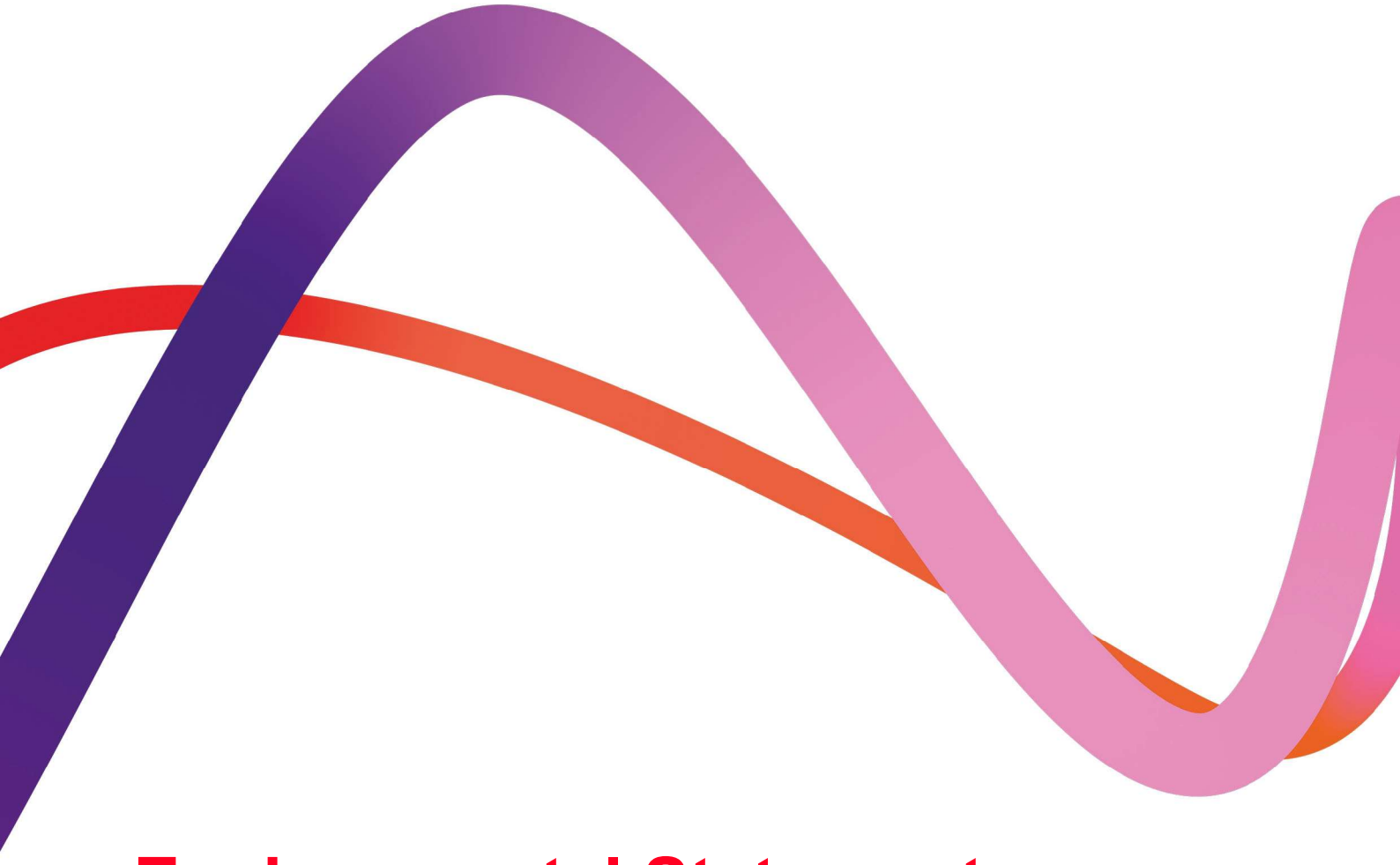
Canford Energy from Waste
Combined Heat and Power Facility



Environmental Statement
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Noise and Vibration

June 2023

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Contents

1. Baseline Sound Survey

1.1.1 The existing noise environment in the vicinity of the Proposed Development is dominated by the existing waste treatment site and Magna Road/A341 to the north. The main traffic exists on Magna Road/A341 between Oakley and Bear Cross.

1.1.2 Unattended long term (LT) sample measurements were undertaken between 09:15 on Thursday 7 July 2022 and 14:56 hours on Wednesday 13 July 2022 at monitoring locations LT1-LT3. Monitoring locations ST1-ST3 are presented in **Figure 1-1**.

Figure 1-1: Measurement Locations

1.1.3 Ambient noise levels were measured using the equipment detailed in **Table 1-1**.

Table 1-1: Monitoring Equipment Details (at time of surveys)

Date of Monitoring	Item of Equipment	Serial No.	Date Last Calibrated	Date Calibration Due
07/07/2022 (ST1-ST3)	Rion NA-28 Class 1 Real-Time 1/3 Octave Integrating Sound Analyser	00711681	18/06/2021	18/06/2023
	Rion NC-74 Acoustic Calibrator	34746695	28/03/2022	28/03/2023
07/07/2022 – 13/07/2022 (LT1)	Rion NL-32 Class 1 Integrating Datalogger Sound Level Meter	630460	21/04/2022	21/04/2024
07/07/2022 – 13/07/2022 (LT2)	Rion NL-31 Class 1 Integrating Datalogger Sound Level Meter	410229	06/01/2022	06/01/2024
07/07/2022 – 13/07/2022 (LT3)	Rion NL-32 Class 1 Integrating Datalogger Sound Level Meter	623771	29/09/2020	29/09/2022
07/07/22 – 13/07/22 (LT1-3)	Rion NC-74 Acoustic Calibrator	34746695	28/03/2022	28/03/2023

1.1.4 Measurements were obtained using the 'F' time weighting and A-weighting frequency network. The sound level meter was calibrated before and after each survey period using a Rion NC-74 Class 1 Acoustic Calibrator. No drift in the calibration levels were recorded during either survey period. The measurements were undertaken with the microphone at a height of 1.5m above ground level.

1.1.5 $L_{Amax,F}$, $L_{A10,T}$, $L_{Aeq,T}$, $L_{A50,T}$ and $L_{A90,T}$ noise levels were measured at each of the attended monitoring locations. Measured levels were obtained over three consecutive five-minute periods, with the 15-minute cumulative levels derived using combination of logarithmic and arithmetic averaging.

1.1.6 Weather conditions during the attended baseline monitoring surveys were recorded using a handheld weather anemometer. The conditions on Thursday 7 July 2022 were observed as full cloud cover in the morning, with sunny clear skies in the afternoon. Wind speeds were mostly below 0.5m/s, with occasional gusts up to 2m/s. No rain was observed. The temperature at the start of the survey was 19.5°C rising steadily to 26°C at the end of the monitoring period.

1.2 Attended Sound Survey Results

The survey results, along with comments and observations, are presented in **Table 1-2**.

Table 1-2: Attended Ambient Baseline Noise Measurements and Comments – 7 July 2022

Monitoring Location	Start Time	Dur (mins)	Measured Noise Levels, dB re. 2 x 10-5 Pa.					Comments
			$L_{Amax,F}$	$L_{A10,5min}$	$L_{Aeq,5min}$	$L_{A50,5min}$	$L_{A90,5min}$	
ST2	11:15:00	5	61.7	45.2	43.3	42.2	40.2	Overcast Wind: 0m/s (Gusting 0.5 m/s) Hum: 63% Temp: 19.5°c Dominant: Birds & trees moving Max: Voices Other sources: Horses, Road just audible
	11:20:00	5	64.4	47.2	46.7	42.8	40.7	
	11:25:00	5	47.1	43.9	42.1	41.6	40.1	
ST1	11:15:00	5	61.7	45.2	43.3	42.2	40.2	Wind: 0.5m/s Dominant: Main road Max: Cars on nearby road / Motorbike Other sources: Crickets & birds, Voices, Reversing alarm from site, Jet plane, Shouts from housing site, Dumper, Loud plant on housing site
	11:20:00	5	64.4	47.2	46.7	42.8	40.7	
	11:25:00	5	47.1	43.9	42.1	41.6	40.1	
ST3	12:40:00	5	58.9	49.7	48.2	47.7	46.1	Wind: 1-1.5m/s (gusting to 2 m/s) Dominant: Plant & alarms from main site Max: Birds Other sources: Crickets, Wind in trees, Housing site audible
	12:45:00	5	63.6	51.1	49.2	48.5	46.5	
	12:50:00	5	58.3	50.7	48.4	47.8	45.6	
ST2	13:20:00	5	53.0	39.6	38.4	37.4	36.5	Wind: 0m/s Dominant: Road Max: Motorbikes on road Other sources: Birds, Site just audible
	13:25:00	5	48.5	40.6	39.0	38.6	36.7	
	13:30:00	5	54.7	40.1	39.3	37.8	36.7	

Monitoring Location	Start Time	Dur (mins)	Measured Noise Levels, dB re. 2 x 10-5 Pa.					Comments
			$L_{Amax,F}$	$L_{A10,5min}$	$L_{Aeq,5min}$	$L_{A50,5min}$	$L_{A90,5min}$	
ST1	13:55:00	5	73.2	57.4	56.9	47.1	44.3	Wind: 0.5m/s Dominant: Main road constant Max: Vehicle passes on near road Other sources: Jet planes (x3), Voices, Crickets, Plant moving on road, Children shouting, Bangs from site
	14:00:00	5	72.1	60.9	57.7	44.7	40.8	
	14:05:00	5	79.7	48.6	54.4	43.8	41.5	
ST3	14:55:00	5	61.8	47.4	46.3	45.6	44.2	Wind: 0.5m/s Dominant: Site noise (plant, alarms, bangs) Max: Shouts from mountain bikers Other sources: Birds, Housing site plant & alarms
	15:00:00	5	66.8	50.1	48.1	46.5	44.7	
	15:05:00	5	54.5	49.2	47.4	47.0	45.2	
ST2	15:40:00	5	70.4	38.9	40.3	36.6	35.6	Wind: 0m/s Temp: 25°c Dominant: Road Max: Dog barking Other sources: Birds, Site just audible, Insects, Trees moving, Voices.

1.2.1 **Table 1-2** shows that ambient daytime $L_{Aeq,15min}$ noise levels ranged between 38.9 and 59.8 dB across all locations. Background $L_{A90,15min}$ noise levels ranged from 36.2 to 46.1 dB across the three attended measurement locations.

1.2.2 During the attended survey on the 7 July 2022, the main source of sound observed at ST1 was road traffic noise from Magna Road/A341. Other sources of environmental sound observed at ST1 included audible activity from the existing recycling facility and the housing construction site located on Provence Drive.

1.2.3 On the same day, the main source of sound observed at ST2 was road traffic noise from Magna Road/A341. Other sources of environmental sound observed at ST2 included local wildlife and low-level activity noise from the existing Canford Resource Park (CRP).

1.2.4 The main source of sound observed at ST3 were activities from the existing recycling facility. Other sources of environmental sound observed at ST3 included local wildlife and the housing construction site located on Provence Drive.

1.3 Unattended Sound Survey Results

1.3.1 Daytime $L_{Aeq,16hr}$ and night-time $L_{Aeq,8hr}$ ambient sound levels presented **in Table 1-3, Table 1-4** and **Table 1-5** have been calculated using logarithmic averaging, whilst mean $L_{Amax,F}$ and $L_{A90,T}$ sound levels have been calculated using arithmetic averaging. The ranges of 15-minute values over which each logarithmic or mean value has been calculated are shown in parenthesis.

