URS

EfW CHP Facility, Devonport

Non-Destructive Testing
Baseline Noise Report

October 2013

Prepared for:

MVV Environment
Devonport Ltd

UNITED
KINGDOM &
IRELAND

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The methodology adopted and the sources of information used by URS in providing its services are outlined in this Report. The work described in this Report was undertaken between 14th and 29th September and is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances.

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EXECUTIVE SUMMARY

MVV Environment Devonport Ltd (MVV) are looking to undertake Non-Destructive Testing (NDT) outside usual working hours. Baseline noise surveys have been undertaken at three sensitive residential receptors close to the site boundary.

At R3 (Savage Road) (façade):

- Weekday evening noise levels have been determined as 51 dB $L_{Aeq4hr;}$ and
- Weekend noise levels have been determined as 54 dB L_{Aeq4hr}.

At R15 (Talbot Gardens) (façade):

- Weekday evening noise levels have been determined as 43 dB $L_{Aeq4hr;}$ and
- Weekend noise levels have been determined as 45 dB L_{Aeq4hr}.

At Cardinal Ave (free-field):

- Weekday evening noise levels have been determined as 48 dB $L_{Aeq4hr.}$
- Weekend noise levels have been determined as 51 dB L_{Aeq4hr}.

Based on the baseline noise monitoring the following noise limits are proposed.

At R3 (Savage Road) (façade):

- Weekday evening noise limit of 61 dB $L_{Aeq,4hr}$ or 64 dB $L_{Aeq,1hr}$; and
- Weekend (Saturday afternoon) noise limit of 64 dB $L_{Aeq,4hr}$ or 67 dB $L_{Aeq,1hr}$.

At R15 (Talbot Gardens) (façade):

- Weekday evening noise limit of 58 dB $L_{Aeq,4hr}$ or 61 dB $L_{Aeq,1hr}$; and
- Weekend (Saturday afternoon) noise limit of 60 dB $L_{Aeq,4hr}$ or 63 dB $L_{Aeq,1hr}$.

At Cardinal Ave (façade):

- Weekday evening noise limit of 61 dB $L_{Aeq,4hr}$ or 64 dB $L_{Aeq,1hr}$.
- Weekend (Saturday afternoon) noise limit of 64 dB $L_{Aeq,4hr}$ or 67 dB $L_{Aeq,1hr}$.

1. INTRODUCTION

MVV Environment Devonport Ltd (MVV) are looking to undertake Non-Destructive Testing (NDT) outside usual working hours. MVV commissioned URS to undertake noise monitoring at three receptors for both a weekday evening and a weekend, in order to establish baseline noise levels. The baseline noise level can, if required, be used to provide a suitable noise limit to NDT works.

This report describes the methodology and findings of the baseline noise survey undertaken between 14th and 29th September 2013. This report does not provide an assessment of NDT works, or whether the NDT works will be within acceptable limits for residential occupation.

An introduction to noise perception and an explanation of the terminology used within this report are provided in Appendix A.

1.1 Key Details of NDT

MVV propose a Trial Period of NDT, which is anticipated to run from September 2013 to December 2013; with activities undertaken between 18:00 and 21:00 Mondays to Fridays and 13:00 to 17:00 on Saturdays.

After this Trial Period, subject to the local planning authority's agreement and there being no justifiable and substantiated complaints related to the inspection and testing activities, NDT will continue, running through until July 2014. NDT activities will be undertaken between 18:00 and 22:00 Mondays to Fridays and 13:00 to 17:00 on Saturdays.

2. SITE DESCRIPTION

The EfW CHP facility is currently being constructed in the North Yard of Her Majesty's Naval Base (HMNB), beside Camels Head junction (the junction between the A3064 and Wolseley Road). The development is located close to a number residential properties, most noticeably those in Barne Barton to the north of the site, as well as on Cardinal Ave to the north-east.

3. METHODOLOGY AND ASSESSMENT CRITERIA

The monitoring procedure conformed to BS 7445: 2003 'Description and Measurement of Environmental Noise', with measurements at Savage Road and Talbot Gardens taken 1 metre from the façade of residential receptors at a height of 1.5 metres. At Cardinal Ave, the measurement was taken free-field, over 3.5 metres from the façade. Wind speeds were below 5 ms^{-1}, with light drizzle and rain occurring intermittently on some occassions.

4. BASELINE NOISE SURVEY

4.1 Protocol

Due to the lack of secure monitoring locations, it was not possible to leave equipment unattended. Consequently, manned noise monitoring has been undertaken.

