APPENDIX A

ILLUSTRATIVE LAYOUT

Schedule of approximate areas

Plot	Platform area		Unit No.	Ground floor area		First floor area		Total unit area		Plot total		Parking spaces	Platform coverage %
	sq.m	acres		sq.m	sq.ft	sq.m	sq.ft	sq.m	sq.ft	sq.m	sq.ft		
SW1	4,273.0	1.1	SW1U1	1,803.4	19,411.8	180.0	1,937.5	1,983.4	21,349.3	1,983.4	21,349.3	30	**42.2**
NW1	5,310.0	1.3	NW1U1	2,198.2	23,661.4	210.0	2,260.4	2,408.2	25,921.9	2,408.2	25,921.9	40	**41.4**
NW2	16,468.0	4.1	NW2U1	7,388.7	79,532.0	771.7	8,306.6	8,160.4	87,838.5	8,160.4	87,838.5	129	**44.9**
NE1	19,066.7	4.7	NE1U1**	8,679.9	93,430.4	438.8	4,723.2	9,118.7	98,153.7	9,118.7	98,153.7	98	**46.7**
NE2	30,219.0	7.5	NE2U1	5,479.6	58,982.4	550.0	5,920.2	6,029.6	64,902.6	15,349.6	165,223.1	73	**46.2**
			NE2U2	8,470.0	91,171.1	850.0	9,149.4	9,320.0	100,320.5			120	
SE2	10,976.0	2.7	SE2U1	4,423.6	47,615.6	477.8	5,142.5	4,901.4	52,758.1	4,901.4	52,758.1	77	**40.3**
SE1	8,899.0	2.2	SE1U1	3,647.4	39,260.6	396.4	4,266.8	4,043.8	43,527.5	4,043.8	43,527.5	52	**41.0**
Total	**95,211.7**	**23.5**	**8.0**	**42,090.8**	**453,065.4**	**3,874.7**	**41,706.7**	**45,965.5**	**494,772.1**	**45,965.5**	**494,772.1**	**619**	**44.2**

*All areas taken as GEA

** 50% of office located on the ground floor

NE2 platform includes access road

NOTES

Do not scale. Work only to figured dimensions.

Subject to Statutory Approvals.

Subject to survey

Where applicable this drawing is to be read in conjunction with other consultants drawings and with the specification.

All dimensions to be checked on site prior to commencement of work.

- Plot boundaries
- Retaining structure
- Acoustic fence

NW2
NW2U1
NW1U1
NW1
NE2U2
NE2U1
NE1U1
SW1
SW1U1
SE1U1
SE1
SE2U1
SE2
MELIONS BUMPSTEAD ROAD
PHOENIX RD
ICENI WAY
A1017 HAVERHILL BYPASS
A1017 HAVERHILL BYPASS
Cherry Gardens
Thistledown
Mayville
Copse Hall