1.3.2 A summary of the unattended monitoring results at LT1 is presented in **Table 1-3**.

Table 1-3: Summary of unattended sound monitoring results at LT1

Day of Measurement	Date	Measured Noise Levels, dB re. 2 x 10^{-5} Pa.											
		Daytime (07:00 – 19:00)				Evening (19:00 – 23:00)				Night-time (23:00 – 07:00)			
		$L_{Amax,F}$	$L_{A10,15\ min}$	$L_{Aeq,15\ min}$	$L_{A90,15\ min}$	$L_{Amax,F}$	$L_{A10,15\ min}$	$L_{Aeq,15\ min}$	$L_{A90,15\ min}$	$L_{Amax,F}$	$L_{A10,15\ min}$	$L_{Aeq,15\ min}$	$L_{A90,15\ min}$
Thu	07-Jul-22	61 (50-86)[2]	45 (41-51)[2]	46 (41-52)[2]	40 (38-42)[2]	52 (41-75)	40 (35-49)	44 (34-54)	35 (33-37)	49 (36-75)	40 (34-52)	44 (33-56)	35 (32-39)
Fri	08-Jul-22	60 (52-80)	47 (44-57)	49 (41-59)	43 (37-46)	53 (44-79)	42 (37-46)	46 (36-56)	37 (35-41)	49 (37-68)	39 (33-49)	39 (32-46)	34 (31-36)
Sat	09-Jul-22	60 (47-80)	46 (44-52)	48 (41-56)	42 (34-46)	56 (47-65)	39 (35-43)	40 (35-45)	34 (32-39)	48 (36-77)	36 (30-48)	42 (29-55)	30 (27-34)
Sun	10-Jul-22	58 (47-79)	46 (39-52)	48 (37-57)	42 (30-48)	53 (44-76)	39 (36-45)	45 (34-55)	34 (32-38)	52 (39-77)	39 (31-50)	45 (30-56)	34 (28-42)
Mon	11-Jul-22	60 (45-76)	47 (42-52)	47 (40-55)	43 (37-48)	52 (40-75)	41 (37-46)	44 (36-52)	35 (32-38)	50 (42-70)	43 (37-50)	41 (36-47)	39 (35-41)
Tue	12-Jul-22	61 (49-77)	48 (44-62)	50 (43-59)	44 (40-47)	50 (44-72)	42 (41-44)	44 (39-54)	39 (38-41)	51 (44-76)	44 (40-50)	46 (39-56)	40 (38-42)
Wed	13-Jul-22	65 (53-82)[2]	50 (47-59)[2]	52 (46-58)[2]	46 (44-50)[2]								
Mean Average		61 (58-65)	47 (45-50)	49 (46-52)	43 (40-46)	53 (50-56)	41 (39-42)	44 (40-46)	36 (34-39)	50 (48-52)	40 (36-44)	43 (39-46)	35 (30-40)

Notes:
[1] the range of 15-minute levels measured during the monitoring periods are shown in parenthesis;
[2] incomplete daytime periods due to equipment set-up/retrieval;

1.3.3 The results of the unattended sound monitoring show that during daytime periods, ambient sound levels ranged between 46 and 52 dB $L_{Aeq,12hr,}$ with a mean level of 49 dB $L_{Aeq,12hr}$.

1.3.4 Mean background sound levels measured during the daytime periods ranged between 40 and 46 dB $L_{A90,12hr}$. The overall mean 12-hour daytime background sound level measured over the 7-day monitoring period was 43 dB $L_{A90,12hr}$.

1.3.5 The results of unattended sound monitoring show that during evening periods, ambient sound levels ranged between 40 and 46 dB $L_{Aeq,4hr,}$ with a mean level of 44 dB $L_{Aeq,4hr}$.

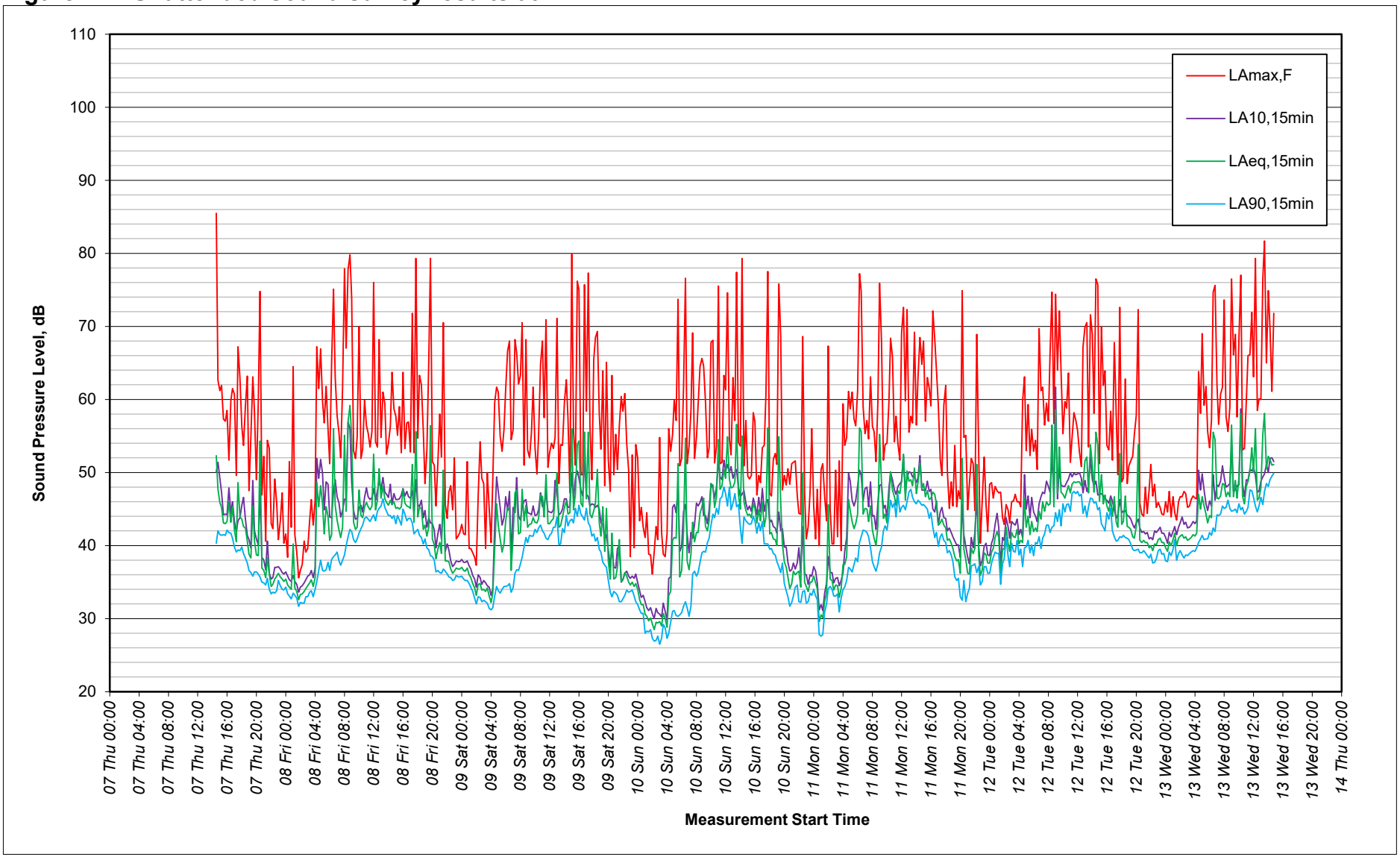
1.3.6 Mean background sound levels measured during the evening periods ranged between 34 and 39 dB $L_{A90,4hr}$. The overall mean 4-hour daytime background sound level measured over the 7-day monitoring period was 36 dB $L_{A90,16hr}$.

1.3.7 During night-time periods ambient sound levels ranged between ranged between 39 and 46 dB $L_{Aeq,8hr,}$ with a mean level of 43 dB $L_{Aeq,8hr}$.

1.3.8 Mean background sound levels measured during the night-time periods ranged between 30 and 40 dB $L_{A90,8hr}$ with an overall mean value of 35 dB $L_{A90,8hr}$.

1.3.9 The results of the unattended sound monitoring at LT1 are presented graphically on **Figure 1-2**.

Figure 1-2: Unattended sound survey results at LT1



1.3.10 A summary of the unattended monitoring results at LT2 is presented in **Table 1-4.**

Table 1-4: Summary of unattended sound monitoring results at LT2

Day of Measurement	Date	Measured Noise Levels, dB re. 2 x 10^{-5} Pa.											
		Daytime (07:00 – 19:00)				Evening (19:00 – 23:00)				Night-time (23:00 – 07:00)			
		$L_{Amax,F}$	$L_{A10,15\ min}$	$L_{Aeq,15\ min}$	$L_{A90,15\ min}$	$L_{Amax,F}$	$L_{A10,15\ min}$	$L_{Aeq,15\ min}$	$L_{A90,15\ min}$	$L_{Amax,F}$	$L_{A10,15\ min}$	$L_{Aeq,15\ min}$	$L_{A90,15\ min}$
Thu	07-Jul-22	62 (46-89) [2]	41 (37-45) [2]	50 (35-59) [2]	33 (33-34) [2]	53 (43-75)	38 (35-50)	44 (34-55)	32 (31-35)	46 (35-73)	35 (28-47)	41 (26-54)	28 (22-39)
Fri	08-Jul-22	60 (48-79)	43 (38-56)	48 (37-58)	35 (33-38)	54 (44-76)	40 (37-45)	45 (36-55)	35 (33-38)	49 (37-64)	35 (29-47)	36 (27-42)	29 (23-34)
Sat	09-Jul-22	59 (44-79)	43 (37-48)	47 (35-56)	35 (31-39)	53 (38-75)	37 (33-42)	38 (32-44)	32 (30-34)	46 (34-76)	33 (27-42)	40 (25-54)	27 (22-31)
Sun	10-Jul-22	56 (44-83)	40 (33-50)	46 (33-57)	32 (29-34)	54 (42-76)	35 (29-44)	45 (28-56)	29 (26-34)	47 (32-78)	32 (25-44)	44 (24-57)	27 (22-35)
Mon	11-Jul-22	56 (47-79)	41 (36-51)	44 (34-56)	33 (31-35)	49 (35-71)	33 (27-40)	41 (27-52)	28 (26-32)	45 (32-73)	32 (26-43)	38 (25-49)	27 (23-35)
Tue	12-Jul-22	61 (45-77)	42 (36-61)	48 (34-58)	33 (30-36)	49 (37-74)	36 (32-41)	44 (30-55)	30 (29-33)	48 (33-77)	34 (26-53)	44 (23-55)	27 (21-39)
Wed	13-Jul-22	65 (46-79) [2]	43 (37-58) [2]	50 (36-57) [2]	34 (33-40) [2]								
Mean Average		60 (56-65)	42 (40-43)	48 (44-50)	34 (32-35)	52 (49-54)	37 (33-40)	43 (38-45)	31 (28-35)	47 (45-49)	34 (32-35)	41 (36-44)	28 (27-29)

Notes:
[1] the range of 15-minute levels measured during the monitoring periods are shown in parenthesis;
[2] incomplete daytime periods due to equipment set-up / retrieval;

1.3.11 The results of unattended sound monitoring show that during daytime periods, ambient sound levels ranged between 44 and 50 dB $L_{Aeq,12hr,}$ with a mean level of 48 dB $L_{Aeq,12hr}$.

1.3.12 Mean background sound levels measured during the daytime periods ranged between 32 and 35 dB $L_{A90,12hr}$. The overall mean 12-hour daytime background sound level measured over the 7-day monitoring period was 34 dB $L_{A90,12hr}$.

1.3.13 The results of unattended sound monitoring show that during evening periods, ambient sound levels ranged between 38 and 45 dB $L_{Aeq,4hr,}$ with a mean level of 43 dB $L_{Aeq,4hr}$.

