorry movement = 66.4 dBA.

4.8 In order to determine the L_{AeqT} value it is necessary to factor for the number of events per working day (0700 to 1900 hours). The Bellamy Roberts' Transportation report estimates daily activity as 25 loads of concrete (50 movements), with a maximum of 3 deliveries of cement (6 movements).

4.9 The $L_{Aeq12hr}$ value may be determined using the equation $L_{Aeq12hr} = SEL + 10 \log N - 10 \log T$ (where N = number of events and T = number of seconds in 12 hours).

4.10 As follows:

$$\begin{aligned} \text{Lorry Fill} \quad L_{Aeq12hr} &= 84.5 + 10 \log 25 - 10 \log 43200 \\ &= 84.5 + 14 - 46.4 \\ &= 52.1 \text{ dB} \end{aligned}$$

$$\begin{aligned} \text{Lorry Movement} &= 66.4 + 10 \log 56 - 10 \log 43200 \\ &= 66.4 + 17.5 - 46.4 \\ &= 37.5 \text{ dB} \end{aligned}$$

4.11 Thus, the overall site noise emission level at Chettle Court (dominated by fill operations) would be $L_{Aeq12hr} = 52.1$ dB, rounded to 52 dB.

4.12 It is accepted that there may be some extraneous vehicle movements on site that are not accommodated in the calculation process. However, bearing in mind the low contribution from the source relative to the fill operation, this would not be likely to affect the overall level materially. It is believed that the noise emission level displayed (free field) is accurate to ± 3 dB.

4.13 There are no other sources of noise on the main site itself that would affect the emission levels displayed. Aggregate would be delivered by train but at a drop point that is well away from Chettle Court (see location plan, appendix A). Noise from equipment itself would be at very low levels.

5.0 Assessment conclusions

5.1 The prevailing noise level at Chettle Court, from site activity, is estimated to be $L_{Aeq12hr} = 52 \text{ dB} \pm 3 \text{ dB}$.

5.2 This noise level is the same as that recorded for the existing background noise level of the area and below the ambient level recorded (paragraph 3.6).

5.3 The noise level from site activity would be within the WHO guideline values where annoyance (moderate or severe) may be assumed to be negligible (paragraph 2.16).

5.4 Thus, it is concluded that noise from operation of the proposed concrete batching plant would not harm the amenities of the residents of Chettle Court.

APPENDIX A

SITE LAYOUT AND LOCATION PLAN

APPENDIX B

ACOUSTIC TERMINOLOGY

1. Noise, defined as unwanted sound, is measured in units of decibels, dB. The range of audible sound is from 0 dB to 140 dB. Two equal sources of sound, if added together will result in an increase in level of 3 dB, i.e. $50 \text{ dB} + 50 \text{ dB} = 53 \text{ dB}$. A 10 dB increase in sound is perceived as a doubling of loudness.
2. Frequency (or pitch) of sound is measured in units of Hertz. 1 Hertz = 1 cycle/second. The range of frequencies audible to the human ear is around 20Hz to 18000Hz (or 18kHz). The capability of a person to hear higher frequencies will reduce with age. The ear is more sensitive to medium frequency than high or low frequencies.
3. To take account of the varying sensitivity of people to different frequencies a weighting scale has been universally adopted called "A-weighting". The measuring equipment has the ability to automatically weight (or filter) a sound to this A scale so that the sound level it measures best correlates to the subjective response of a person. The unit of measurement thus becomes dBA (decibel, A-weighted).
4. The second important characteristic of sound is amplitude or level. Two units are used to express level a) sound power level - L_w , and b) sound pressure level - L_p . Sound power level is an inherent property of a source whilst sound pressure level is dependent on surroundings/distance/directivity etc. The sound level that is measured on a meter is the sound pressure level, L_p .
5. External sound levels are rarely steady but rise or fall in response to the activity in the area - cars, voices, planes, birdsong, etc. A person's subjective response to difference noises has been found to vary dependent on its temporal distribution (i.e. its variation with time). For this reason a set of statistical indices have been developed.

6. There are four main statistical indices in use in the UK:

L_{A90} : The sound level (in dBA) exceeded for 90% of the time. This unit gives an indication of the sound level during the quieter periods of time in any given sample. It is used to describe the “background noise level” of an area.