Weekday evening and weekend noise monitoring was undertaken at three locations representative of the closest receptors to the site; logging L_{Aeq}, L_{A90} and L_{AFmax} levels in contiguous 5-minute periods. Table 1 lists the noise monitoring locations shown in Figure 1, Appendix B, as well as the time monitoring was undertaken.

TABLE 1: NOISE MONITORING LOCATION AND TIMINGS				
Location*	**Road**	**Details**	**Date**	**Time**
R3	Savage Road	Representative of the closest noise sensitive properties to the north west (approx. 100 metres from the Site).	Saturday 14th September (weekend)	13:00 – 17:00
			Monday 16th September (weekday)	18:00 – 22:00
R15	Talbot Gardens	Representative of the closest noise sensitive properties to the north (approx. 60 metres from the Site).	Sunday 15th September (weekend)	09:00 – 13:00
			Monday 16th September (weekday)	18:00 – 22:00
-	Cardinal Ave	Representative of the closest noise sensitive properties to the north-east (approx. 200 metres from the Site).	Sunday 29th September (weekend)	13:00 - 17:00
			Tuesday 24th September (weekday)	18:00 – 22:00

* Correlates with residential receptors for the Environmental Statement for the EfW CHP facility (11/00750/FUL)

It was the intention to monitor baseline noise levels at the same time as NDT works would be occurring, however, monitoring at Talbot Gardens (R15) occurred in the morning on Sunday 15th September and monitoring at Cardinal Avenue occurred on the afternoon of Sunday 29th September.

Whilst weekend monitoring at Talbot Gardens and Cardinal Ave was undertaken on a Sunday, URS considers that this will not detract from the credibility of the result. If anything, this will provide greater protection for the public, due to a likely lower noise level on a Sunday compared to a Saturday.

4.2 Instrumentation

Two sound level meters were utilised for the monitoring:

- A Brüel & Kjær 2238 sound level meter, serial number 2562627 was utilised for all noise monitoring, except on Monday 16th at R3;
- A Rion NL52 sound level meter, serial number 1021278 was used at R3 on Monday 16th,

Full calibration details are available upon request.

The calibration levels were checked prior to and following the measurements with a:

- Brüel & Kjær 4231 field calibrator, serial 3005464.; and a
- Rion NC74 field calibrator, serial 35173436, respectively.
- No significant drift (+/- 0.1 dB) was noted.

4.3 Meteorological Conditions

Weather conditions during the measurements were as shown below in Table 2.

TABLE 2: WEATHER CONDITIONS DURING NOISE MONITORING

Location	Time	Max Wind Speed (m/s)	Wind Direction	Temperature	Precipitation
R3	Weekend	0.3	N	16°C	None
	Weekday	0.6	NW	11-12°C	18:05-18:10; 19:10-19:15 – Light Rain
R15	Weekend	3.0	SW	14°C	12:30-12:50 – Light intermittent drizzle 12:50-13:00 – Light continuous rain
	Weekday	0.6	NW	11-12°C	18:05-18:10; 19:10-19:15 – Light Rain
Cardinal Ave	Weekend	0.3 – 3.1	SE	16-17°C	None
	Weekday	0.3	S	17-18 °C	None

Data were removed from the noise assessment for periods of light continuous rain while intermittent drizzle was not considered substantial enough to alter the results.

4.4 Commentary

The following observations of local noise sources were made whilst at the site during the weekend:

- At R3 (Savage Road) the noise climate for the weekend was dominated by local road traffic noise on Savage Road and other surrounding roads (particularly Wolseley Road) as well as passing trains. Also present was occasional noise from pedestrians walking past on the street and besides the meter when entering and exiting the residential properties; as well as noise from within residential properties (talking, television etc…). During lulls in the noise of local road traffic the noise of wind in trees was dominant, as well as noise from the children's play area (approx. 100 metres away).

- At R15 (Talbot Gardens) the noise climate for the weekend was dominated by a mixture of noise from: road traffic from surrounding roads (particularly Savage Road and Wolseley Road); passing trains; residential properties (talking, television, dogs barking etc…); unidentified noises (presumed to be from HMNB); as well as the noise of wind in trees; and bird and animals in Blackie Wood. Also present was occasional noise from vehicles passing on Talbot Gardens and residents talking on their balconies or outside close to the sound level meter.

- At Cardinal Ave the noise climate for the weekend was dominated by a mixture of noise from: road traffic on Cardinal Ave (cars manoeuvring, parking and passing etc…) as well as from surrounding roads (particularly Wolseley Road); passing trains; and pedestrians and residents walking past on the street.