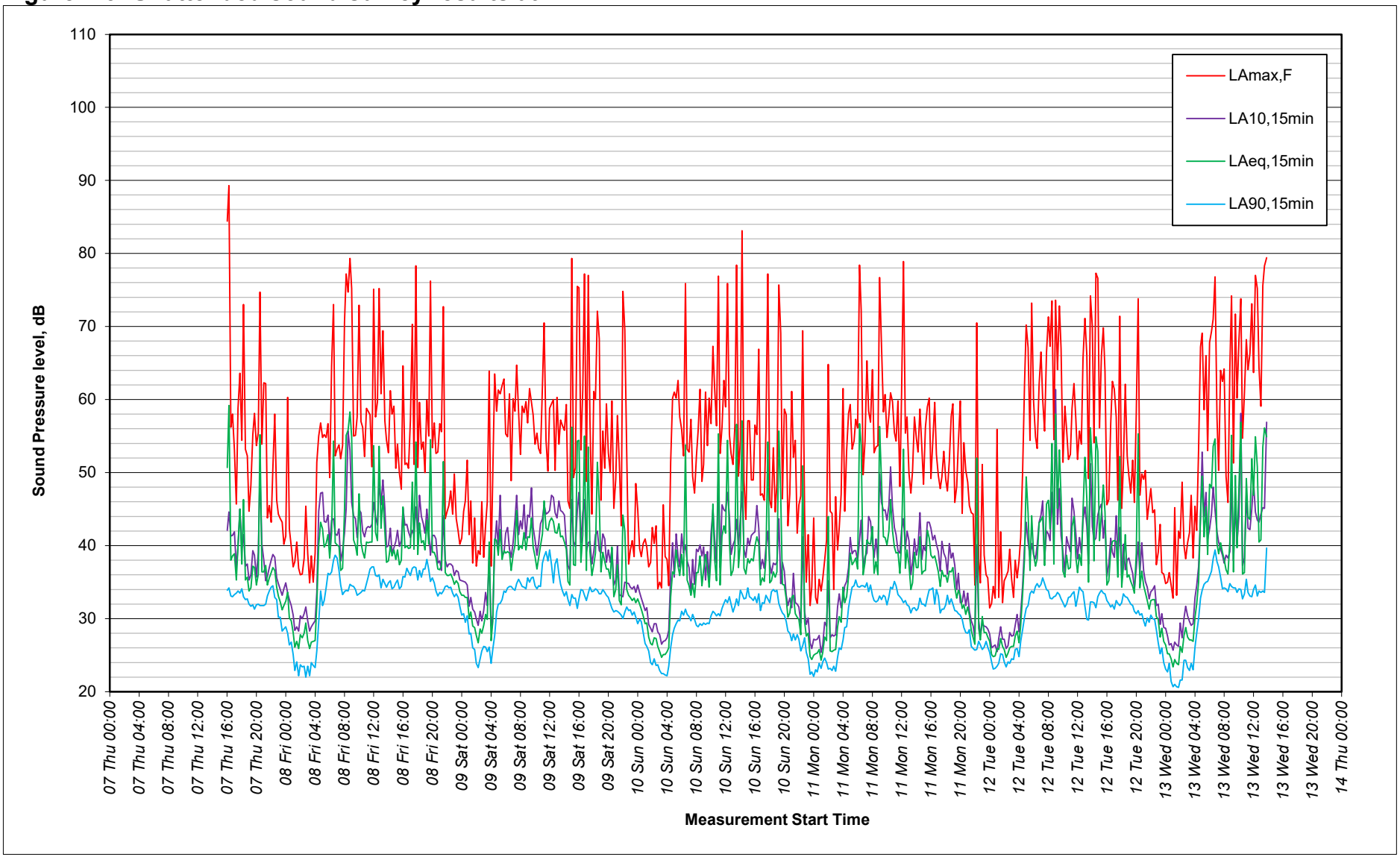
1.3.14 Mean background sound levels measured during the evening periods ranged between 28 and 35 dB $L_{A90,4hr}$. The overall mean 4-hour daytime background sound level measured over the 7-day monitoring period was 31 dB $L_{A90,16hr}$.

1.3.15 During night-time periods ambient sound levels ranged between ranged between 36 and 44 dB $L_{Aeq,8hr,}$ with a mean level of 41 dB $L_{Aeq,8hr}$.

1.3.16 Mean background sound levels measured during the night-time periods ranged between 27 and 29 dB $L_{A90,8hr}$ with an overall mean value of 28 dB $L_{A90,8hr}$.

1.3.17 The results of the unattended sound monitoring at LT2 are presented graphically on **Figure 1-3**.

Figure 1-3: Unattended sound survey results at LT2



1.3.18 A summary of the unattended monitoring results at LT3 is presented in **Table 1-5**.

Table 1-5: Summary of unattended sound monitoring results at LT3

Day of Measurement	Date	Measured Noise Levels, dB re. 2 x 10^{-5} Pa.											
		Daytime (07:00 – 19:00)				Evening (19:00 – 23:00)				Night-time (23:00 – 07:00)			
		$L_{Amax,F}$	$L_{A10,15\ min}$	$L_{Aeq,15\ min}$	$L_{A90,15\ min}$	$L_{Amax,F}$	$L_{A10,15\ min}$	$L_{Aeq,15\ min}$	$L_{A90,15\ min}$	$L_{Amax,F}$	$L_{A10,15\ min}$	$L_{Aeq,15\ min}$	$L_{A90,15\ min}$
Thu	07-Jul-22	61 (50-87) [2]	47 (44-49) [2]	48 (43-52) [2]	45 (42-46) [2]	50 (41-72)	39 (35-47)	42 (34-52)	36 (33-41)	48 (39-74)	41 (37-52)	44 (36-56)	38 (35-44)
Fri	08-Jul-22	63 (54-79)	50 (46-58)	50 (45-59)	47 (43-49)	54 (43-78)	43 (40-46)	46 (39-56)	40 (38-43)	50 (43-59)	43 (40-50)	42 (39-46)	39 (38-43)
Sat	09-Jul-22	60 (48-79)	49 (45-54)	50 (44-54)	46 (43-49)	55 (43-68)	42 (40-45)	43 (39-48)	40 (37-43)	49 (41-74)	42 (39-51)	42 (37-52)	37 (35-40)
Sun	10-Jul-22	58 (47-78)	48 (44-52)	49 (42-56)	46 (41-49)	51 (39-73)	39 (34-45)	45 (33-53)	36 (31-42)	48 (38-73)	41 (36-51)	45 (35-56)	37 (33-48)
Mon	11-Jul-22	59 (48-75)	48 (44-55)	49 (43-55)	46 (42-49)	53 (47-67)	43 (40-46)	43 (39-50)	40 (37-43)	52 (42-75)	43 (39-53)	45 (38-55)	39 (37-44)
Tue	12-Jul-22	66 (49-116)[3]	51 (42-70) [3]	76 (41-93) [3]	44 (40-51) [3]	50 (42-73)	42 (38-53)	44 (37-54)	37 (35-39)	50 (39-74)	43 (36-56)	46 (35-55)	38 (34-44)
Wed	13-Jul-22	65 (56-80)[2]	49 (47-59) [2]	51 (46-57) [2]	45 (44-46) [2]								
Mean Average		61 (58-65)	49 (47-50)	50 (48-51)	46 (45-47)	52 (50-55)	41 (39-43)	44 (42-46)	38 (36-40)	50 (48-52)	42 (41-43)	44 (42-46)	38 (37-39)

Notes:
[1] the range of 15-minute levels measured during the monitoring periods are shown in parenthesis;
[2] incomplete daytime periods due to equipment set-up / retrieval; and
[3] period discounted from average due to unknown event.

1.3.19 The results of unattended sound monitoring show that during daytime periods, ambient sound levels ranged between 48 and 51 dB $L_{Aeq,12hr,}$ with a mean level of 50 dB $L_{Aeq,12hr}$.

1.3.20 Mean background sound levels measured during the daytime periods ranged between 45 and 47 dB $L_{A90,12hr}$. The overall mean 12-hour daytime background sound level measured over the 7-day monitoring period was 46 dB $L_{A90,12hr}$.

1.3.21 The results of unattended sound monitoring show that during evening periods, ambient sound levels ranged between 42 and 46 dB $L_{Aeq,4hr,}$ with a mean level of 44 dB $L_{Aeq,4hr}$.

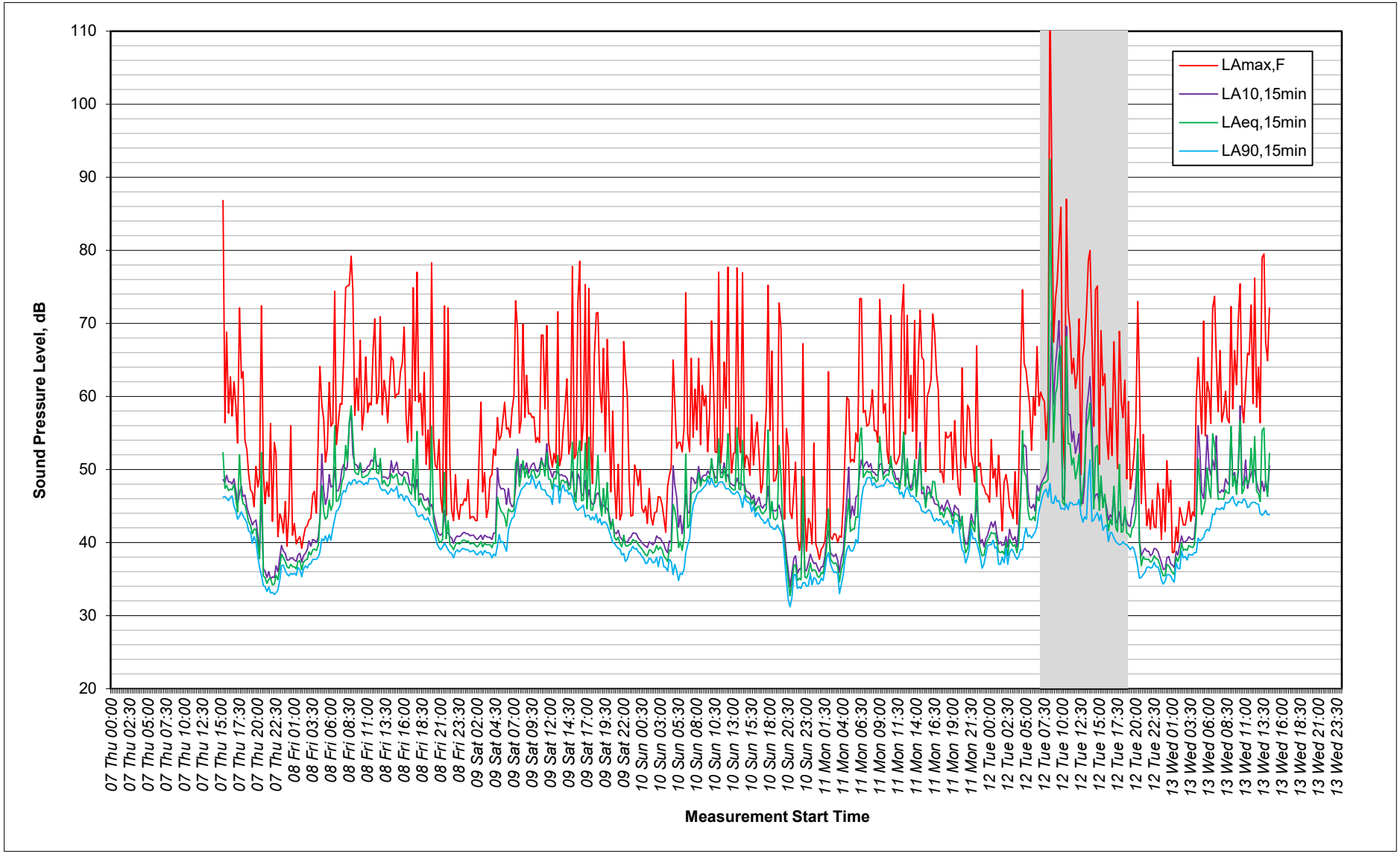
1.3.22 Mean background sound levels measured during the evening periods ranged between 36 and 40 dB $L_{A90,4hr}$. The overall mean 4-hour daytime background sound level measured over the 7-day monitoring period was 38 dB $L_{A90,16hr}$.

1.3.23 During night-time periods ambient sound levels ranged between ranged between 42 and 46 dB $L_{Aeq,8hr,}$ with a mean level of 44 dB $L_{Aeq,8hr}$.

1.3.24 Mean background sound levels measured during the night-time periods ranged between 37 and 39 dB $L_{A90,8hr}$ with an overall mean value of 38 dB $L_{A90,8hr}$.

1.3.25 The results of the unattended sound monitoring at LT3 are presented graphically on **Figure 1-4.**

Figure 1-4: Unattended sound survey results at LT3



Note: Highlighted section of data excluded due to unrepresentative event(s).

Derivation of Ambient and Background Sound Levels

1.3.26 The results of the sound monitoring at unattended locations provide an indication of the diurnal variation in sound levels in the vicinity of the Proposed Development, whilst short-term attended measurements provide an indication of the variation in sound levels between the unattended and attended locations.