Rev	Description	Chkd	Date

Peer House
8 -14 Verulam Street
London WC1X 8LZ

tel +44(0)20 7400 2120

enquiries@cornisharchitects.com
www.cornisharchitects.com

cornisharchitects

Project
HAVERHILL

Drg Title
FRAMEWORK PLAN

Status
PLANNING

0 50 m

Scale 1:1000 @ A1

Date 27/10/2015

Drg No 15016 / TP / 004

Rev

APPENDIX B

NOISE SURVEY RESULTS

Appendix B1: Monitoring Location 1

Date	Time	L_{Amax}	$L_{A(10)}$	$L_{A(90)}$	L_{Aeq}
0001 2015-10-21	17:01:39	81	73.7	47.7	68.6
0002 2015-10-21	17:16:39	80.2	74.2	51.7	69.4
0003 2015-10-21	17:31:39	80.5	74.2	51.7	69.3
0004 2015-10-21	17:46:39	83.3	74.2	50.7	69.7
0005 2015-10-21	18:01:39	79.7	73.2	49.7	68.2
0006 2015-10-21	18:16:39	80.7	73.7	49.7	68.7
0007 2015-10-21	18:31:40	80.3	72.7	47.7	67.6
0008 2015-10-21	18:46:40	80.5	72.7	48.7	67.5
0009 2015-10-21	19:01:40	80.9	72.2	48.2	67.1
0010 2015-10-21	19:16:40	82.4	72.2	46.2	67
0011 2015-10-21	19:31:40	80.2	69.2	44.7	64.5
0012 2015-10-21	19:46:40	82	71.2	45.2	65.7
0013 2015-10-21	20:01:40	81.7	70.2	44.2	64.9
0014 2015-10-21	20:16:40	80.9	68.7	43.7	64
0015 2015-10-21	20:31:40	78	63.7	43.7	61.4
0016 2015-10-21	20:46:40	81.2	64.2	43.7	62.3
0017 2015-10-21	21:01:41	79.8	66.2	42.7	62.4
0018 2015-10-21	21:16:41	78.6	65.2	41.7	61.7
0019 2015-10-21	21:31:41	77.8	66.2	42.2	62.5
0020 2015-10-21	21:46:41	79.3	60.7	42.7	61.3
0021 2015-10-21	22:01:41	82.7	61.2	41.7	61.1
0022 2015-10-21	22:16:41	78.4	65.7	42.2	62
0023 2015-10-21	22:31:41	77.4	61.7	41.7	60.3
0024 2015-10-21	22:46:41	78.5	53.7	39.7	59
0025 2015-10-21	23:01:41	78.2	55.2	38.5	58.5
0026 2015-10-21	23:16:41	80.1	59.7	39.7	60.9
0027 2015-10-21	23:31:42	79.9	56.2	39.7	59.2
0028 2015-10-21	23:46:42	77.9	50.2	40.7	56.4
0029 2015-10-22	00:01:42	76.6	51.2	38.5	57.6
0030 2015-10-22	00:16:42	78.3	49.2	40.7	54.9
0031 2015-10-22	00:31:42	77.6	46.2	38.4	51.9
0032 2015-10-22	00:46:42	77.6	51.2	39.7	57
0033 2015-10-22	01:01:42	79.6	49.7	39.7	56.4
0034 2015-10-22	01:16:42	58.8	43.7	38.1	41.3
0035 2015-10-22	01:31:42	80.2	45.2	39.3	54.6
0036 2015-10-22	01:46:42	77.2	47.7	37.8	52
0037 2015-10-22	02:01:43	80.5	46.2	40.2	53.5
0038 2015-10-22	02:16:43	80.1	49.7	37.9	56.4
0039 2015-10-22	02:31:43	76.5	45.2	38.4	49.9
0040 2015-10-22	02:46:43	74.7	46.2	39.7	49.2
0041 2015-10-22	03:01:43	78.3	49.7	39.7	57.2
0042 2015-10-22	03:16:43	55.5	45.7	38.7	42.8

Date	Time	L_{Amax}	$L_{A(10)}$	$L_{A(90)}$	L_{Aeq}
0043 2015-10-22	03:31:43	79.6	48.7	38.9	55.4
0044 2015-10-22	03:46:43	78.8	47.7	39.1	56.3
0045 2015-10-22	04:01:43	76.5	47.7	39.7	51.7
0046 2015-10-22	04:16:43	79.9	49.7	39.3	57.3
0047 2015-10-22	04:31:43	78.3	47.2	39.4	56.3
0048 2015-10-22	04:46:44	78.2	50.2	38.9	56.8
0049 2015-10-22	05:01:44	78.2	51.2	40.7	58
0050 2015-10-22	05:16:44	79.3	61.7	41.7	61.6
0051 2015-10-22	05:31:44	82.8	63.7	42.2	62.6
0052 2015-10-22	05:46:44	83.4	67.2	42.7	63.8
0053 2015-10-22	06:01:44	79.6	66.7	43.7	62.9
0054 2015-10-22	06:16:44	81.6	69.7	44.7	65
0055 2015-10-22	06:31:44	82.7	69.7	44.7	64.8
0056 2015-10-22	06:46:44	80.3	72.2	46.7	67
0057 2015-10-22	07:01:44	80.6	72.7	48.7	67.6
0058 2015-10-22	07:16:45	80.1	73.7	52.2	68.7
0059 2015-10-22	07:31:45	79.6	73.2	49.2	67.9
0060 2015-10-22	07:46:45	80.3	73.7	51.2	68.7
0061 2015-10-22	08:01:45	83.4	73.7	51.7	68.8
0062 2015-10-22	08:16:45	80.1	73.7	52.2	68.6
0063 2015-10-22	08:31:45	80.5	73.2	51.2	68.4