The following observations of local noise sources were made whilst at the site during the weekday evening:

- At R3 (Savage Road) the noise climate for the weekday evening was dominated by local road traffic noise on Savage Road (vehicles and motorbikes) and other surrounding roads (particularly Wolseley Road). ; trains; a sports game on the floodlit sports pitch in HMNB between approximately 19:15 and 21:00 (approx. 400 metres away, though shielded by the mass of the EfW CHP facility); noise from residents at Savage Road properties including talking and television and pedestrians along Savage Road. A low level but audible plant hum noise was also noted, from the direction of HMNB.

- At R15 (Talbot Gardens) the noise climate for the weekday evening was dominated by a mixture of noise from: road traffic from surrounding roads (particularly Savage Road and Wolseley Road); passing trains; residential properties (talking, television etc...); a sports game on the floodlit sports pitch in HMNB between approximately 19:15 and 21:00 (approx. 300 metres away); as well as the noise of birds and animals in Blackie Wood. Also present was occasional noise from vehicles passing on Talbot Gardens and residents talking on their balconies or outside by the sound level meter.

- At Cardinal Ave the noise climate for the weekday evening was dominated by a mixture of noise from: road traffic on Cardinal Ave (cars manoeuvring, parking and passing etc…) as well as from surrounding roads (particularly Wolseley Road); passing trains; and pedestrians and residents walking past on the street.

4.5 R3 (Savage Road) Results

The results of the baseline noise monitoring, measured during the weekend, at location R3 (Savage Road) are given below in Table 3.

TABLE 3: WEEKEND NOISE MONITORING RESULTS FOR R3

Location	Date and Time	Ambient $L_{Aeq,4hr}$ (dB)	Average Background $L_{A90,5min}$ (dB)	Maximum $L_{Amax,5min}$ (dB)
R3	14/09/2013 13:00-17:00	54	40	87

The results of the baseline noise monitoring, measured during the weekday evening, at location R3 (Savage Road) are given below in Table 4.

TABLE 4: WEEKDAY NOISE MONITORING RESULTS FOR R3

Location	Date and Time	Ambient $L_{Aeq,4hr}$ (dB)	Average Background $L_{A90,5min}$ (dB)	Maximum $L_{Amax,5min}$ (dB)
R3	16/09/2013 18:00-22:00	51	38	79

From Tables 3 and Table 4, the results show that the L_{Aeq} and L_{A90} are comparable, with the L_{Amax} varying due to events such as car horns, motorbikes, etc.

The full noise survey data for Savage Road are provided in Appendix C, Tables C1 and C2.

4.6 R15 (Talbot Gardens) Results

The results of the baseline noise monitoring, measured during the weekend, at location R15 (Talbot Gardens) are given below in Table 5.

TABLE 5: WEEKEND NOISE MONITORING RESULTS FOR R15 (FAÇADE LEVELS)				
Location	**Date and Time**	**Ambient $L_{Aeq,4hr}$ (dB)**	**Average Background $L_{A90,5min}$ (dB)**	**Maximum $L_{Amax,5min}$ (dB)**
R15	15/09/2013 09:00-13:00	45	40	76

The results of the baseline noise monitoring as measured during the weekday evening at location R15 (Talbot Gardens) are given below in Table 6.

TABLE 6: WEEKDAY NOISE MONITORING RESULTS FOR R15 (FAÇADE LEVELS)				
Location	**Date and Time**	**Ambient $L_{Aeq,4hr}$ (dB)**	**Average Background $L_{A90,5min}$ (dB)**	**Maximum $L_{Amax,5min}$ (dB)**
R15	16/09/2013 18:00-22:00	43	35	80

Tables 5 and Table 6 noise survey results demonstrate that the L_{Aeq} is comparable, while the L_{A90} shows a variation of up to 5dB. The L_{Amax} between weekend and weekday varies and is due to events such as car horns, motorbikes, sirens etc.

The full noise survey data for Talbot Gardens are provided in Appendix C, Tables C3 and C4.

4.7 Cardinal Ave Results

The results of the baseline noise monitoring, measured during the weekend, at location R15 (Talbot Gardens) are given below in Table 7.

TABLE 7: WEEKEND NOISE MONITORING RESULTS FOR CARDINAL AVENUE (FREE-FIELD LEVELS)				
Location	**Date and Time**	**Ambient $L_{Aeq,4hr}$ (dB)**	**Average Background $L_{A90,5min}$ (dB)**	**Maximum $L_{Amax,5min}$ (dB)**
Cardinal Ave	29/09/2013 13:00-17:00	51	43	81

The results of the baseline noise monitoring as measured during the weekday evening at location Cardinal Ave are given below in Table 8.