1.3.27 The results of the attended sound measurements have been compared with the corresponding levels measured at LT1, LT2 and LT3, with the calculated difference used to derive a correction factor to extrapolate mean 16-hour and 8-hour $L_{Aeq,T}$ sound levels at the attended monitoring locations.

Ambient Sound Levels

1.3.28 The $L_{Aeq,5min}$ ambient sound levels measured at ST1 have been compared to corresponding levels measured at LT1, $L_{Aeq,5min}$ sound levels at ST2 have been compared to corresponding levels measured LT2, and $L_{Aeq,5min}$ sound levels at ST3 has been compared to corresponding levels measured LT3.

1.3.29 The daytime ambient sound levels measured at LT1, LT2 and LT3 during the coincident time periods with the attended measurements are presented in **Table 1-6**.

Table 1-6: Comparison of daytime ambient sound levels measured at LT1, LT2 LT3 and attended locations (ST1, ST2 & ST3)

Measurement Time	Ambient Sound Level, dB $L_{Aeq,5min}$					
	LT1	ST1	LT2	ST2	LT3	ST3
11:15:00	-	-	42.2	43.3	-	-
11:20:00	-	-	42.8	46.7	-	-
11:25:00	-	-	40.7	42.1	-	-
12:05:00	45.1	59.2	-	-	-	-
12:10:00	44.6	57.2	-	-	-	-
12:15:00	56.0	61.8	-	-	-	-
12:40:00	-	-	-	-	49.0	48.2
12:45:00	-	-	-	-	48.2	49.2
12:50:00	-	-	-	-	47.1	48.4
13:20:00	-	-	40.0	38.4	-	-
13:25:00	-	-	36.9	39.0	-	-
13:30:00	-	-	39.5	39.3	-	-
13:55:00	51.4	56.9	-	-	-	-
14:00:00	49.7	57.7	-	-	-	-

Measurement Time	Ambient Sound Level, dB $L_{Aeq,5min}$					
	LT1	ST1	LT2	ST2	LT3	ST3
14:05:00	42.2	54.4	-	-	-	-
14:55:00	-	-	-	-	47.5	46.3
15:00:00	-	-	-	-	47.6	48.1
15:05:00	-	-	-	-	48.4	47.4
15:40:00	-	-	42.1	40.3	-	-
15:45:00	-	-	38.3	38.3	-	-
15:50:00	-	-	38.5	39.6	-	-
Average Difference (ST minus LT)	+9.7		+0.7		0.0	

1.3.30 Due to influence on the attended sound measurements at ST1 from the local residential construction site, the difference between LT1 and ST1 has been discounted. Assumed ambient sound levels at ST1 are based directly on measurements at LT1.

1.3.31 The corrections have not been applied to the night-time ambient levels as the existing recycling facility site does not operate during the night-time period.

1.3.32 The extrapolated free-field ambient sound levels at all measurement locations are presented in **Table 1-7**.

Table 1-7: Derived free-field ambient sound levels

Measurement Time	Derived Free-field Ambient sound levels, dB re. 2x 10^{-5} Pa		
	Daytime $L_{Aeq,12hr}$	Evening $L_{Aeq,4hr}$	Night $L_{Aeq,8hr}$
LT1	49	44	43
LT2	48	43	41
LT3	50	44	44
ST1	49	44	43
ST2	49	44	41
ST3	50	44	44

Background Sound Levels

1.3.33 Histograms of the background $L_{A90,15min}$ sound levels measured at LT1, LT2 and LT3 are presented in **Figure 1-5, Figure 1-6** and **Figure 1-7,** respectively.

Figure 1-5: Modal Analysis of Background LA90,15min Sound Levels Measured at LT1

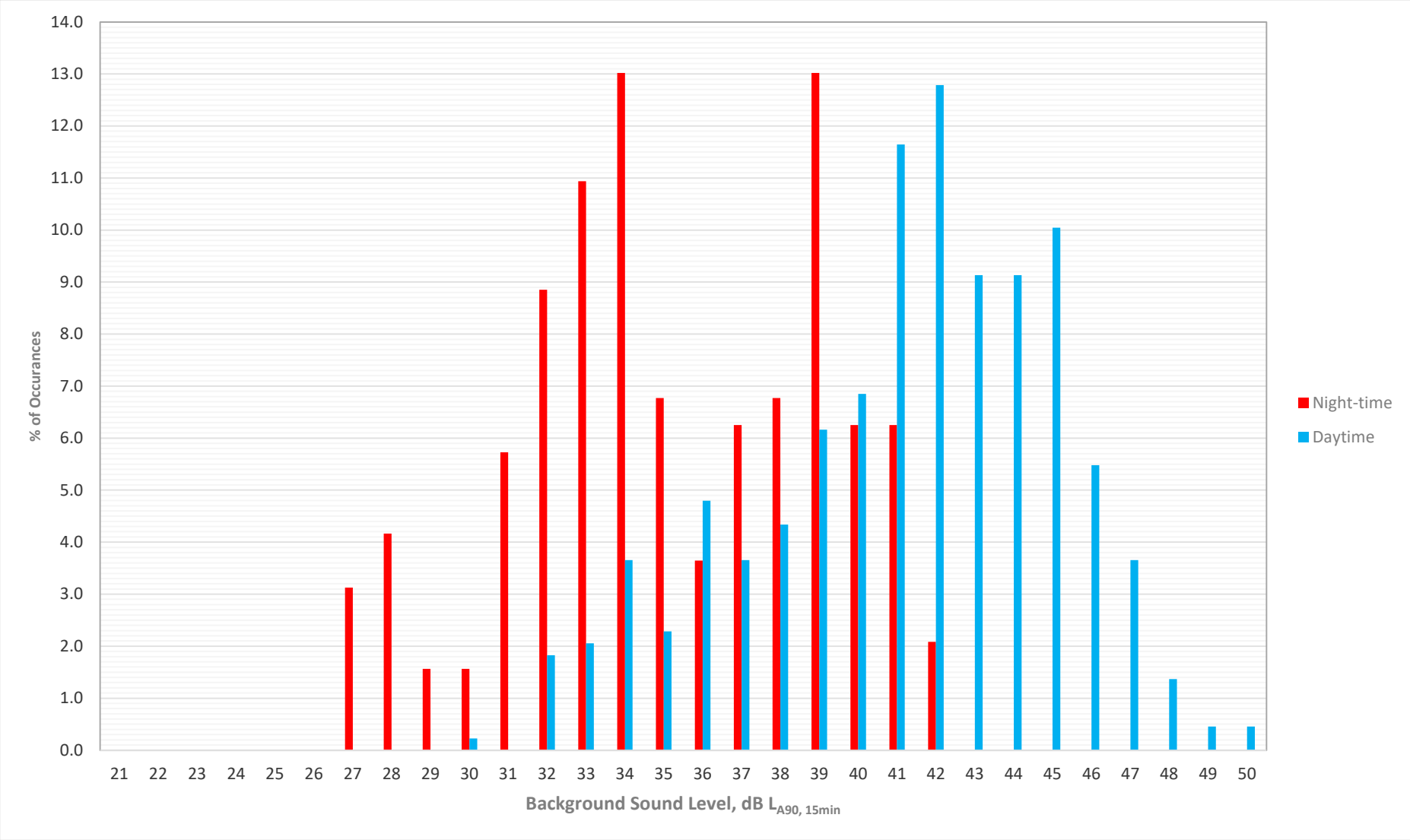


Figure 1-6: Modal Analysis of Background LA90,15min Sound Levels Measured at LT2

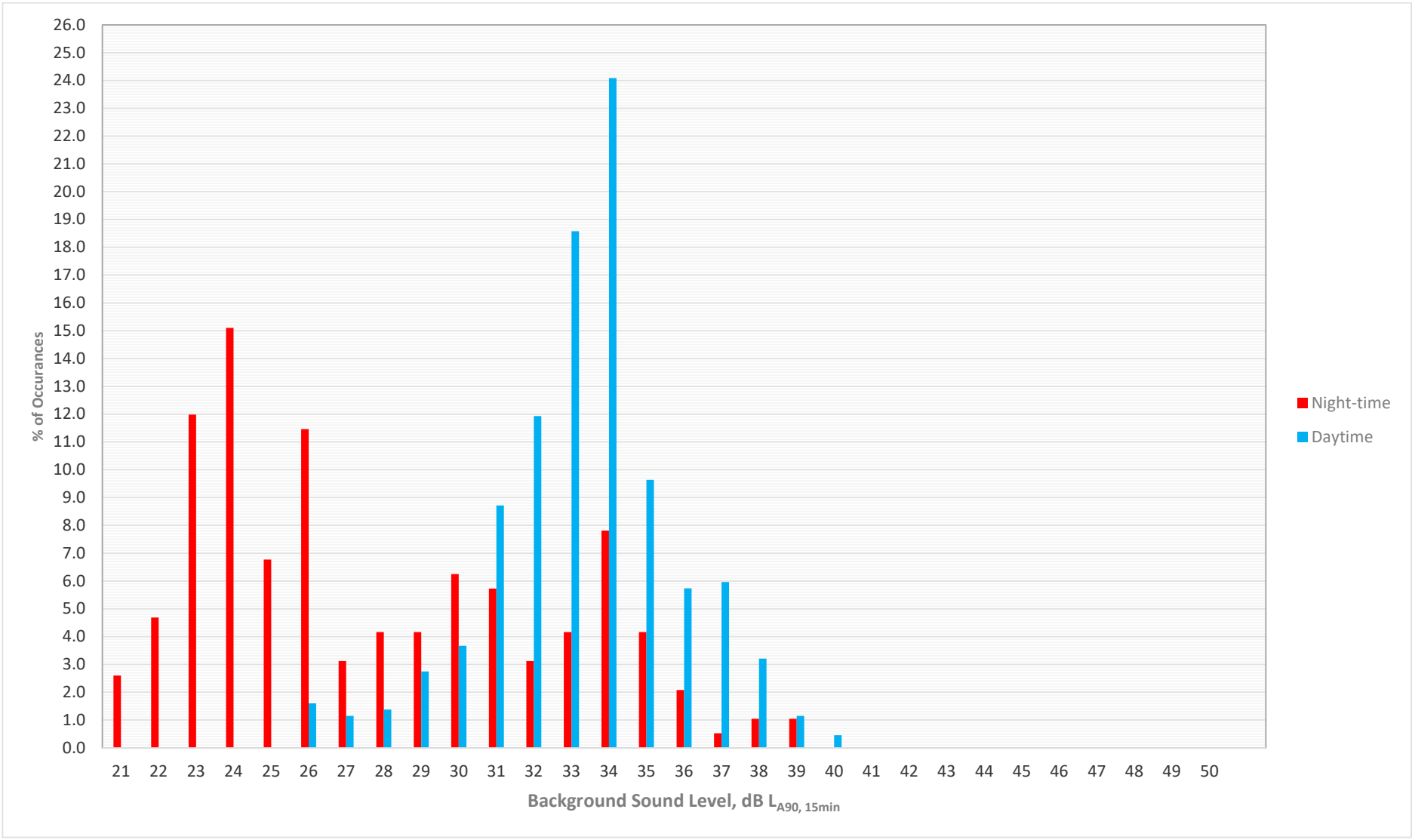
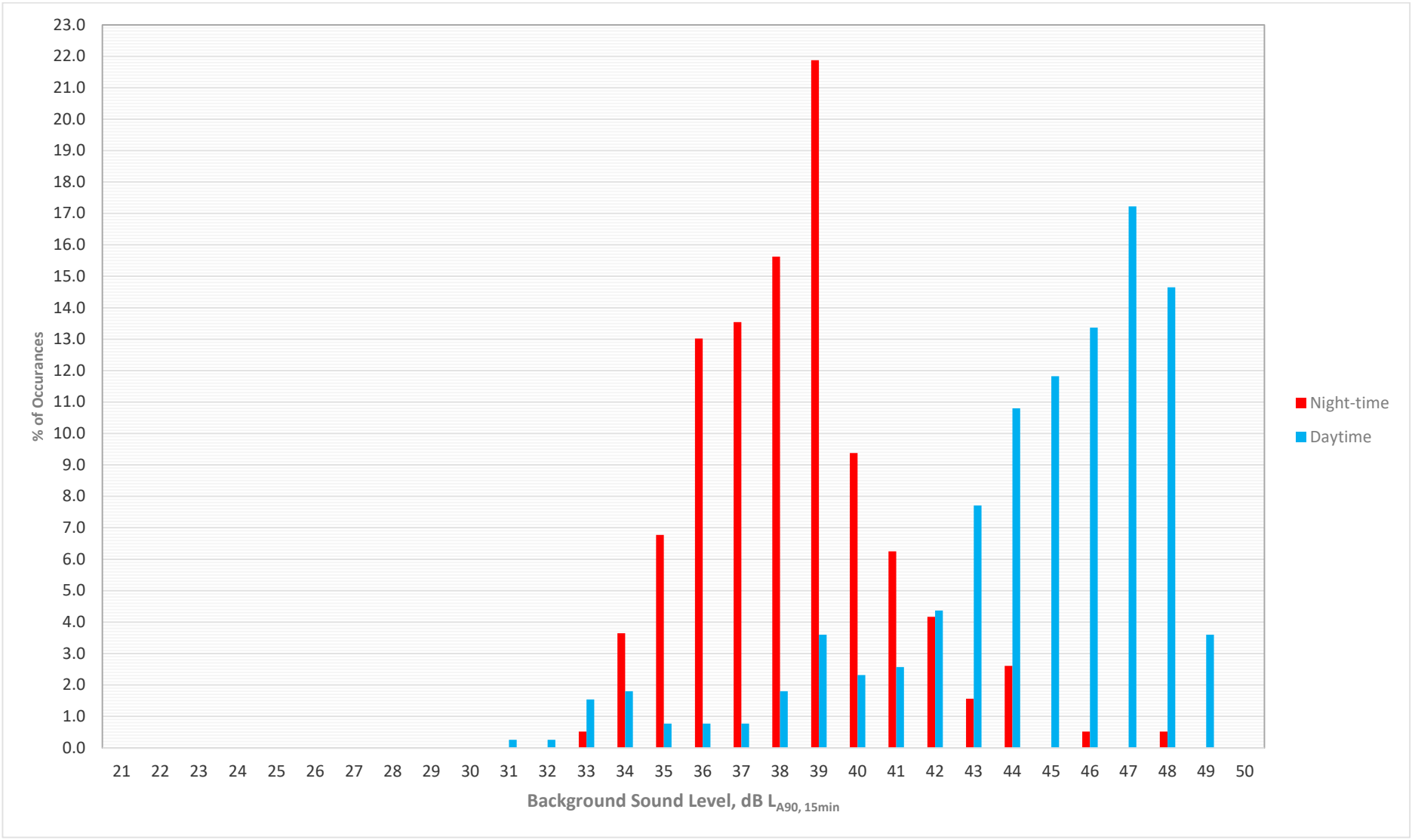