Appendix B2: Monitoring Location 2

Date	Time	$L_{Af(max)}$	L_{Af10}	$L_{Af(90)}$	L_{Aeq}
2015 : Oct : 21	20 : 01	65.3	58.7	49.2	55.3
2015 : Oct : 21	20 : 15	69.3	58.1	50.6	55.2
2015 : Oct : 21	20 : 30	68.6	58.9	48	55.6
2015 : Oct : 21	20 : 45	71.1	57.4	47.8	54.2
2015 : Oct : 21	21 : 00	66.8	58.8	50.2	55.5
2015 : Oct : 21	21 : 15	66.7	57.5	48.1	54.1
2015 : Oct : 21	21 : 30	67.5	57.3	49.2	54.2
2015 : Oct : 21	21 : 45	67.4	56.9	48.7	54.3
2015 : Oct : 21	22 : 00	66.8	58	47.5	54.2
2015 : Oct : 21	22 : 15	69.5	57.2	48.6	54
2015 : Oct : 21	22 : 30	68	57.7	48.6	54.4
2015 : Oct : 21	22 : 45	66.9	56.4	46.6	52.7
2015 : Oct : 21	23 : 00	65.7	55.3	47	52.8
2015 : Oct : 21	23 : 15	71.1	61	47	57.9
2015 : Oct : 21	23 : 30	70.8	56.3	46.9	53
2015 : Oct : 21	23 : 45	73.1	55.1	46.6	52.8
2015 : Oct : 22	00 : 00	69.2	58.8	47.9	54.7
2015 : Oct : 22	00 : 15	69.4	54.8	46.2	51.9

Date	Time	$L_{Af(max)}$	L_{Af10}	$L_{Af(90)}$	L_{Aeq}
2015 : Oct : 22	00 : 30	70	56.1	46.3	52.4
2015 : Oct : 22	00 : 45	67.8	56.5	48.9	53.7
2015 : Oct : 22	01 : 00	66.3	52.3	46	50.7
2015 : Oct : 22	01 : 15	64.6	52.5	46.1	50.9
2015 : Oct : 22	01 : 30	68.3	57.8	47	53.8
2015 : Oct : 22	01 : 45	69.9	56.4	47.2	53.3
2015 : Oct : 22	02 : 00	65.9	58.5	46.8	54.5
2015 : Oct : 22	02 : 15	66.5	58.7	46.6	54.5
2015 : Oct : 22	02 : 30	65.7	55.3	47.4	52.8
2015 : Oct : 22	02 : 45	63.5	56.4	50	53.5
2015 : Oct : 22	03 : 00	66.7	55.3	49.9	53.1
2015 : Oct : 22	03 : 15	66.7	56.3	49.7	53.3
2015 : Oct : 22	03 : 30	68.9	56.1	49.7	53.4
2015 : Oct : 22	03 : 45	64.8	58	49.7	54.6
2015 : Oct : 22	04 : 00	66.8	58.1	49.7	54.5
2015 : Oct : 22	04 : 15	71.1	56.3	49.4	53.5
2015 : Oct : 22	04 : 30	62.9	56.2	49.6	53
2015 : Oct : 22	04 : 45	66.1	56.7	49.9	53.9
2015 : Oct : 22	05 : 00	63.6	57.1	49.8	53.8
2015 : Oct : 22	05 : 15	65.2	57.7	50.1	54.3
2015 : Oct : 22	05 : 30	67.2	58.1	50.7	55.1
2015 : Oct : 22	05 : 45	67.3	58	50.6	55.2
2015 : Oct : 22	06 : 00	82.2	59.3	51.3	56.6
2015 : Oct : 22	06 : 15	64.9	58.6	51	55.7
2015 : Oct : 22	06 : 30	74.8	60	51.7	57
2015 : Oct : 22	06 : 45	66.5	60.5	52.3	57.4
2015 : Oct : 22	07 : 00	71.2	61.4	54.8	59
2015 : Oct : 22	07 : 15	74.1	60.7	54.5	58.3
2015 : Oct : 22	07 : 30	67.4	61.4	54.3	58.7
2015 : Oct : 22	07 : 45	80.2	61.6	55	59.4
2015 : Oct : 22	08 : 00	86.1	61.2	54.5	59.4
2015 : Oct : 22	08 : 15	79.4	61.3	54.6	59.3
2015 : Oct : 22	08 : 30	75.1	60.6	54	58.2
2015 : Oct : 22	08 : 45	69.4	61.2	54.2	58.7