TABLE 8: WEEKDAY NOISE MONITORING RESULTS FOR CARDINAL AVENUE (FREE-FIELD LEVELS)

Location	Date and Time	Ambient $L_{Aeq,4hr}$ (dB)	Average Background $L_{A90,5min}$ (dB)	Maximum $L_{Amax,5min}$ (dB)
Cardinal Ave	24/09/2013 18:00-22:00	48	39	77

Table 7 and Table 8 noise survey results demonstrate that the L_{Aeq} is comparable (3 dB), while the L_{A90} shows a variation of up to 4 dB. The L_{Amax} between weekend and weekday varies and is due to events such as car horns, motorbikes, sirens etc.

The full noise survey data for Cardinal Ave are provided in Appendix C, Table C5 and C6.

5. PROPOSED NOISE LIMITS FOR NDT

Based on the noise limits in the PCC Code of Construction Practice (Appendix D), Table 8 lists noise limits that shall be imposed on NDT activities.

Location	Time	Ambient $L_{Aeq,4hr}$ (dB)		Noise Limits (based on façade measurement)	
		Free Field	Façade	$L_{Aeq,4hr}$ dB	$L_{Aeq,1hr}$ dB
R3	Weekend	-	54	64	67
	Weekday	-	51	61	64
R15	Weekend	-	45	60	63
	Weekday	-	43	58	61
Cardinal Ave	Weekend	51	54	64	67
	Weekday	48	51	61	64

*[1] The $L_{Aeq,4hr}$ noise limit shall be applied to both the 3 hour and 4 hour noise measurements of NDT

APPENDIX A NOISE PERCEPTION AND TERMINOLOGY

Between the quietest audible sound and the loudest tolerable sound there is a million to one ratio in sound pressure (measured in Pascals (Pa)). Because of this wide range a noise level scale based on logarithms is used in noise measurement called the decibel (dB) scale. Audibility of sound covers a range of approximately 0 to 140 dB.

The human ear system does not respond uniformly to sound across the detectable frequency range and consequently instrumentation used to measure noise is weighted to represent the performance of the ear. This is known as the 'A weighting' and annotated as dB (A). Table 1 below lists the sound pressure level in dB (A) for common situations.

Table 1: Sound Pressure Levels for a Range of Situations

Typical Noise Levels dB(A)	Example
0	Threshold of hearing
30	Rural area at night, still air
40	Public library Refrigerator humming at 2m
50	Quiet office, no machinery Boiling kettle at 0.5m
60	Normal conversation
70	Telephone ringing at 2m Vacuum cleaner at 3m
80	General factory noise level
100	Pneumatic drill at 5m
120	Discotheque - 1m in front of loudspeaker
140	Threshold of pain

The noise level at a measurement point is rarely steady, even in rural areas, and varies over a range dependent upon the effects of local noise sources. Close to a busy road, the noise level may vary over a range of 5 dB(A), whereas in a suburban area this may increase by up to 40 dB(A) and more due to the multitude of noise sources in such areas (cars, dogs, aircraft etc.) and their variable operation. Furthermore, the range of night time noise levels will often be smaller and the levels significantly reduced compared to daytime levels.

The equivalent continuous A-weighted sound pressure level, LAeq, is the single number that represents the average sound energy measured over that period. The LAeq is the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period.

Human subjects are generally only capable of noticing changes in noise levels of no less than 3 dB(A). It is generally accepted that a change of 10 dB(A) in an overall, steady noise level is perceived to the human ear as a doubling (or halving) of the noise level.

A parameter that is widely accepted as reflecting human perception of the ambient noise is the background noise level, LA90. This is the noise level exceeded for 90% of the measurement period and generally reflects the noise level in the lulls between individual noise events. Over a 1-hour period the LA90 will be the noise level exceeded for 54 minutes.

The parameter LA10 is used to describe road traffic noise. This is the noise level exceeded for 10 % of the measurement period. Over a one hour period, the LA10 will be the noise level exceeded for 6 minutes.