L_{AeqT} : The equivalent continuous sound level over a period of time, T. this unit may be described as “the notional steady noise level that would provide, over a period, the same energy as the varying noise in question”. In other words, the energy average level. This unit is now used to measure a wide variety of different types of noise of an industrial or commercial nature, as well as road traffic, aircraft and trains.

L_{A10} : The sound level (in dBA) exceeded for 10% of the time. This level gives an indication of the sound level during the noisier periods of time in any given sample. It has been used over many years to measure and assess road traffic noise.

L_{AMAX} : The maximum level of sound, i.e. the peak level of sound measured in any given period. This unit is used to measure and assess transient noises, i.e. gun shots, individual vehicles, etc.

APPENDIX C

ISO 9613 CALCULATION SHEETS

Lorry movement

Summary & Results

Title:
Project:

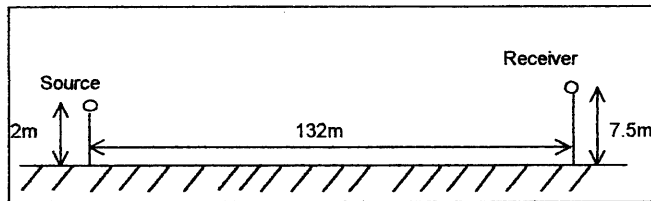
Calc. Sheet
Date:

Frequency	31.5	63	125	250	500	1000	2000	4000	8000
L_w /dB		96.0	101.0	105.0	110.0	113.0	113.0	105.0	96.0
Attenuation / dB:									
Divergence: A_{div}	53.4	53.4	53.4	53.4	53.4	53.4	53.4	53.4	53.4
Atmospheric Absorption: A_{atm}	0.0	0.0	0.1	0.1	0.3	0.5	1.2	4.0	13.9
Ground Effects: A_{gr}	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Total: A_{total}	50.4	50.5	50.5	50.6	50.7	51.0	51.6	54.4	64.3
A-Weighted L_p / dB		45.5	50.5	54.4	59.3	62.0	61.4	50.6	31.7
									dBA: 66.4

Horizontal Distance From Source to Receiver, d: 132 m

Temperature: 10 °C
Humidity: 70-80 %

	Source	Receiver
Height above Ground / m	2	7.5
Ground Level (above Ref.) / m	0	6



Ground Effects

Source Region

(A Region 60m around the source)

Ground Factor 0.00

Middle Region

N/A

Ground Factor 1.00

Receiver Region

(A Region 225m around the receiver)

Ground Factor 0.00

Lorry fill

Summary & Results

Title:
Project:

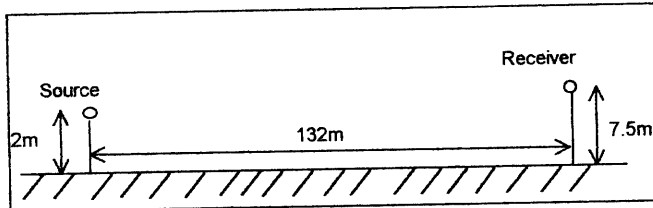
Calc. Sheet
Date:

Frequency	31.5	63	125	250	500	1000	2000	4000	8000
L_w / dB		113.0	117.0	124.0	128.0	131.0	131.0	128.0	116.0
Attenuation / dB:									
Divergence: A_{div}	53.4	53.4	53.4	53.4	53.4	53.4	53.4	53.4	53.4
Atmospheric Absorption: A_{atm}	0.0	0.0	0.1	0.1	0.3	0.5	1.2	4.0	13.9
Ground Effects: A_{gr}	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Total: A_{total}	50.4	50.5	50.5	50.6	50.7	51.0	51.6	54.4	64.3
A-Weighted L_p / dB		62.5	66.5	73.4	77.3	80.0	79.4	71.6	51.7
								dB(A):	84.5

Horizontal Distance From Source to Receiver, d: 132 m

Temperature: 10 °C
Humidity: 70-80 %

	Source	Receiver
Height above Ground / m	2	7.5
Ground Level (above Ref.) / m	0	6



Ground Effects

Source Region
(A Region 60m around the source)