APPENDIX C

SERVICE YARD CALCULATIONS

Appendix C: External Servicing Calculations

Table C1: 37 Bumpstead Road – Daytime

Assessment project:Unit NE 1	Delivery component		
	Arrival	**Unloading**	**Departure**
Delviery noise activity - predicted ambient noise levels ($L_{Aeq\ 1\ hour}$)			
Closest residential property address:	**37 Bumpstead Road**		
Source noise level at 10 metres $L_{Aeq\ T}$	69	66	67
Time - minutes	2	40	0.5
Distance between noise source and residential property in metres	140	140	140
Screening attenuation	10	10	10
Convert to 1 hour - dB	-14.8	-1.8	-20.8
Distance attenuation correction - dB	-22.9	-22.9	-22.9
Nos of Vehicle movements = 10 log 7	+8	+8	+8
Activity $L_{Aeq.1\ hr}$	29.3 dB	39.3 dB	21.3 dB
Overall delivery activity noise (arrival, unloading, departure) $L_{Aeq\ 1\ hr}$	**39 dB**		

Table C2: 37 Bumpstead Road – Night time

Assessment project: Unit NE 1	Delivery component		
	Arrival	**Unloading**	**Departure**
Delviery noise activity - predicted ambient noise levels ($L_{Aeq\ 1\ hour}$)			
Closest residential property address:	**37 Bumpstead Road**		
Source noise level at 10 metres $L_{Aeq\ T}$	69	66	67
Time - minutes	2	40	0.5
Distance between noise source and residential property in metres	140	140	140
Screening attenuation	10	10	10
Convert to 1 hour - dB	-14.8	-1.8	-20.8
Distance attenuation correction - dB	-22.9	-22.9	-22.9
Nos of vehicle movements = 10 log 4	+5	+5	+5
Activity $L_{Aeq.1\ hr}$	25.3 dB	36.3 dB	18.3 dB
Overall delivery activity noise (arrival, unloading, departure) $L_{Aeq\ 1\ hr}$	**36 dB**		
Delivery noise activity - predicted peak noise levels (L_{Amax})			
Source noise level at 10 metres $L_{Aeq\ T}$	75	79	75
Distance between noise source and residential property in metres	140	140	140
Screening attenuation	10.0	10.0	10.0
Distance attenuation correction - dB	-22.9	-22.9	-22.9
Peak noise level L_{Amax}	**42 dB**	**46 dB**	**42 dB**