APPENDIX B NOISE MONITORING RECEPTORS

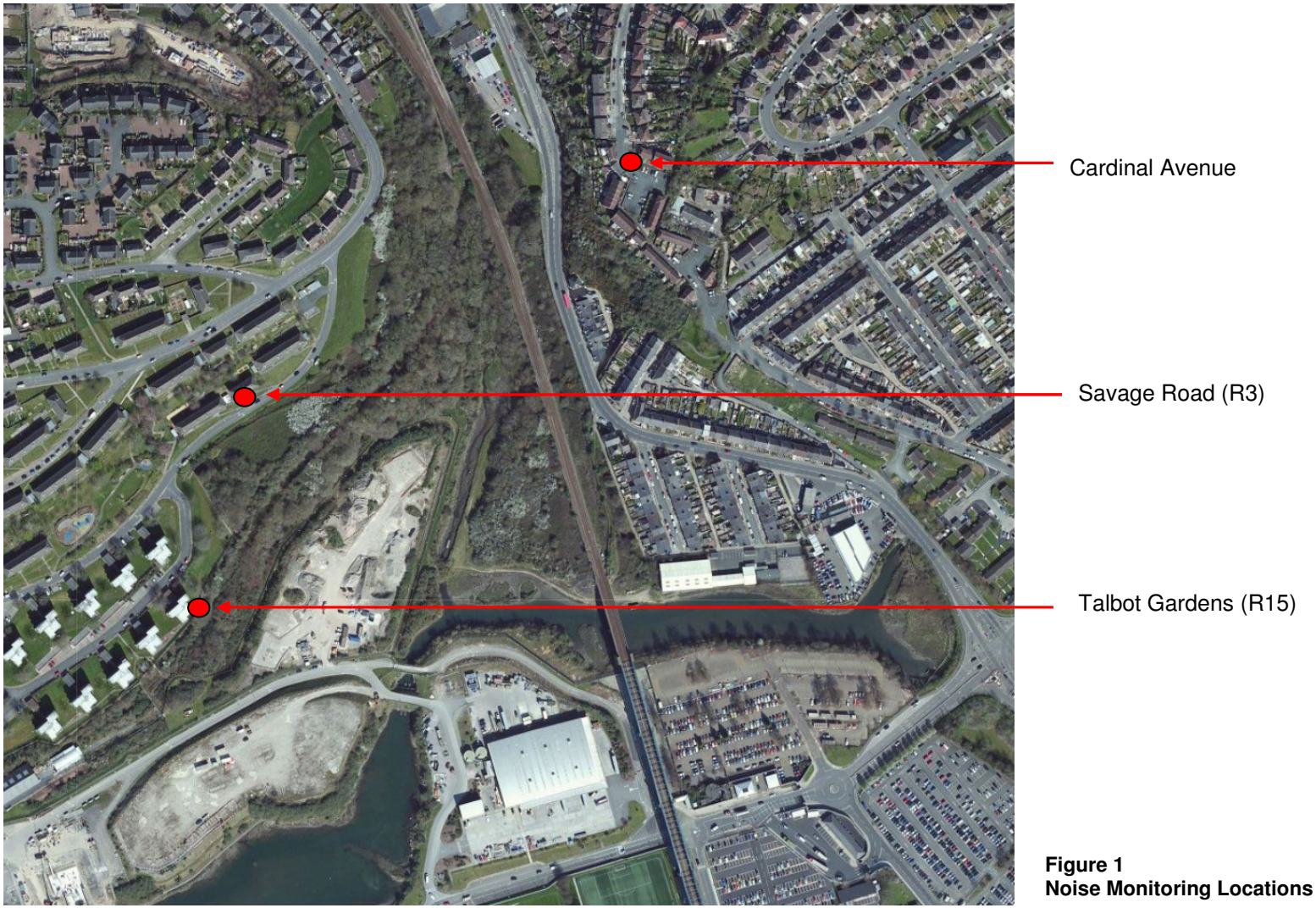

Figure 1
Noise Monitoring Locations

Receptor R3 (Savage Road)

Receptor R15 (Talbot Gardens)

Cardinal Avenue

APPENDIX C FULL NOISE MONITORING RESULTS

Tables C1 to C5 list the full suite of measured noise data.

TABLE C1: SAVAGE ROAD MEASURED NOISE LEVELS (WEEKEND)