Ground Factor 0.00

Middle Region
N/A

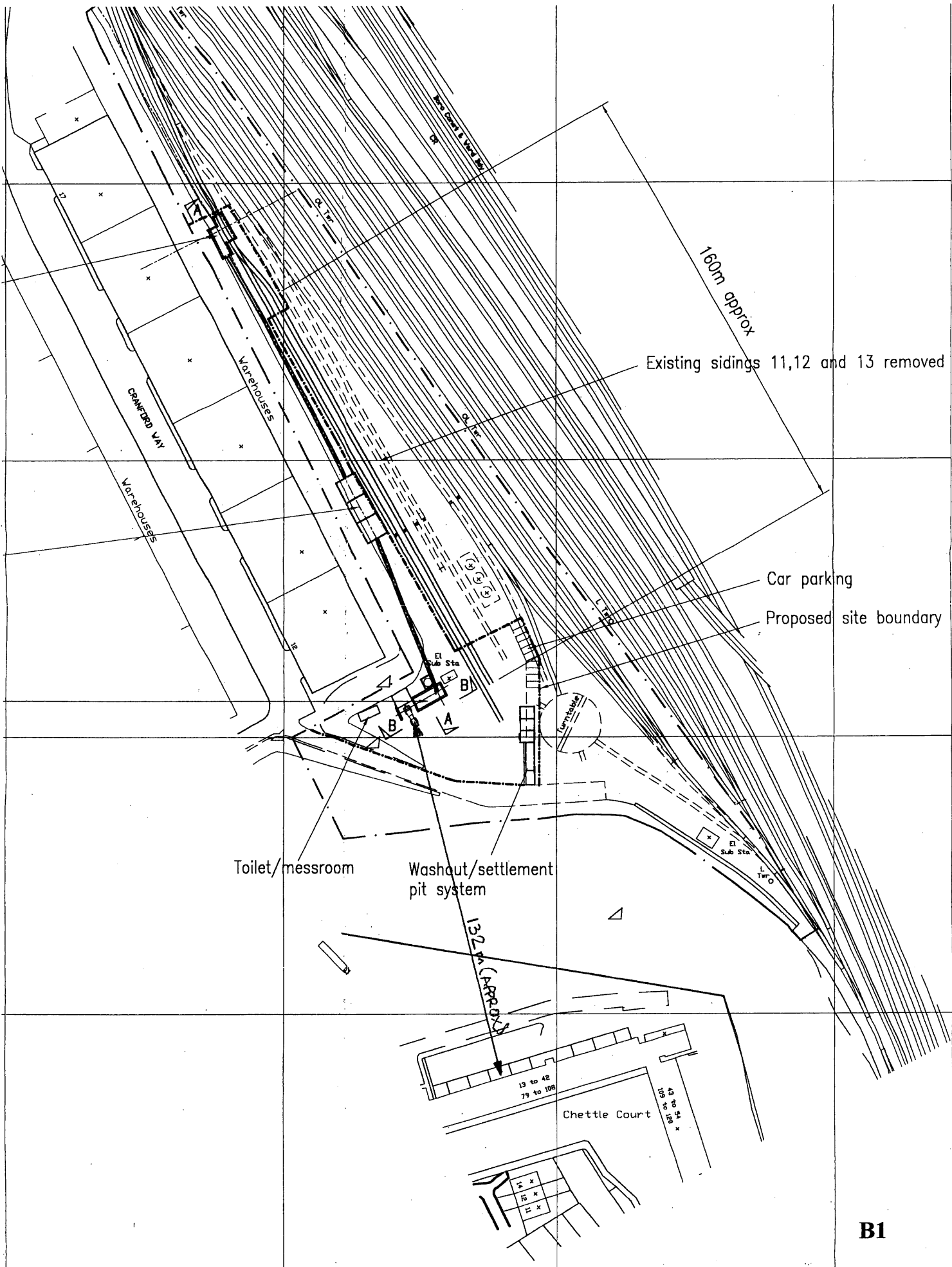
Ground Factor 1.00

Receiver Region
(A Region 225m around the receiver)