Table C3: 37 Bumpstead Road – Daytime

Assessment project:Unit NW 2	Delivery component		
	Arrival	**Unloading**	**Departure**
Delviery noise activity - predicted ambient noise levels ($L_{Aeq\ 1\ hour}$)			
Closest residential property address:	**37 Bumpstead Road**		
Source noise level at 10 metres $L_{Aeq\ T}$	69	66	67
Time - minutes	2	40	0.5
Distance between noise source and residential property in metres	170	170	170
Screening attenuation	10	10.0	10.0
Convert to 1 hour - dB	-14.8	-1.8	-20.8
Distance attenuation correction - dB	-25	-25	-25
Nos of Vehicle movements = 10 log 7	+8	+8	+8
Activity $L_{Aeq.1\ hr}$	27 dB	37 dB	19 dB
Overall delivery activity noise (arrival, unloading, departure) $L_{Aeq\ 1\ hr}$	**38 dB**		

Table C4: £7 Bumpstead Road – Night time

Assessment project: Unit NW 2	Delivery component		
	Arrival	**Unloading**	**Departure**
Delviery noise activity - predicted ambient noise levels ($L_{Aeq\ 1\ hour}$)			
Closest residential property address:	**37 Bumpstead Road**		
Source noise level at 10 metres $L_{Aeq\ T}$	69	66	67
Time - minutes	2	40	0.5
Distance between noise source and residential property in metres	170	170	170
Screening attenuation	10.0	10.0	10.0
Convert to 1 hour - dB	-14.8	-1.8	-20.8
Distance attenuation correction - dB	-22.9	-22.9	-22.9
Nos of vehicle movements = 10 log 4	+5	+5	+5
Activity $L_{Aeq.1\ hr}$	24 dB	34 dB	16 dB
Overall delivery activity noise (arrival, unloading, departure) $L_{Aeq\ 1\ hr}$	**35 dB**		
Delivery noise activity - predicted peak noise levels (L_{Amax})			
Source noise level at 10 metres $L_{Aeq\ T}$	75	79	75
Distance between noise source and residential property in metres	170	170	170
Screening attenuation (from Appendix B) dB	10.0	10.0	10.0
Distance attenuation correction - dB	-25	-25	-25
Peak noise level L_{Amax}	**40 dB**	**44 dB**	**40 dB**

Table C5: Copse Hall – Bumpstead Road

Assessment project:Unit SW 1	Delivery component		
	Arrival	**Unloading**	**Departure**
Delviery noise activity - predicted ambient noise levels ($L_{Aeq\ 1\ hour}$)			
Closest residential property address:	**Copse Hall**		
Source noise level at 10 metres $L_{Aeq\ T}$	69	66	67
Time - minutes	2	40	0.5
Distance between noise source and residential property in metres	150	150	150
Convert to 1 hour - dB	-14.8	-1.8	-20.8
Screening Loss	-10 dB	-10 dB	-10 dB
Distance attenuation correction - dB	-24	-24	-24
Nos of Vehicle movements = 10 log 3	+5	+5	+5
Activity $L_{Aeq.1\ hr}$	25 dB	35 dB	17 dB
Overall delivery activity noise (arrival, unloading, departure) $L_{Aeq\ 1\ hr}$	**36 dB**		

Table C6: Copse Hall – Bumpstead Road

Assessment project: Unit SW 1	Delivery component		
	Arrival	**Unloading**	**Departure**
Delviery noise activity - predicted ambient noise levels ($L_{Aeq\ 1\ hour}$)			
Closest residential property address:	**Copse Hall**		
Source noise level at 10 metres $L_{Aeq\ T}$	69	66	67
Time - minutes	2	40	0.5
Distance between noise source and residential property in metres	150	150	150
Convert to 1 hour - dB	-14.8	-1.8	-20.8
Screening Loss	-10 dB	-10 dB	-10 dB
Distance attenuation correction - dB	-22.9	-22.9	-22.9
Nos of vehicle movements = 10 log 2	+3	+3	+3
Activity $L_{Aeq.1\ hr}$	23 dB	33 dB	15 dB
Overall delivery activity noise (arrival, unloading, departure) $L_{Aeq\ 1\ hr}$	**34 dB**		
Delivery noise activity - predicted peak noise levels (L_{Amax})			
Source noise level at 10 metres $L_{Aeq\ T}$	75	79	75
Distance between noise source and residential property in metres	150	150	150
Screening attenuation	-10 dB	-10 dB	-10 dB
Distance attenuation correction - dB	-25	-25	-25
Peak noise level L_{Amax}	**40 dB**	**44 dB**	**40 dB**