Figure 1-7: Modal Analysis of Background LA90,15min Sound Levels Measured at LT3



1.3.34 Statistical analysis of the $L_{A90,15min}$ sound levels measured at LT1 in free-field conditions shows the modal value of $L_{A90,15min}$ data measured during the daytime periods to be 42 dB $L_{A90,15min}$ and the modal value of the $L_{A90,15min}$ sound data measured during the night-time periods to be 34 dB $L_{A90,15min}$.

1.3.35 Statistical analysis of the $L_{A90,15min}$ sound levels measured at LT2 in free-field conditions shows the modal value of $L_{A90,15min}$ data measured during the daytime periods to be 34 dB $L_{A90,15min}$ and the modal value of the $L_{A90,15min}$ sound data measured during the night-time periods to be 24 dB $L_{A90,15min}$.

1.3.36 Statistical analysis of the $L_{A90,15min}$ sound levels measured at LT3 in free-field conditions shows the modal value of $L_{A90,15min}$ data measured during the daytime periods to be 47 dB $L_{A90,15min}$ and the modal value of the $L_{A90,15min}$ sound data measured during the night-time periods to be 39 dB $L_{A90,15min}$. When considering the overall spread of $L_{A90,15min}$ values measured at LT3, this assessment will use daytime and night-time values of 46 dB $L_{A90,15min}$ and 38 dB $L_{A90,15min}$ for a more cautious assessment.

1.3.37 The $L_{A90,5min}$ background sound levels measured at ST1 have been compared to corresponding levels measured at LT1, $L_{A90,5min}$ sound levels at ST2 have been compared to corresponding levels measured at LT2, and $L_{A90,5min}$ sound levels at ST3 has been compared to corresponding levels measured at LT3.

1.3.38 The daytime background sound levels measured at LT1, LT2 and LT3 during the coincident time periods with the attended measurements are presented in **Table 1-8**.

Table 1-8: Comparison of daytime background sound levels measured at LT1, LT2 LT3 and attended locations (ST1, ST2 & ST3)

Measurement Time	Background Sound Level, dB $L_{A90,5min}$					
	LT1	ST1	LT2	ST2	LT3	ST3
11:15:00	-	-	38.0	40.2	-	-
11:20:00	-	-	38.0	40.7	-	-
11:25:00	-	-	37.0	40.1	-	-
12:05:00	42.7	45.0	-	-	-	-
12:10:00	42.3	46.4	-	-	-	-
12:15:00	41.6	44.8	-	-	-	-
12:40:00	-	-	-	-	47.7	46.1
12:45:00	-	-	-	-	46.8	46.5
12:50:00	-	-	-	-	45.2	45.6
13:20:00	-	-	35.3	36.5	-	-
13:25:00	-	-	34.3	36.7	-	-
13:30:00	-	-	34.7	36.7	-	-
13:55:00	42.4	44.3	-	-	-	-
14:00:00	42.1	40.8	-	-	-	-
14:05:00	40.9	41.5	-	-	-	-
14:55:00	-	-	-	-	46.6	44.2
15:00:00	-	-	-	-	46.4	44.7
15:05:00	-	-	-	-	46.7	45.2

Measurement Time	Background Sound Level, dB $L_{A90,5min}$					
	LT1	ST1	LT2	ST2	LT3	ST3
15:40:00	-	-	34.2	35.6	-	-
15:45:00	-	-	35.1	36.4	-	-
15:50:00	-	-	34.7	36.7	-	-
Average Difference (ST minus LT)	+1.8		+2.0		-1.2	

1.3.39 Due to influence on the attended sound measurements at ST1 from the local residential construction site, the difference between LT1 and ST1 has been discounted. Assumed ambient sound levels at ST1 are based directly on measurements at LT1.

1.3.40 The corrections have not been applied to the night-time background levels as the existing recycling facility does not operate during the night-time period.

1.3.41 The extrapolated free-field background sound levels at all measurement locations are presented in **Table 1-9**.

Table 1-9: Derived free-field background sound levels

Measurement Time	Derived Free-field Background Sound Levels, dB re. 2x 10^{-5} Pa	
	$L_{A90,16hr}$	$L_{A90,8hr}$
LT1	42	34
LT2	34	24
LT3	46	38
ST1	42	34
ST2	36	24
ST3	45	38

2. Construction Activity Noise

2.1.1 The plant assumptions used for the construction activity assessment are presented in **Table 2-1**.

Table 2-1: Construction - Plant Assumptions

Construction activity	Activity Description	Plant Noise Level Data	On time %	No.	BS Ref	Sound Power, dBA L_W	Sound power corrected for no. & on time, dBA L_W
TCC1/TCC2 mobilisation	Stripping off and storing of top soil, installing geotextile matting, 300m of compacted hardcore, 100mm of compacted type 1.	C2.2 Tracked excavator	75	2	BS 5228-1:2009+A1:2014 Table C.2:2	105	107
		C2.10 Dozer	75	2	BS 5228-1:2009+A1:2014 Table C.2:10	108	110
		C2.27 Wheeled loader	75	2	BS 5228-1:2009+A1:2014 Table C.2:27	108	110
		C2.32 Articulated dump truck (tipping fill)	50	2	BS 5228-1:2009+A1:2014 Table C.2:32	102	102
		C2.33 Articulated dump truck	50	2	BS 5228-1:2009+A1:2014 Table C.2:33	109	109
		C2.45 Water pump	100	2	BS 5228-1:2009+A1:2014 Table C.2:45	93	96
		C2.37 Roller (rolling fill)	50	2	BS 5228-1:2009+A1:2014 Table C.2:37	107	107
TCC1/TCC2 & EfW CHP Facility Site mobilisation	Construction compound incl offices, stores, car parking, utility set up, boundary creation and access arrangements.	C4.39 Mobile telescopic crane	50	1	BS 5228-1:2009+A1:2014 Table C.4:39	105	102
		C4.91 Dust suppression unit trailer	75	1	BS 5228-1:2009+A1:2014 Table C.4:91	106	105
		C2.27 Wheeled loader	50	2	BS 5228-1:2009+A1:2014 Table C.2:27	108	108
		C8.20 Tipper lorry	50	1	BS 5228-1:2009+A1:2014 Table C.8:20	107	104
		C2.7 Tracked excavator	75	2	BS 5228-1:2009+A1:2014 Table C.2:7	98	100

Construction activity	Activity Description	Plant Noise Level Data	On time %	No.	BS Ref	Sound Power, dBA L_W	Sound power corrected for no. & on time, dBA L_W
	Demolition of existing structures.	C2.10 Dozer	75	1	BS 5228-1:2009+A1:2014 Table C.2:10	108	107
		C2.8 Wheeled backhoe loader	75	1	BS 5228-1:2009+A1:2014 Table C.2:8	96	95
		C1.5 Pulveriser mounted on excavator	50	2	BS 5228-1:2009+A1:2014 Table C.1:5	100	100
		C4.4 Dumper	50	2	BS 5228-1:2009+A1:2014 Table C.4:4	104	104
		C5.1 Backhoe mounted hydraulic breaker[1]	50	1	BS 5228-1:2009+A1:2014 Table C.5:1	116	113
		C10.14 Screen stockpiler	50	1	BS 5228-1:2009+A1:2014 Table C.10:14	109	106
		C1.20 Lump hammer	25	2	BS 5228-1:2009+A1:2014 Table C.1:20	109	106
		C1.15 Tracked crusher	75	1	BS 5228-1:2009+A1:2014 Table C.1:15	112	111
		C5.30 Asphalt paver (+ tipper lorry)	50	1	BS 5228-1:2009+A1:2014 Table C.5:30	103	100
		C4.21 Large lorry concrete mixer	33	5	BS 5228-1:2009+A1:2014 Table C.4:21	105	107
		C4.82 Diesel generator	100	1	BS 5228-1:2009+A1:2014 Table C.4:82	84	84
		C4.76 Diesel generator	100	5	BS 5228-1:2009+A1:2014 Table C.4:76	89	96
TCC1/TCC2 activity, daytime (First 5 months only)	Diesel generators for power supply prior to mains connection. Telescopic handler moving materials.	C4.84 Diesel generator	100	4	BS 5228-1:2009+A1:2014 Table C.4:84	102	108
		C2.35 Telescopic handler	50	2	BS 5228-1:2009+A1:2014 Table C.2:35	99	99

Construction activity	Activity Description	Plant Noise Level Data	On time %	No.	BS Ref	Sound Power, dBA L_W	Sound power corrected for no. & on time, dBA L_W
TCC1/TCC2 activity, daytime (All months after: telescopic handler only)	Diesel generators for power supply prior to mains connection. Telescopic handler moving materials.	C2.35 Telescopic handler	50	2	BS 5228-1:2009+A1:2014 Table C.2:35	99	99
TCC1/TCC2, night-time (First 5 months)	Diesel generators for power supply prior to mains connection	C4.82 Diesel generator	100	1	BS 5228-1:2009+A1:2014 Table C.4:82	84	84
		C4.76 Diesel generator	100	5	BS 5228-1:2009+A1:2014 Table C.4:76	89	96
EfW CHP Facility Site earthworks	Earthworks and piling, dewatering (if required), waste bunkers created via piled retaining walls, material excavated from bunkers re-used on site where possible.	C2.14 Tracked excavator	75	2	BS 5228-1:2009+A1:2014 Table C.2:14	107	112
		C2.33 Articulated dump truck	50	2	BS 5228-1:2009+A1:2014 Table C.2:33	109	109
		C2.35 Forklift	50	1	BS 5228-1:2009+A1:2014 Table C.2:35	99	96
		C2.10 Dozer	50	1	BS 5228-1:2009+A1:2014 Table C.2:10	108	110
		D4.98 Continuous flight auger injected piling	75	2	BS 5228-1:2009+A1:2014 Table C.3:27	108	110
		C3.12 Rig power pack	75	1	BS 5228-1:2009+A1:2014 Table C.3:12	91	90
		C2.45 Water pump	100	4	BS 5228-1:2009+A1:2014 Table C.2:45	93	99
		C3.28 Tracked mobile crane	75	2	BS 5228-1:2009+A1:2014 Table C.3:28	95	97
		C4.24 Concrete pump + cement mixer truck (discharging)	75	1	BS 5228-1:2009+A1:2014 Table C.4:24	95	94