Ground Factor 0.00

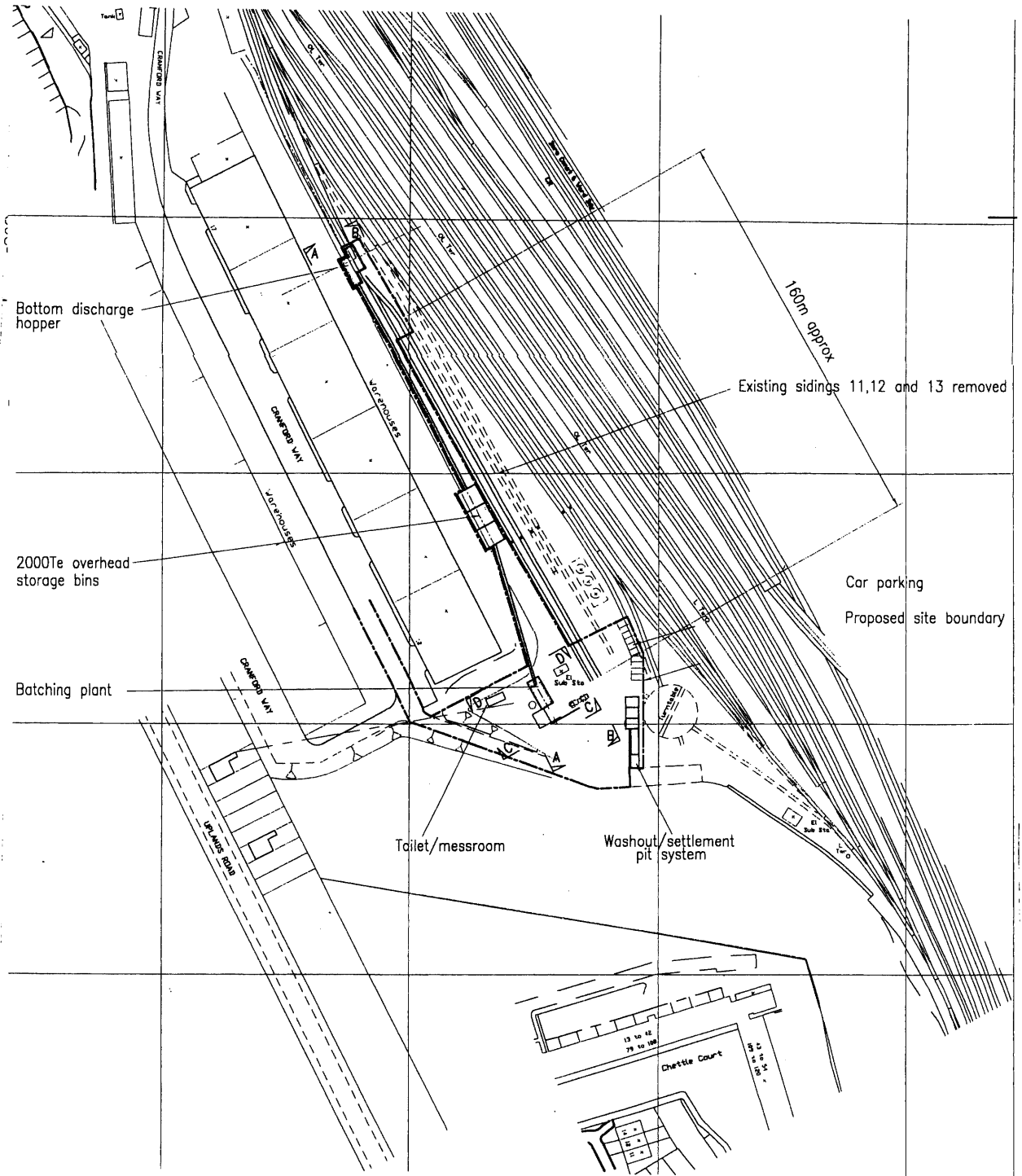
APPENDIX B

PREVIOUS SITE LAYOUT AND LOCATION PLAN



APPENDIX C

REVISED SITE LAYOUT AND LOCATION PLAN



Bottom discharge hopper

2000Te overhead storage bins

Batching plant

Toilet/messroom

Washout/settlement pit system

160m approx

Existing sidings 11,12 and 13 removed

Car parking

Proposed site boundary

Chettle Count

APPENDIX D

**SECTION THROUGH A MIXER LORRY AND THE ACOUSTIC
SCREEN**

4.0 Conclusions

- 4.1 The prevailing noise level at Chettle Court (the critical property in noise assessment terms), from site activity, is estimated to be a maximum of $L_{Aeq12hr} = 41$ dB.
- 4.2 This level is 11 dB lower than that estimated for a previous scheme submitted in January 2004.
- 4.3 The reduction has been obtained by re-orientating the plant through 90° and screening the lorry fill operation.
- 4.4 The noise emission levels from site activity, of 41 dB would be well within the WHO guideline values of 50 to 55 dB whereby annoyance (moderate or serious) may be assumed to be negligible.
- 4.5 Surveys in the area indicate that noise levels have reduced between April 2003 and June 2005. This may be due to different meteorological conditions between surveys but may also be due to less activity on the nearby commercial estate.
- 4.6 The noise emission level of the site activity would be well below previously recorded background noise levels and similar to recently surveyed levels. Noise from site activity would be well below the ambient (L_{AeqT}) level of the area.
- 4.7 Thus, it is concluded that the noise level of site activity would not harm the amenities of residents of Chettle Court.