Table C7: Copse Hall – Bumpstead Road

Assessment project:Unit SE 1	Delivery component		
	Arrival	**Unloading**	**Departure**
Delviery noise activity - predicted ambient noise levels ($L_{Aeq\ 1\ hour}$)			
Closest residential property address:	**Copse Hall**		
Source noise level at 10 metres $L_{Aeq\ T}$	69	66	67
Time - minutes	2	40	0.5
Distance between noise source and residential property in metres	220	220	220
Convert to 1 hour - dB	-14.8	-1.8	-20.8
Screening Loss	-10 dB	-10 dB	-10 dB
Distance attenuation correction - dB	-27	-27	-27
Nos of Vehicle movements = 10 log 3	+5	+5	+5
Activity $L_{Aeq.1\ hr}$	22 dB	32 dB	14 dB
Overall delivery activity noise (arrival, unloading, departure) $L_{Aeq\ 1\ hr}$	**33 dB**		

Table C8: Copse Hall – Bumpstead Road

Assessment project: Unit SE 1	Delivery component		
	Arrival	**Unloading**	**Departure**
Delviery noise activity - predicted ambient noise levels ($L_{Aeq\ 1\ hour}$)			
Closest residential property address:	**Copse Hall**		
Source noise level at 10 metres $L_{Aeq\ T}$	69	66	67
Time - minutes	2	40	0.5
Distance between noise source and residential property in metres	220	220	220
Convert to 1 hour - dB	-14.8	-1.8	-20.8
Screening Loss	-10 dB	-10 dB	-10 dB
Distance attenuation correction - dB	-27	-27	-27
Nos of vehicle movements = 10 log 2	+3	+3	+3
Activity $L_{Aeq.1\ hr}$	20 dB	30 dB	12 dB
Overall delivery activity noise (arrival, unloading, departure) $L_{Aeq\ 1\ hr}$	**31 dB**		
Delivery noise activity - predicted peak noise levels (L_{Amax})			
Source noise level at 10 metres $L_{Aeq\ T}$	75	79	75
Distance between noise source and residential property in metres	220	220	220
Screening attenuation	-10 dB	-10 dB	-10 dB
Distance attenuation correction - dB	-27	-27	-27
Peak noise level L_{Amax}	**38 dB**	**42 dB**	**38 dB**

APPENDIX D

BS 4142:2014 ASSESSMENT

Appendix D1: BS 4142:2014 Assessment – 37 Bumpstead Road

Results	Time period		Relevant clause	Commentary
	Daytime	Night Time		
Background sound level	46 dB	40 dB	**8.1, 8.1.3**	Background sound level is the based on measured noise levels for the period being assessed.
Specific sound level - predicted delivery event noise level	41 dB	39 dB		Predicted service yard activity from Table 4.2
Acoustic feature correction	+3 dB		**9.2**	Delivery activity noise is typically characterised by a series of short impulsive bangs, crashes and 'rattles' associated with the movement of produce roll cages. At night the noise sensitive location is inside with windows open. The impulsivity associated with a delivery event is considered to be just perceptible (within the bedroom).
Rating level	44 dB	42 dB	**9.2**	
Background sound level	46 dB	40 dB	**8.1** **8.1.3**	
Excess of rating level over background level	-2	-1	**11**	
Assessment is indicative of low impact.	**Relevant clause 11** The context is: 1. Predicted delivery event noise levels are within the WHO daytime guideline values (50 - 55 dB LAeq16hr) and night time guideline values (45 dB LAeq8hr) 2. The predicted noise levels are well below the existing ambient noise levels; 3. Calculations are based on screening from buildings and acoustic fence around service yards.			
Uncertainty of the assessment	**Relevant clause 10**			
	In this instance the uncertainty of the measurement does not have any significance to the outcome of the assessment.			