Construction activity	Activity Description	Plant Noise Level Data	On time %	No.	BS Ref	Sound Power, dBA L_W	Sound power corrected for no. & on time, dBA L_W
EfW CHP Facility Site foundations	Concrete Pour for EfW foundation and hardstandings	C4.26 Concrete pump + concrete mixer truck (idling)	75	1	BS 5228-1:2009+A1:2014 Table C.4:26	103	102
		C4.34 Poker vibrator	75	4	BS 5228-1:2009+A1:2014 Table C.4:34	97	102
		D6.44 Power Float	75	4	BS 5228-1:2009+A1:2014 Table C.4:35	100	105
EfW CHP Facility Site roads and hardstandings	Grading of access routes will be required to provide a constant grade across site	C5.31 Asphalt paver (+ tipper lorry)	75	1	BS 5228-1:2009+A1:2014 Table C.5:31	105	104
		C5.25 Vibratory roller[1]	50	2	BS 5228-1:2009+A1:2014 Table C.5:25	103	103
		C2.41 Vibratory plate (petrol)	50	1	BS 5228-1:2009+A1:2014 Table C.2:41	108	105
		C5.5 Compressor for hand-held pneumatic breaker	75	2	BS 5228-1:2009+A1:2014 Table C.5:5	93	95
		C8.20 Tipper lorry	50	2	BS 5228-1:2009+A1:2014 Table C.8:20	107	107
		C4.63 Tracked excavator	50	3	BS 5228-1:2009+A1:2014 Table C.4:63	105	107
		C4.21 Large lorry concrete mixer	75	1	BS 5228-1:2009+A1:2014 Table C.4:21	105	104
EfW CHP Facility Site structures (Civil)	Erection of concrete structures, steelwork framing, roof and wall cladding for main and ancillary buildings	C3.30 Wheeled mobile crane	75	3	BS 5228-1:2009+A1:2014 Table C.3:30	98	102
		C4.51 Tracked mobile crane (idling)	50	2	BS 5228-1:2009+A1:2014 Table C.4:51	94	94
		C4.60 Diesel scissor lift (idling)	50	4	BS 5228-1:2009+A1:2014 Table C.4:60	98	101
		C4.58 Lifting platform (idling)	50	4	BS 5228-1:2009+A1:2014 Table C.4:58	91	94
		C3.32 Generator for welding	75	2	BS 5228-1:2009+A1:2014 Table C.3:32	101	103
		C3.31 Hand-held welder (welding piles)	75	2	BS 5228-1:2009+A1:2014 Table C.3:31	101	103

Construction activity	Activity Description	Plant Noise Level Data	On time %	No.	BS Ref	Sound Power, dBA L_W	Sound power corrected for no. & on time, dBA L_W
		C4.93 Angle grinder (grinding steel)	75	2	BS 5228-1:2009+A1:2014 Table C.4:93	108	110
		C1.20 Lump hammer	25	2	BS 5228-1:2009+A1:2014 Table C.1:20	109	106
		C2.34 Lorry	50	2	BS 5228-1:2009+A1:2014 Table C.2:34	108	108
		C4.24 Concrete pump + cement mixer truck (discharging)	75	2	BS 5228-1:2009+A1:2014 Table C.4:24	95	97
		C4.34 Poker vibrator	25	4	BS 5228-1:2009+A1:2014 Table C.4:34	97	97
		C4.72 Hand-held circular saw (petrol-cutting concrete blocks)	25	4	BS 5228-1:2009+A1:2014 Table C.4:72	107	107
		C5.5 Compressor for hand-held pneumatic breaker	75	1	BS 5228-1:2009+A1:2014 Table C.5:5	93	92
		C4.55 Telescopic handler	50	3	BS 5228-1:2009+A1:2014 Table C.4:55	98	100
EfW CHP Facility Site M&E	Installation of mechanical and electrical equipment.	C3.30 Wheeled mobile crane	75	4	BS 5228-1:2009+A1:2014 Table C.3:30	98	103
		C3.32 Generator for welding	75	6	BS 5228-1:2009+A1:2014 Table C.3:32	101	108
		C3.31 Hand-held welder (welding piles)	75	6	BS 5228-1:2009+A1:2014 Table C.3:31	101	108
		C4.93 Angle grinder (grinding steel)	75	6	BS 5228-1:2009+A1:2014 Table C.4:93	108	115
		C2.34 Lorry	50	1	BS 5228-1:2009+A1:2014 Table C.2:34	108	105
		C4.57 Lifting platform	25	4	BS 5228-1:2009+A1:2014 Table C.4:57	95	95
		C5.5 Compressor for hand-held pneumatic breaker	75	1	BS 5228-1:2009+A1:2014 Table C.5:5	93	92

Construction activity	Activity Description	Plant Noise Level Data	On time %	No.	BS Ref	Sound Power, dBA L_W	Sound power corrected for no. & on time, dBA L_W
		C4.60 Diesel scissor lift (idling)	50	2	BS 5228-1:2009+A1:2014 Table C.4:60	98	98
		C4.72 Hand-held circular saw (petrol-cutting concrete blocks)	25	1	BS 5228-1:2009+A1:2014 Table C.4:72	107	101
		C4.51 Tracked mobile crane (idling)	50	2	BS 5228-1:2009+A1:2014 Table C.4:51	94	94
		C4.55 Telescopic handler	50	2	BS 5228-1:2009+A1:2014 Table C.4:55	98	98
EfW CHP Facility Site M&E (out-of-core-hours construction activity)	Installation of mechanical and electrical equipment	C3.30 Wheeled mobile crane	75	1	BS 5228-1:2009+A1:2014 Table C.3:30	98	97
		C3.32 Generator for welding	75	1	BS 5228-1:2009+A1:2014 Table C.3:32	101	100
		C3.31 Hand-held welder (welding piles)	75	2	BS 5228-1:2009+A1:2014 Table C.3:31	101	103
		C4.93 Angle grinder (grinding steel)	75	2	BS 5228-1:2009+A1:2014 Table C.4:93	108	110
		C2.34 Lorry	50	1	BS 5228-1:2009+A1:2014 Table C.2:34	108	105
		C4.57 Lifting platform	25	2	BS 5228-1:2009+A1:2014 Table C.4:57	95	92
		C5.5 Compressor for hand-held pneumatic breaker	75	1	BS 5228-1:2009+A1:2014 Table C.5:5	93	92
		C4.60 Diesel scissor lift (idling)	50	2	BS 5228-1:2009+A1:2014 Table C.4:60	98	98
		C4.72 Hand-held circular saw (petrol-cutting concrete blocks)	25	1	BS 5228-1:2009+A1:2014 Table C.4:72	107	101
		C4.51 Tracked mobile crane (idling)	50	1	BS 5228-1:2009+A1:2014 Table C.4:51	94	91
		C4.55 Telescopic handler	50	1	BS 5228-1:2009+A1:2014 Table C.4:55	98	95

Construction activity	Activity Description	Plant Noise Level Data	On time %	No.	BS Ref	Sound Power, dBA L_W	Sound power corrected for no. & on time, dBA L_W
EfW CHP Facility Site plant installation	Installation of grate and boiler works, ACC, turbine, water treatment plant and APC system	C3.30 Wheeled mobile crane	75	2	BS 5228-1:2009+A1:2014 Table C.3:30	98	100
		C3.32 Generator for welding	75	2	BS 5228-1:2009+A1:2014 Table C.3:32	101	103
		C3.31 Hand-held welder (welding piles)	75	2	BS 5228-1:2009+A1:2014 Table C.3:31	101	103
		C4.93 Angle grinder (grinding steel)	75	2	BS 5228-1:2009+A1:2014 Table C.4:93	108	110
		C2.34 Lorry	50	1	BS 5228-1:2009+A1:2014 Table C.2:34	108	105
		C4.57 Lifting platform	25	4	BS 5228-1:2009+A1:2014 Table C.4:57	95	95
		C5.5 Compressor for hand-held pneumatic breaker	75	1	BS 5228-1:2009+A1:2014 Table C.5:5	93	92
		C4.55 Telescopic handler	50	2	BS 5228-1:2009+A1:2014 Table C.4:55	98	98
CHP and Grid Connection cable/pipe install	Cable installed by open cut trenching.	C2.2 Tracked excavator	75	2	BS 5228-1:2009+A1:2014 Table C.2:2	105	107
		C2.32 Articulated dump truck (tipping fill)	50	2	BS 5228-1:2009+A1:2014 Table C.2:32	102	102
		C2.33 Articulated dump truck	50	2	BS 5228-1:2009+A1:2014 Table C.2:33	109	109
		C2.37 Roller (rolling fill)	50	2	BS 5228-1:2009+A1:2014 Table C.2:37	107	107
		C2.34 Lorry	50	1	BS 5228-1:2009+A1:2014 Table C.2:34	108	105
BM34 Substation	Soil strip, earth bund, concrete pads, crane in equipment, landscaping.	C2.2 Tracked excavator	33	1	BS 5228-1:2009+A1:2014 Table C.2:2	105	100
		C3.30 Wheeled mobile crane	20	1	BS 5228-1:2009+A1:2014 Table C.2:32	102	95
		C2.33 Articulated dump truck	20	1	BS 5228-1:2009+A1:2014 Table C.2:33	109	102

Construction activity	Activity Description	Plant Noise Level Data	On time %	No.	BS Ref	Sound Power, dBA L_W	Sound power corrected for no. & on time, dBA L_W
		C2.37 Roller (rolling fill)	10	1	BS 5228-1:2009+A1:2014 Table C.2:37	107	97
		C2.34 Lorry	33	1	BS 5228-1:2009+A1:2014 Table C.2:34	108	103

Note: [1] Potential source of vibration

2.1.2 **Table 2-2** presents the average monthly construction noise levels for each time period based on the assumed programme, with the maximum monthly levels presented in parentheses.