Start date	Start time	Duration	L_{Aeq}	L_{AFmax}	L_{AF90}
14/09/2013	12:59:59	00:05:00	51.9	67.1	41
14/09/2013	13:04:59	00:05:00	45.1	62.4	39.5
14/09/2013	13:09:59	00:05:00	46.9	63	40
14/09/2013	13:14:59	00:05:00	51.6	73.3	40
14/09/2013	13:19:59	00:05:00	58.8	83.5	40.5
14/09/2013	13:24:59	00:05:00	52.6	65.2	39
14/09/2013	13:29:59	00:05:00	50.3	69.7	38
14/09/2013	13:34:59	00:05:00	48.1	65.5	39
14/09/2013	13:39:59	00:05:00	48	63.6	39.5
14/09/2013	13:44:59	00:05:00	43.7	57.1	39.5
14/09/2013	13:49:59	00:05:00	47.8	65.1	40
14/09/2013	13:54:59	00:05:00	50.9	67.2	41
14/09/2013	13:59:59	00:05:00	49.8	76.2	40
14/09/2013	14:04:59	00:05:00	47.5	65.1	38.5
14/09/2013	14:09:59	00:05:00	62.3	82.2	40
14/09/2013	14:14:59	00:05:00	51.1	66.5	39.5
14/09/2013	14:19:59	00:05:00	51.3	68.2	41.5
14/09/2013	14:24:59	00:05:00	48	72.1	40
14/09/2013	14:29:59	00:05:00	44.7	61.2	38.5
14/09/2013	14:34:59	00:05:00	61.7	84.9	39.5
14/09/2013	14:39:59	00:05:00	51.8	71	39.5
14/09/2013	14:44:59	00:05:00	51.7	66.3	40.5
14/09/2013	14:49:59	00:05:00	50.2	63.3	39.5
14/09/2013	14:54:59	00:05:00	51.3	68.3	40
14/09/2013	14:59:59	00:05:00	49.6	63.1	41
14/09/2013	15:04:59	00:05:00	50	62.5	41

TABLE C1: SAVAGE ROAD MEASURED NOISE LEVELS (WEEKEND)					
Start date	Start time	Duration	L_{Aeq}	L_{AFmax}	L_{AF90}
14/09/2013	15:09:59	00:05:00	49.7	66.1	40
14/09/2013	15:14:59	00:05:00	50.8	63.3	41.5
14/09/2013	15:19:59	00:05:00	48	63.2	40.5
14/09/2013	15:24:59	00:05:00	53.6	68.6	40
14/09/2013	15:29:59	00:05:00	49.9	67.2	40
14/09/2013	15:34:59	00:05:00	50.4	66.7	38.5
14/09/2013	15:39:59	00:05:00	63.6	86.9	37.5
14/09/2013	15:44:59	00:05:00	61.2	83.3	39
14/09/2013	15:49:59	00:05:00	51.4	67.2	41.5
14/09/2013	15:54:59	00:05:00	51.2	64.6	41
14/09/2013	15:59:59	00:05:00	50	64.1	41.5
14/09/2013	16:04:59	00:05:00	49.1	66.8	39.5
14/09/2013	16:09:59	00:05:00	50.5	67.6	38
14/09/2013	16:14:59	00:05:00	49.8	63.8	38.5
14/09/2013	16:19:59	00:05:00	45.8	59.3	38.5
14/09/2013	16:24:59	00:05:00	45.8	63.1	37.5
14/09/2013	16:29:59	00:05:00	54.4	67.6	38
14/09/2013	16:34:59	00:05:00	47.9	62.7	38.5
14/09/2013	16:39:59	00:05:00	49.1	60.1	39.5
14/09/2013	16:44:59	00:05:00	48.2	62.8	39
14/09/2013	16:49:59	00:05:00	48.4	60.4	39
14/09/2013	16:54:59	00:05:00	49.3	59.8	38.5

TABLE C2: SAVAGE ROAD MEASURED NOISE LEVELS (WEEKDAY EVENING)				
Start date & Time	Duration	L_{Aeq}	L_{AFmax}	L_{AF90}
16/09/2013 18:00:00	0:05:00	50.4	64.7	41.4
16/09/2013 18:05:00	0:05:00	RAIN		
16/09/2013 18:10:00	0:05:00	52.8	72.9	42.9
16/09/2013 18:15:00	0:05:00	52	66.8	41
16/09/2013 18:20:00	0:05:00	51.6	73.6	39.7
16/09/2013 18:25:00	0:05:00	54.4	75	39.1
16/09/2013 18:30:00	0:05:00	50.5	65.4	40.3
16/09/2013 18:35:00	0:05:00	51.2	72.3	39.9
16/09/2013 18:40:00	0:05:00	47.7	62.4	39.2
16/09/2013 18:45:00	0:05:00	49.6	62.4	39.6
16/09/2013 18:50:00	0:05:00	52.3	66.6	40.6
16/09/2013 18:55:00	0:05:00	50.5	65.9	40.1
16/09/2013 19:00:00	0:05:00	53.5	70.8	41.2
16/09/2013 19:05:00	0:05:00	46.5	60.3	39.6
16/09/2013 19:10:00	0:05:00	RAIN		
16/09/2013 19:15:00	0:05:00	52.5	67.4	39.4
16/09/2013 19:20:00	0:05:00	49.5	65.2	39.5
16/09/2013 19:25:00	0:05:00	52.5	68.7	38.6
16/09/2013 19:30:00	0:05:00	47.7	65.9	37.6
16/09/2013 19:35:00	0:05:00	48.4	63.7	38.2
16/09/2013 19:40:00	0:05:00	53.5	65.7	39.3
16/09/2013 19:45:00	0:05:00	48.6	61.6	37.2
16/09/2013 19:50:00	0:05:00	47.5	61.8	38.7
16/09/2013 19:55:00	0:05:00	50.6	64.8	37.5
16/09/2013 20:00:00	0:05:00	48.1	64.2	37.1
16/09/2013 20:05:00	0:05:00	49.6	62.3	38.7