Appendix D2: BS 4142:2014 Assessment – Copse Hall, Bumpstead Road

Results	Time period		Relevant clause	Commentary
	Daytime	Night time		
Background sound level	50 dB	45 dB	**8.1, 8.1.3**	Background sound level is the based on measured noise levels at ML 2 for the period being assessed.
Specific sound level - predicted delivery event noise level	38 dB	36 dB		Predicted service yard activity from Table 4.3
Acoustic feature correction	+3 dB		**9.2**	Service activity noise is typically characterised by a series of short impulsive bangs, crashes and 'rattles' . At night the noise sensitive location is inside with windows open. The impulsivity associated with a delivery event is considered to be just perceptible (within the bedroom).
Rating level	41 dB	50 dB	**9.2**	
Background sound level	50 dB	45 dB	**8.1** **8.1.3**	
Excess of rating level over background level	-9	-6	**11**	
Assessment is indicative of low impact.	**Relevant clause 11** The context is: 1. Predicted delivery event noise levels are within the WHO daytime guideline values (50 - 55 dB LAeq16hr) and night time guideline value (45 dB $L_{Aeq\,8\,hours}$). 2. The predicted noise levels are within the existing daytime and ambient noise levels measured at ML2 3. The overall change in noise level resulting from servicing activity will be negligible			
Uncertainty of the assessment	**Relevant clause 10**			
	The excess of the rating level over the background sound level is -9 during the daytime and -6 dB at night, in this instance the uncertainty of the assessment based on the short survey period would not have any significance to the outcome of the assessment.			

APPENDIX E

ACOUSTIC TERMINOLOGY

Acoustic Terminology

A1 Noise, defined as unwanted sound, is measured in units of decibels, dB. The range of audible sounds 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 dB + 50 dB = 53 dB. Increases in continuous sound are perceived in the following manner:

1 dB increase - barely perceptible.

3 dB increase - just noticeable.

10 dB increase - perceived as twice as loud.

A2 Frequency (or pitch) of sound is measured in units of Hertz. 1 Hertz (Hz) = 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.

A3 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 automatically to 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).

A4 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.

A5 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 different noises has been found to vary dependent on the type and temporal distribution of a particular type of noise. A set of statistical indices have been developed for the subjective response to these different noise sources.

A6 The main noise indices in use in the UK are:

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

L_{Aeq}: The equivalent continuous sound level in dBA. This unit may be described as "the notional steady noise level that would provide, over a period, the same energy as the intermittent noise". 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 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 measured in any given period. This unit is used to measure and assess transient noises, i.e. gun shots, individual vehicles, etc.

A7 The sound energy of a transient event may be described by a term SEL - Sound Exposure Level. This is the L_{Aeq} level normalised to one second. That is the constant level in dBA which lasting for one second has the same amount of acoustic energy as a given A weighted noise event lasting for a period of time. The use of this unit allows the prediction of the L_{Aeq} level over any period and for any number of events using the equation;

$$L_{AeqT} = SEL + 10 \log n - 10 \log T \text{ dB}.$$

Where

n = Number of events in time period T.

T = Total sample period in seconds.

A8 In the open, known as free field, sound attenuates at a rate of 6 dB per each doubling of distance. This is known as geometric spreading or sometimes referred to as the Inverse Square Law. As noise is measured on a Logarithmic scale, this attenuation in distance = 20 Log (ratio of distances), e.g. for a noise level of 60 dB at ten metres, the corresponding level at 160 metres is:

$$60 - 20 \text{ Log } {}^{160}/_{10} = 60 - 24 = 36 \text{ dB}$$