Table 2-2: Construction Noise Levels

Receptor No.	Average Monthly Construction Noise levels, dB $L_{Aeq,T}$					
	Option TCC1			Option TCC2		
	Daytime	Evening	Night	Daytime	Evening	Night
R1	45.5 (51.7)	32.0 (40.5)	23.1 (40.5)	46.9 (51.8)	32.0 (40.5)	24.0 (40.5)
R2	48.3 (54.1)	34.3 (43.4)	25.0 (43.4)	49.4 (54.1)	34.3 (43.4)	25.7 (43.4)
R3	48.3 (53.4)	33.6 (42.6)	25.0 (42.6)	48.2 (53.4)	33.6 (42.6)	25.0 (42.6)
R4	43.9 (49.0)	29.4 (37.2)	21.9 (37.2)	43.4 (48.0)	29.4 (37.2)	21.6 (37.2)
R5	45.7 (50.6)	30.8 (39.0)	23.2 (39.0)	45.0 (49.8)	30.8 (39.0)	22.8 (39.0)
R6	43.4 (50.5)	28.3 (35.9)	21.7 (35.9)	42.0 (46.6)	28.3 (35.9)	20.9 (35.9)
R7	46.4 (51.4)	31.5 (39.9)	24.0 (39.9)	45.7 (50.0)	31.5 (39.9)	23.3 (39.9)
R8	47.7 (57.1)	30.9 (39.2)	24.4 (39.2)	45.0 (49.3)	30.9 (39.2)	22.8 (39.2)
R9	44.7 (52.5)	29.3 (37.1)	22.6 (37.1)	42.3 (47.0)	29.3 (37.1)	21.0 (37.1)
R10	46.2 (51.2)	31.4 (39.8)	23.8 (39.8)	44.8 (49.5)	31.4 (39.8)	22.6 (39.8)
R11	48.0 (53.2)	34.1 (43.2)	24.8 (43.2)	48.0 (53.2)	34.1 (43.2)	24.7 (43.2)
R12	40.3 (45.6)	25.3 (32.1)	19.0 (32.1)	39.9 (44.1)	25.3 (32.1)	18.9 (32.1)
R13	39.7 (45.3)	25.2 (31.9)	18.8 (31.9)	39.3 (43.4)	25.2 (31.9)	18.6 (31.9)
R14	34.4 (39.5)	20.5 (26.0)	14.9 (26.0)	34.4 (39.3)	20.5 (26.0)	15.1 (26.0)
R15	33.7 (40.3)	20.2 (25.6)	14.8 (25.6)	32.7 (36.8)	20.2 (25.6)	14.6 (25.6)
R16	40.1 (44.6)	26.1 (33.0)	19.0 (33.0)	39.9 (44.2)	26.1 (33.0)	18.9 (33.0)
R17	51.7 (60.0)	34.7 (44.0)	27.3 (44.0)	48.7 (53.8)	34.7 (44.0)	25.4 (44.0)
R18	50.7 (57.2)	35.0 (44.3)	26.4 (44.3)	50.9 (57.2)	35.0 (44.3)	26.5 (44.3)
R19	46.2 (54.0)	29.9 (37.9)	23.2 (37.9)	45.6 (51.8)	29.9 (37.9)	22.8 (37.9)
R20	49.0 (54.9)	33.0 (41.8)	25.3 (41.8)	47.9 (52.9)	33.0 (41.8)	24.7 (41.8)
R21	46.4 (55.0)	30.8 (39.0)	23.7 (39.0)	44.5 (49.4)	30.8 (39.0)	22.7 (39.0)
R22	53.1 (60.5)	40.0 (50.7)	28.1 (50.7)	54.5 (60.5)	40.0 (50.7)	29.3 (50.7)

Note: Average monthly values presented in the main cell, Maximum monthly value presented in brackets

3. Construction Vibration

3.1.1 Based on the construction assumptions presented in **Table 2-1**, the element of plant which is assumed to be the greatest source of vibration is the vibratory roller.

3.1.2 To estimate the potential groundborne vibration that could arise during the use of the vibratory rollers, the following empirical predictors in BS5228-2 have been used:

Vibratory Compaction (Steady State)

$$v_{res} = nk_s\sqrt{n_d}\left[\frac{A}{x + L_d}\right]^{1.5}$$

Vibratory Compaction (Start up and run down)

$$v_{res} = nk_t\sqrt{n_d}\left[\frac{A^{1.5}}{(x + L_d)^{1.3}}\right]$$

Where:
V_{res} = resultant PPV, mms^{-1}
K_s/K_t = scaling factor (and probability of predicted value being exceeded)
n_d = number of vibrating drums ($1 \leq n_d \leq 2$)
n = number of plant
A = maximum amplitude of drum vibration, in millimetres (mm) ($0.4 \leq A \leq 1.75$)
x = distance measure along the ground surface, in meters (m) ($2 \leq x \leq 110$)
L_d = vibrating roller drum width, in meters (m) ($0.75 \leq L_d \leq 2.2$)

3.1.3 The entry for vibratory roller presented **Table 2-1** is based on a 4.5t roller. This assumption has been used within this vibration assessment and the parameters are based off a BOMAG BW 135 AD-5 Tandem Roller which has a maximum amplitude of 0.5mm (A), drum diameter of 0.9m (L_d) and have assumed the scaling factors of K_s = 276 and K_t = 177.

3.1.4 VDV levels have been predicted on the below formula:

$$vdv = 51.6 \text{ x } v_{res} \text{ x } t^{0.25}$$

Where:
VDV = resultant VDV, $ms^{-1.75}$
V_{res} = resultant PPV, mms^{-1}
T = time in seconds over which the Vres is expected during construction activities

3.1.5 The results of the vibration assessment at each Receptor are presented in **Table 3-1**.

Table 3-1: Assessment of Construction Vibration Levels – PPV

Receptor No.	Dist. (m)[1]	PPV mms^{-1}	
		Steady State	Start up / Run down
R1	790	0.01	0.01
R2	680	0.01	0.01
R3	630	0.02	0.02
R4	920	0.01	0.01
R5	700	0.01	0.01
R6	880	0.01	0.01
R7	700	0.01	0.01
R8	760	0.01	0.01
R9	920	0.01	0.01
R10	820	0.01	0.01
R11	650	0.02	0.02
R12	640	0.02	0.02
R13	710	0.01	0.01
R14	1010	0.01	0.01
R15	1080	0.01	0.01
R16	950	0.01	0.01
R17	410	0.03	0.03
R18	360	0.04	0.04
R19	480	0.03	0.03
R20	440	0.03	0.03
R21	750	0.01	0.01
R22	200	0.09	0.09

Note: [1] distances used in calculations are greater than the maximum permitted value of x.

4. Operational Noise

4.1.1 A sound model has been constructed to calculate the propagation of sound away from the EfW CHP Facility Site and to calculate the resulting sound levels at the residential Receptors.

4.1.2 The sound modelling has been undertaken using the SoundPLAN sound modelling software. SoundPLAN is a propriety software package which calculates sound levels using acoustical ray-tracing techniques through implementation of a prediction procedure, which, in this section is ISO 9613-2: 1996 (ISO, 1996).

4.1.3 ISO 9613-2 provides a method of calculation for predicting the attenuation of sound during propagation outdoors. The environmental sound propagation from source to receiver position is calculated using the following acoustic algorithm:

$$LfT(DW) = Lw + Dc - A$$

Where:
LfT(DW) = equivalent continuous downwind octave-band sound pressure level at a receiver location, representing a worse case assessment
Lw = octave-band sound power level of the sound source, where available, otherwise overall dB(A) level used
Dc = directivity correction
A = octave-band attenuation that occurs during propagation from the sound source to the receiver
A = Adiv + Aatm + Agr + Abar +Amisc
Adiv = attenuation due to geometrical divergence
Aatm = attenuation due to atmospheric absorption
Agr = attenuation due to the ground effect
Abar = attenuation due to a barrier
Amisc = attenuation due to miscellaneous other effects.

Modelled Sound Sources

4.1.4 Reference sound levels for the operational noise sources are presented in **Table 4-1**.

Table 4-1: Operational Noise Source Inputs

ID	Source	Source Type	Index*	No. in Model	Height Above Ground Level, m	On time/ Other inputs	Overall, dBA	Spectral Sound Levels, dB per Octave Band (63 Hz - 8 kHz)							
								63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
ID02	Tipping hall (during delivery hours)	Building	L_{pi}	1	16.5	100%, 0700 - 2000 hrs	89	56	71	75	80	81	85	81	77
ID02	Tipping hall (outside delivery hours)	Building	L_{pi}	1	16.5	100%, 2000 - 0700 hrs	86	59	73	76	83	81	79	73	70
ID02	Tipping hall doors (weekday delivery hours)	Area	L_{pi}	2	6	Open 100% 0700 - 2000 hrs	89	56	71	75	80	81	85	81	77
ID02	Tipping hall Doors (weekend delivery hours)	Building	L_{pi}	2	6	Open 50% 0700 - 2000 hrs	86	56	71	75	80	81	85	81	77
ID03	Waste bunker building	Building	L_{pi}	1	36.5	100%	78	48	56	66	71	74	73	65	60
ID04	Boiler house building	Building	L_{pi}	1	50	100%	86	59	73	76	83	81	79	73	70
ID05a	APC plant, silos and reactor	Building	L_W	1	22	100%	86	59	73	76	83	81	79	73	70
ID05b	Bag filter	Building	L_{pi}	2	25	100%	86	59	73	76	83	81	79	73	70
ID05c	Induced draft fan	Building	L_{pi}	2	10	100%	89	62	76	79	86	84	82	76	73
ID05d	Compressed air station	Building	L_{pi}	1	8	100%	85	94	89	86	81	79	76	74	72
ID05e	Water treatment plant	Building	L_{pi}	1	16	100%	85	58	72	75	82	80	78	72	69

ID	Source	Source Type	Index*	No. in Model	Height Above Ground Level, m	On time/ Other inputs	Overall, dBA	Spectral Sound Levels, dB per Octave Band (63 Hz - 8 kHz)							
								63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
ID08	Chimney outlet	Point	L_W	2	90.5	100%	90	67	76	87	90	83	80	68	69
ID09	Turbine hall	Building	L_{pi}	1	25	100%	89	56	71	75	80	81	85	81	77
ID10	Air cooled condenser	Point	L_w	6	25	100%	88	89	84	83	90	78	74	68	60
ID11	Water re-cooling system (full load)	Area	L_W	1	25	100%	89	67	72	77	81	85	84	78	72
ID13	Main transformer	Point	L_w	1	11	100%	72	75	77	72	72	66	61	56	49
ID17	Switchgear building	Building	L_{pi}	1	16	100%	75	84	79	76	71	69	66	64	62
A	HGV deliveries of waste	Line	L_w	1	1	10 mph on site 0700 - 2000 hrs	108	101	106	106	106	102	101	96	94
B	Loader (external movements)	Line	L_w	1	1	10 mph on site 0700 - 2000 hrs 2 movements per hour	99	111	100	98	97	93	92	85	77
C	Exhaust Steam Pipe (Turbine Normal Operation) (between turbine hall and ACC)	Line	L_w	1	12.0-26.0	100%	75	42	53	59	68	73	68	60	50
D	Exhaust Steam Pipe (Turbine Bypass Operation) (between turbine hall and ACC)	Line	L_w	1	12.0-26.0	100% when in turbine bypass mode	88	60	65	71	80	85	80	72	54

* - L_{pi} = internal sound pressure level

4.1.5 Sound reduction values of facades for buildings in which noise sources will be located are presented in **Table 4-2**.

Table 4-2: Building Façade Sound Reductions

Façade Element	Overall, dB R_w	Sound Reduction, dB R_w per Octave Band (63 Hz - 8 kHz)							
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Walls, concrete: Waste Bunker (up to 23 m above ground level)	49	33	37	38	44	53	60	67	67
Walls: cladding Boiler House, Turbine Hall, Tipping Hall, APC building, Waste bunker (> 23 m)	24	15	16	19	23	26	22	39	44
Roof Construction All buildings	24	15	16	19	23	26	22	39	44
Roller Shutter Door Turbine Hall, Boiler House, APC building	29	19	23	22	26	34	31	25	20
Roller Shutter Door Tipping Hall	24	14	18	17	21	29	26	20	15

Residential Receptors - BS 4142 Assessment

4.1.6 The method for predicting the significance of sound of an industrial and/or commercial nature in accordance with the principles of BS 4142:2014+A1:2019 is based on a comparison of the EfW CHP Facility's Rating Level ($L_{Ar,T}$) with the background $L_{A90,T}$ assessment sound level at a Receptor location.

4.1.7 The $L_{A90,T}$ background sound level is the sound level exceeded for 90 % of the time in the absence of any sound from the specific source of interest. **Table 1-9** presents the $L_{A90,T}$ background sound level used in this assessment.

4.1.8 BS 4142 indicates that certain acoustic features such as tonality, impulsivity and intermittency can increase the significance of an effect over that expected from a basic comparison between the specific $L_{Aeq,T}$ sound level and the background $L_{A90,T}$ sound level. Where such features are present at the assessment location, a character correction should be added to the specific sound level to obtain the rating level for comparison with the background sound assessment level.

4.1.9 The corrections that can be applied to account for acoustical features in the specific sound level at the Receptor are summarised in **Table 4-3**.

Table 4-3: BS 4142 Corrections for Acoustic Features

Acoustic Feature	Description	Character Correction, dB
Tonality	Just perceptible	+2
	Clearly perceptible	+4
	Highly perceptible	+6
Impulsivity	Just perceptible	+3
	Clearly perceptible	+6
	Highly perceptible	+9
Intermittency	Intermittency is readily distinctive against the residual acoustic environment.	+3
Other sound characteristics	Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment.	+3

4.1.10 A +3 dB correction has been applied to specific sound levels to account for the potential risk of the specific sound having a characteristic which may be distinctive against the residual sound environment in the vicinity of the EfW CHP Facility Site.