Glossary of terms

Sound:

Sound is defined as a pressure fluctuation. The source of sound is anything that stimulates the surrounding particles of air (or liquids/solids) into motion. This motion spreads to adjacent air particles further from the source in a way that can be visualised by the ripples that emanate around a stone dropped into a pond (but in three dimensions). The speed of sound in air is around 340 metres a second.

Noise:

Noise is defined as unwanted sound. It follows that if noise (or sound) is audible then it is detectable by the human ear. Noise ranges from the threshold of hearing to the threshold of pain. The ratio between these two extremes is very large being in linear terms more than a million to one. To describe different noise values using a linear scale would be cumbersome and so a logarithmic scale is employed.

decibel (dB):

The logarithmic scale is described in terms of decibel levels . . . dB. On this scale the numbers are compressed into a range from 0 dB (threshold of hearing) to 130 dB (threshold of pain). The following semantic scale shows noise (sound) levels for typical everyday sources and recognised noise criteria.

Noise level (dBA)	Example
130	Threshold of pain
120	Jet aircraft take-off at 100 metres
110	Chainsaw at 1 metre
100	Inside disco - general level
90	Heavy lorries at 5 metres. Shout at 1 metre
80	Kerbside of busy street
70	Loud radio (in typical domestic room). Car at 7.5 metres
60	Office or restaurant - general level. Normal conversation at 1 metre
50-55	WHO guideline values (external day) - at sound levels lower than these values moderate/serious annoyance can be assumed to be negligible
50	Domestic fan heater at 1 metre. Background noise - urban, night
45	WHO Guideline value (external night) - at sound levels lower than this value sleep disturbance can be assumed to be negligible (windows open)
40	Living room - typical, day
30	Theatre. Whisper at 1 metre
25-35	Background noise - typical, rural, night
10	Sound insulated test chamber
0	Threshold of hearing

Sound levels:

A sound level 10 dB higher than another contains 10 times as much energy; a sound 20 dB than another contains 100 times as much energy and so on. However, the human perception of these noise levels is different to the true energy relationships (see perception of noise levels, below).

Adding and subtracting noise levels:

The logarithmic way by which noise levels are described mean that they cannot be added or subtracted in the conventional way. Two sounds of a level of 50 dB equal 53 dB; a level of 50 dB and 60 dB equals 60.4 dB. It can be seen that when two sound levels are around 10 dB apart then the lower sound level does not materially influence the higher.

Perception of noise levels:

For a given noise, a change in level of 3 dB is not perceptible in normal environmental conditions and a change of around 10 dB is perceived as a doubling of loudness. The following semantic “dose-response” scale is often employed in Environmental Impact Assessments:

Increase in noise level L_{AeqT} dB	Effect/impact
<3	imperceptible/none
3-5	perceptible/slight
6-10	less than a doubling of loudness/significant
11-15	more than a doubling of loudness/substantial
>15	approximately a trebling of loudness/severe

Frequency:

The number of pressure variations in each second (cycles per second) is displayed in terms of “hertz” (Hz). The range of frequencies that a (young) person can hear ranges from around 20Hz to 20000Hz. Middle C is 256Hz. Frequency is split into octaves with centre frequencies of 31.5, 63, 125, 250, 500, 1k, 2k, 4k and 8k (Hz). Low frequency noise is normally described as having significant acoustic energy in the frequency range 8 to 100Hz.

Frequency weighting:

The human ear is less sensitive to low and high frequency than it is to medium frequency. In order to accommodate this variation in response, noise is conventionally measured in terms of the A-weighted sound level (dBA). The measuring equipment has the ability to weight (or filter) sound to this "A" scale so that the sound level it measures best correlates to the response of the human ear. The "A" is often transferred to the statistical index if noise is described in this way (see below).

Types of noise:

Most environmental noise sources can be described as: steady, continuous, intermittent or impulsive.