TABLE C2: SAVAGE ROAD MEASURED NOISE LEVELS (WEEKDAY EVENING)				
Start date & Time	Duration	L_{Aeq}	L_{AFmax}	L_{AF90}
16/09/2013 20:10:00	0:05:00	43.7	59.6	36.9
16/09/2013 20:15:00	0:05:00	39.7	54.2	36.1
16/09/2013 20:20:00	0:05:00	54.4	76.2	36.6
16/09/2013 20:25:00	0:05:00	42.9	56.9	36.1
16/09/2013 20:30:00	0:05:00	49.8	64.1	36.1
16/09/2013 20:35:00	0:05:00	46.4	59.5	37.7
16/09/2013 20:40:00	0:05:00	43.4	59.4	36.6
16/09/2013 20:45:00	0:05:00	57.4	79.3	36.9
16/09/2013 20:50:00	0:05:00	44.5	59.6	37.1
16/09/2013 20:55:00	0:05:00	44.5	58.2	36.2
16/09/2013 21:00:00	0:05:00	44.7	61.1	37.3
16/09/2013 21:05:00	0:05:00	45.7	61	38.7
16/09/2013 21:10:00	0:05:00	52.2	77.8	37.8
16/09/2013 21:15:00	0:05:00	44.4	62.3	36.8
16/09/2013 21:20:00	0:05:00	45.9	60.8	37.8
16/09/2013 21:25:00	0:05:00	49.1	61.8	37.6
16/09/2013 21:30:00	0:05:00	47.5	62.6	36.7
16/09/2013 21:35:00	0:05:00	55.5	74.9	38.1
16/09/2013 21:40:00	0:05:00	50.6	71.4	38.2
16/09/2013 21:45:00	0:05:00	42.4	58.6	37.8
16/09/2013 21:50:00	0:05:00	40.9	63	37.3
16/09/2013 21:55:00	0:05:00	51.1	66.8	38.1

TABLE C3: TALBOT GARDENS MEASURED NOISE LEVELS (WEEKEND)					
Start date	Start time	Duration	L_{Aeq}	L_{AFmax}	L_{AF90}
15/09/2013	09:00:01	00:05:00	39.6	63.2	37.5
15/09/2013	09:05:01	00:05:00	41.3	62.4	37.5
15/09/2013	09:10:01	00:05:00	40.2	56.7	37
15/09/2013	09:15:01	00:05:00	43.2	55.4	36.5
15/09/2013	09:20:01	00:05:00	40	50.2	37.5
15/09/2013	09:25:01	00:05:00	39.8	51.1	37
15/09/2013	09:30:01	00:05:00	40.7	50.4	37.5
15/09/2013	09:35:01	00:05:00	41.3	51.4	38
15/09/2013	09:40:01	00:05:00	40	56.1	37.5
15/09/2013	09:45:01	00:05:00	40.4	53.7	38
15/09/2013	09:50:01	00:05:00	42.9	54.7	38.5
15/09/2013	09:55:01	00:05:00	41.2	52.3	39
15/09/2013	10:00:01	00:05:00	41.6	51.4	39.5
15/09/2013	10:05:01	00:05:00	40.5	54.2	38.5
15/09/2013	10:10:01	00:05:00	44.8	54.6	41
15/09/2013	10:15:01	00:05:00	45.7	69.4	39.5
15/09/2013	10:20:01	00:05:00	50	73.8	40.5
15/09/2013	10:25:01	00:05:00	49	75.9	41
15/09/2013	10:30:01	00:05:00	44	62.3	41.5
15/09/2013	10:35:01	00:05:00	42.8	49.4	40.5
15/09/2013	10:40:01	00:05:00	43	54.1	40
15/09/2013	10:45:01	00:05:00	42.7	49.3	40
15/09/2013	10:50:01	00:05:00	45.1	55.6	41
15/09/2013	10:55:01	00:05:00	43.8	54.8	40.5
15/09/2013	11:00:01	00:05:00	46	53.4	41.5
15/09/2013	11:05:01	00:05:00	46.2	62.4	41
15/09/2013	11:10:01	00:05:00	43.5	54.8	40
15/09/2013	11:15:01	00:05:00	43.3	58.6	40.5