4.1.11 A +3 dB correction has also been applied to the specific sound levels to compensate for potential uncertainty within the source data provided in the sound model.

4.1.12 The calculated specific and rating sound levels at the Receptor locations during normal operation are presented in **Table 4-4** and **Table 4-5** for the daytime and night-time assessment periods respectively, along with a comparison of the rating levels with the associated background sound assessment level.

Table 4-4: Daytime BS 4142 Sound Assessment – Normal Operation

	BS 4142 Sound Level Assessment					
Rep ID	Specific Sound Level, $L_{Aeq,1hr}$[1,2]	Uncertainty	Acoustic Feature Correction, dB	Rating Level, $L_{Aeq,1hr}$	Background Sound Level, $L_{A90,T}$	Excess of Rating Over Background, dB
	(a)	(b)	(c)	(d)	(e)	(d minus e)
R1	19	3	3	25	45	-20
R2	21	3	3	27	45	-18
R3	22	3	3	28	45	-17
R4	18	3	3	24	42	-18

BS 4142 Sound Level Assessment

Rep ID	Specific Sound Level, $L_{Aeq,1hr}$[1,2]	Uncertainty	Acoustic Feature Correction, dB	Rating Level, $L_{Aeq,1hr}$	Background Sound Level, $L_{A90,T}$	Excess of Rating Over Background, dB
	(a)	(b)	(c)	(d)	(e)	(d minus e)
R5	*Non-residential* [3]					
R6	22	3	3	28	42	-14
R7	*Non-residential* [3]					
R8	*Non-residential* [3]					
R9	20	3	3	26	36	-10
R10	*Non-residential* [3]					
R11	26	3	3	32	36	-4
R12	19	3	3	25	34	-9
R13	19	3	3	25	34	-9
R14	14	3	3	20	34	-14
R15	14	3	3	20	34	-14
R16	17	3	3	23	34	-11
R17	*Non-residential* [3]					
R18	29	3	3	35	42	-7
R19	24	3	3	30	42	-12
R20	31	3	3	37	42	-5
R21	21	3	3	27	42	-15
R22	*Non-residential* [3]					

Note: [1] Specific and Rating Levels calculated at a free-field location, 1.5m above local ground
[2] where multiple facades may be exposed to the specific sound, the façade with the highest calculated Specific Sound Level is presented; and
[3] Non-residential Receptors are beyond the scope of BS 4142.

Table 4-5: Night-time BS 4142 Sound Assessment – Normal Operation

Rep ID	BS 4142 Sound Level Assessment					
	Specific Sound Level, $L_{Aeq,15min}$ [1,2]	Uncertainty	Acoustic Feature Correction, dB	Rating Level, $L_{Aeq,15min}$	Background Sound Level, $L_{A90,T}$	Excess of Rating Over Background, dB
	(a)	(b)	(c)	(d)	(e)	(d minus e)
R1	16	3	3	22	38	-16
R2	18	3	3	24	38	-14
R3	18	3	3	24	38	-14
R4	14	3	3	20	34	-14
R5	*Non-residential* [3]					
R6	14	3	3	20	34	-14
R7	*Non-residential* [3]					
R8	*Non-residential* [3]					
R9	18	3	3	24	24	0
R10	*Non-residential* [3]					
R11	27	3	3	33	24	+9
R12	19	3	3	25	24	+1
R13	20	3	3	26	24	+2
R14	15	3	3	21	24	-3
R15	14	3	3	20	24	-4
R16	16	3	3	22	24	-2
R17	*Non-residential* [3]					
R18	21	3	3	27	34	-7
R19	17	3	3	23	34	-11
R20	20	3	3	26	34	-8
R21	17	3	3	23	34	-11
R22	*Non-residential* [3]					

Note: [1] Specific and Rating Levels calculated at a free-field location, 1.5m above local ground;
[2] where multiple facades may be exposed to the specific sound, the façade with the highest calculated Specific Sound Level is presented; and
[3] Non-residential Receptors are beyond the scope of BS 4142.

4.1.13 The level differences presented in **Table 4-4** show that rating levels during the daytime assessment period are calculated to fall below the background sound assessment levels by at least 4 dB at residential Receptors.

4.1.14 The level differences presented in **Table 4-5** show that rating levels during the night-time assessment period are calculated to exceed the background sound assessment levels by up to 9 dB at the worst affected residential Receptor, R11 – Arrowsmith Road.

4.1.15 According to BS 4142, a difference between the background sound level and the rating level of around +10 dB or more is likely to be an indication of a significant adverse impact. A difference between the background sound level and the rating level of around +5 dB or more is likely to be an indication of an adverse impact.

4.1.16 BS 4142 goes on to indicate that the impact derived by the comparison of the Rating Level with background sound level is however dependent on the context of the sound environment at an assessment location.

4.1.17 The calculated specific and rating sound levels at the Receptor locations during turbine bypass operation are presented in **Table 4-6** and **Table 4-7** for the daytime and night-time assessment periods respectively, along with a comparison of the rating levels with the associated background sound assessment level.

Table 4-6: Daytime BS 4142 Sound Assessment – Turbine Bypass Operation

Rep ID	BS 4142 Sound Level Assessment					
	Specific Sound Level, $L_{Aeq,1hr}$[1,2]	Uncertainty	Acoustic Feature Correction, dB	Rating Level, $L_{Aeq,1hr}$	Background Sound Level, $L_{A90,T}$	Excess of Rating Over Background, dB
	(a)	(b)	(c)	(d)	(e)	(d minus e)
R1	19	3	3	25	45	-20
R2	21	3	3	27	45	-18
R3	22	3	3	28	45	-17
R4	18	3	3	24	42	-18
R5		*Non-residential* [3]				
R6	22	3	3	28	42	-14
R7		*Non-residential* [3]				
R8		*Non-residential* [3]				
R9	20	3	3	26	36	-10
R10		*Non-residential* [3]				
R11	27	3	3	33	36	-3
R12	20	3	3	26	34	-8

Rep ID	BS 4142 Sound Level Assessment					
	Specific Sound Level, $L_{Aeq,1hr}$[1,2]	Uncertainty	Acoustic Feature Correction, dB	Rating Level, $L_{Aeq,1hr}$	Background Sound Level, $L_{A90,T}$	Excess of Rating Over Background, dB
	(a)	(b)	(c)	(d)	(e)	(d minus e)
R13	20	3	3	26	34	-8
R14	15	3	3	21	34	-13
R15	14	3	3	20	34	-14
R16	17	3	3	23	34	-11
R17		*Non-residential* [3]				
R18	29	3	3	35	42	-7
R19	24	3	3	30	42	-12
R20	31	3	3	37	42	-5
R21	22	3	3	28	42	-14
R22		*Non-residential* [3]				

Note: [1] Specific and Rating Levels calculated at a free-field location, 1.5m above local ground
[2] where multiple facades may be exposed to the specific sound, the façade with the highest calculated Specific Sound Level is presented; and
[3] Non-residential Receptors are beyond the scope of BS 4142.

Table 4-7: Night-time BS 4142 Sound Assessment – Turbine Bypass Operation

Rep ID	BS 4142 Sound Level Assessment					
	Specific Sound Level, $L_{Aeq,15min}$[1,2]	Uncertainty	Acoustic Feature Correction, dB	Rating Level, $L_{Aeq,15min}$	Background Sound Level, $L_{A90,T}$	Excess of Rating Over Background, dB
	(a)	(b)	(c)	(d)	(e)	(d minus e)
R1	16	3	3	22	38	-16
R2	18	3	3	24	38	-14
R3	18	3	3	24	38	-14
R4	14	3	3	20	34	-14
R5		*Non-residential* [3]				
R6	15	3	3	21	34	-13
R7		*Non-residential* [3]				

Rep ID	BS 4142 Sound Level Assessment					
	Specific Sound Level, $L_{Aeq,15min}$[1,2]	Uncertainty	Acoustic Feature Correction, dB	Rating Level, $L_{Aeq,15min}$	Background Sound Level, $L_{A90,T}$	Excess of Rating Over Background, dB
	(a)	(b)	(c)	(d)	(e)	(d minus e)
R8		*Non-residential* [3]				
R9	18	3	3	24	24	0
R10		*Non-residential* [3]				
R11	27	3	3	33	24	+9
R12	20	3	3	26	24	+2
R13	21	3	3	27	24	+3
R14	15	3	3	21	24	-3
R15	15	3	3	21	24	-3
R16	17	3	3	23	24	-1
R17		*Non-residential* [3]				
R18	21	3	3	27	34	-7
R19	18	3	3	24	34	-10
R20	21	3	3	27	34	-7
R21	18	3	3	24	34	-10
R22		*Non-residential* [3]				

Note: [1] Specific and Rating Levels calculated at a free-field location, 1.5m above local ground;
[2] where multiple facades may be exposed to the specific sound, the façade with the highest calculated Specific Sound Level is presented; and
[3] Non-residential Receptors are beyond the scope of BS 4142.

4.1.18 The level differences presented in **Table 4-6** show that rating levels during the daytime assessment period are calculated to fall below the background sound assessment levels by at least 3 dB at residential Receptors.

4.1.19 The level differences presented in **Table 4-7** show that rating levels during the night-time assessment period are calculated to exceed the background sound assessment levels by up to 9 dB at the worst affected residential Receptor, R11 – Arrowsmith Road.

4.1.20 According to BS 4142, a difference between the background sound level and the rating level of around +10 dB or more is likely to be an indication of a significant adverse impact. A difference between the background sound level and the rating level of around +5 dB or more is likely to be an indication of an adverse impact.

4.1.21 BS 4142 goes on to indicate that the impact derived by the comparison of the Rating Level with background sound level is however dependent on the context of the sound environment at an assessment location.

5. Traffic Noise

5.1.1 The base traffic model has been developed using the results of the traffic survey undertaken at a junction on Magna Road/A341 close to the Proposed Development, as presented in **Figure 5-1**.

Figure 5-1: Location of Traffic Counter

5.1.2 The data from this traffic survey indicated the number of movements of different vehicles over a 1-week period. The number of movements of light vehicles (cars, motorbikes, buses etc.) and medium/heavy vehicles (LGV, OGVs, etc.) between the hours of operation (07:00 – 20:00) has been averaged to an hourly flow and is presented in **Table 5-1.**

5.1.3 Between the baseline survey and the operational start of 2027, it has been assumed that there will be a 1.033245% increase in traffic.

Table 5-1: Vehicle movements per hour – Baseline (06:00-24:00)

Baseline Year	Light	Medium/Heavy	Total	% Medium/Heavy
2022	13531.1	1484.9	15016.0	9.9
2027	13670.9	1500.2	15171.1	9.9

5.1.4 The assumed traffic movements during the 36-month construction phase are presented in **Table 5-2** and **Table 5-3**.

Table 5-2: Additional Vehicle movements during construction phase – Months 1-18

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
HGV	10	10	15	35	35	45	45	70	80	100	100	90	90	85	80	80	80	70
Light	10	10	18	40	45	55	63	93	103	120	130	130	116	110	108	108	112	120

Table 5-3: Additional Vehicle movements during construction phase – Months 19-36

Month	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
HGV	75	60	60	55	50	45	35	25	20	20	20	15	15	15	10	10	5	0
Light	124	138	160	156	144	152	138	124	106	115	95	70	45	38	28	35	35	30

5.1.5 During the operational period (assumed from 2027) there will be an average of 50 extra HGV movements travelling to and from the west on Magna Road/A341 and 24 extra travelling to and from the east.

5.1.6 The BNL for each Receptor has been calculated using the below formula:

$$BNL = Q + V + p + Road\ surface + Prop$$

Where:
BNL = Basic Noise Level, $L_{A10,18hour}$
Q = 29.1+10log(q), where q=total vehicles in 18 hours period
V = Correction due to speed = 33log(v+40+(500/v), where v=speed in km/h
P = Correction due to % of heavy vehicles = 10log(1+(5p/v) where p=% of heavy vehicles
Road Surface = -1 dB as assumed to be impervious bituminous road surface
Prop = Propagation, = 10log(d/13.5), where d = distance from source to receiver, m

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