- a steady noise is one that is produced by say a machine operating at the same speed and duty;
- a continuous noise may vary in level all the time - this is the normal noise found in the environment;
- intermittent noise is often caused by equipment that operates in cycles or when a single vehicle (car, aircraft, train) passes; and
- impulsive noise is that associated with explosions (fireworks, gunfire) or say a pile driver.

Statistical indices:

It is not possible to reasonably describe a given noise in terms of one level . . . since with most environments the noise will be continuous but the level will usually be changing continually. Instead, a set of statistical indices have been developed to describe particular types of noise:

L_{A90} : This is the A-weighted sound level (in dB) exceeded for 90% (i.e. almost all of) the time. It is used to describe the background noise level.

L_{AeqT} : This is the A-weighted noise level that is equivalent (in energy terms) to a continuously changing noise level. It is effectively the average noise energy level. L_{AeqT} is used to describe most environmental noise.

L_{AMAX} : This is the A-weighted maximum noise level recorded over a given survey period.

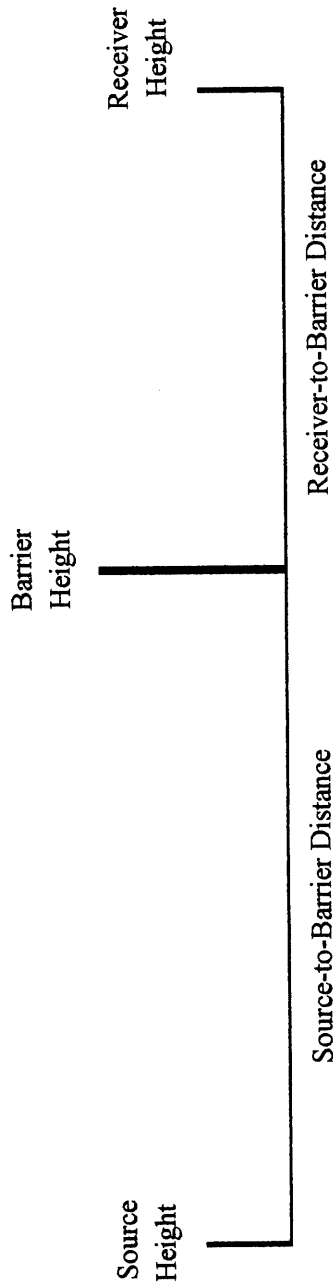
APPENDIX A

**SHARPS REDMORE PARTNERSHIP
REPORT OF 22ND APRIL 2003**

APPENDIX E

SCREENING CALCULATION SHEETS

BASIC BARRIER ATTENUATION



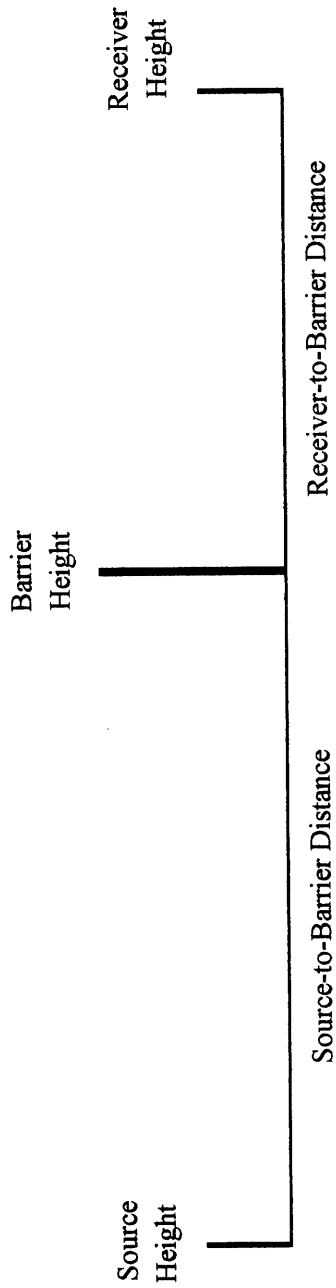
Source-to-Barrier Distance	1.5 m
Receiver-to-Barrier Distance	125.0 m

Source Height	1.0 m
Receiver Height	13.5 m
Barrier Height	4.5 m

Path difference = 2.015 m

Frequency - Hz	63	125	250	500	1K	2K	4K	8K	CRTN
Attenuation - dB	12.5	15.1	17.9	20.8	23.8	26.7	29.7	32.7	18.2 dBA

BASIC BARRIER ATTENUATION



Source-to-Barrier Distance	2.1 m
Receiver-to-Barrier Distance	125.0 m

Source Height	3.2 m
Receiver Height	13.5 m
Barrier Height	4.5 m

Path difference = 0.277 m

Frequency - Hz	63	125	250	500	1K	2K	4K	8K	CRTN
Attenuation - dB	7.0	8.5	10.4	12.8	15.5	18.3	21.2	24.2	11.5 dBA

APPENDIX F

SURVEY RESULTS

17th April 2003

Weather: dry; warm (8-16°C); no wind

Equipment: Bruel and Kjaer 2231 precision sound level meter fitted with a statistical module allowing the direct measurement of the indices shown.

Calibration: meter calibrated before, during and after the survey with no drift in level noted.

Measurement locations: Measurements were made at the entrance to Chettle Court and at the entrance to the application site. These locations are denoted 1 and 2 respectively, below.

Time (hours)	Sound level (dB)			Location
	L _{A90}	L _{AeqT}	L _{AMAX}	
0600-0607	44.5	48.0	62.0	1
0614-0620	44.0	47.5	63.5	2
0630-0645	46.0	51.5	68.5	1
0700-0745	49.5	53.0	62.5	2
0800-0845	51.5	56.5	69.5	2
0900-0945	53.0	57.5	71.0	2
1000-1045	52.0	57.0	70.0	2
1100-1145	52.0	57.5	69.5	2
1200-1245	54.0	58.0	71.5	2
1300-1345	52.5	59.0	72.0	2

The background noise level of the area was dictated by traffic on the surrounding roads as well as distant plant. Ambient noise levels were dictated by a multitude of sources: rail traffic, local road traffic and noise from the nearby commercial development.

14th/15th June 2005

Weather: dry (but rain at end of survey); very warm 21-27°C; slight breeze from the south to south-west (measurement location screened from the wind by Chettle Court building).

Equipment: Bruel and Kjaer 2231 precision sound level meter fitted with a statistical module showing the direct measurement of the indices shown.

Calibration: meter calibrated before and after each days survey period with no drift in level noted.

Measurement location: measurements were made in the grounds of Chettle Court approximately mid-way along the façade of the building on the grassed area alongside the roadway and parking area (close to the play area).

Time (hours)	Sound level (dB)		
	L _{A90}	L _{AeqT}	L _{AMAX}
14th June 2005			
1140-1200	42.5	52.0	76.0
1200-1300	43.5	51.0	66.5
1300-1400	43.5	50.5	67.5
1400-1500	41.0	52.5	76.0
1500-1550	40.5	52.0	75.5
1600-1700	41.0	52.5	78.0
1700-1800	42.5	52.5	71.0
1800-1900	42.0	52.0	72.0
15th June 2005			
0700-0800	40.0	51.0	67.1
0900-1000	42.5	54.0	69.5
1000-1045*	41.5	51.5	68.5

* survey stopped due to rain

The background noise level of the area was dictated by traffic on the surrounding roads though this was more subdued than during the April 2003 survey probably due to the wind direction and consequent screening by Chettle Court.

Ambient noise levels were dictated by train activity and more local traffic with some noise from the commercial estate (vehicles and reversing alarms).

Background and ambient noise levels during the June 2005 survey were much lower than recorded in April 2003 due probably to reduced traffic noise due to wind direction and less activity on the nearby commercial estate.

23rd June 2005

Survey conducted to check relative levels at Chettle Court versus the application site entrance.

Weather: dry; very warm (25°C); no wind at ground level but clouds moving from the south.

Equipment: Bruel and Kjaer 2236 precision sound level meter fitted with a statistical module allowing the direct measurement of the indices shown.

Calibration: meter calibrated before and after the survey with no drift in level noted.

Measurement locations: measurement were made in the grounds of Chettle Court as per the survey in June 2005 and at the entrance to the site as per the survey in April 2003. (Locations 1 and 2 respectively).

Time (hours)	Sound level (dB)			Location
	L _{A90}	L _{AeqT}	L _{AMAX}	
1100-1130	42.0	52.5	71.5	1
1140-1210	41.5	50.5	62.0	2
1225-1255	43.0	53.5	68.5	1
1310-1340	42.5	52.0	64.5	2