TABLE C3: TALBOT GARDENS MEASURED NOISE LEVELS (WEEKEND)					
Start date	Start time	Duration	L_{Aeq}	L_{AFmax}	L_{AF90}
15/09/2013	11:20:01	00:05:00	43.7	57.3	41
15/09/2013	11:25:01	00:05:00	47.3	61.2	41
15/09/2013	11:30:01	00:05:00	44.8	51.9	42
15/09/2013	11:35:01	00:05:00	45.4	52.5	42
15/09/2013	11:40:01	00:05:00	44.6	53.9	42
15/09/2013	11:45:01	00:05:00	47.3	56.1	44
15/09/2013	11:50:01	00:05:00	44.8	57.6	41.5
15/09/2013	11:55:01	00:05:00	44.1	56	41
15/09/2013	12:00:01	00:05:00	45.7	67.1	42.5
15/09/2013	12:05:01	00:05:00	44.2	53	42
15/09/2013	12:10:01	00:05:00	44.1	55	41.5
15/09/2013	12:15:01	00:05:00	46.5	55.2	42.5
15/09/2013	12:20:01	00:05:00	45.7	59.2	42.5
15/09/2013	12:25:01	00:05:00	44.9	50.4	42
15/09/2013	12:30:01	00:05:00	47.4	56.5	43
15/09/2013	12:35:01	00:05:00	49.3	58	44.5
15/09/2013	12:40:01	00:05:00	45.5	54.5	43
15/09/2013	12:45:01	00:05:00	45.9	56.2	42.5
15/09/2013	12:50:01	00:05:00	Rain		
15/09/2013	12:55:01	00:05:00	Rain		

TABLE C4: TALBOT GARDENS MEASURED NOISE LEVELS (WEEKDAY EVENING)					
Start date	**Start time**	**Duration**	**L_{Aeq}**	**L_{AFmax}**	**L_{AF90}**
16/09/2013	18:00:00	00:05:00	45.9	58.2	41.5
16/09/2013	18:05:00	00:05:00	Rain		
16/09/2013	18:10:00	00:05:00	43.8	53	41
16/09/2013	18:15:00	00:05:00	40.5	48	38.5
16/09/2013	18:20:00	00:05:00	40.8	52.7	37.5
16/09/2013	18:25:00	00:05:00	39.1	55.6	37
16/09/2013	18:30:00	00:05:00	40	54.8	36.5
16/09/2013	18:35:00	00:05:00	41.9	56.4	36.5
16/09/2013	18:40:00	00:05:00	39.2	51.6	36.5
16/09/2013	18:45:00	00:05:00	44.9	62.7	38
16/09/2013	18:50:00	00:05:00	44.6	63.9	38.5
16/09/2013	18:55:00	00:05:00	41	48.1	37.5
16/09/2013	19:00:00	00:05:00	45.1	63.1	36.5
16/09/2013	19:05:00	00:05:00	44	62.2	36
16/09/2013	19:10:00	00:05:00	42.3	58.6	36.5
16/09/2013	19:15:00	00:05:00	Rain		
16/09/2013	19:20:00	00:05:00	39.3	51.5	35
16/09/2013	19:25:00	00:05:00	38.7	52.1	35
16/09/2013	19:30:00	00:05:00	41.9	63.2	35
16/09/2013	19:35:00	00:05:00	42.7	52.3	37.5
16/09/2013	19:40:00	00:05:00	43.4	55.7	35
16/09/2013	19:45:00	00:05:00	54	79.5	37
16/09/2013	19:50:00	00:05:00	49.5	73.3	37
16/09/2013	19:55:00	00:05:00	38.9	54.8	35.5
16/09/2013	20:00:00	00:05:00	37.1	49	34.5
16/09/2013	20:05:00	00:05:00	38.4	60	34.5
16/09/2013	20:10:00	00:05:00	37.7	52.6	33.5

TABLE C4: TALBOT GARDENS MEASURED NOISE LEVELS (WEEKDAY EVENING)					
Start date	Start time	Duration	L_{Aeq}	L_{AFmax}	L_{AF90}
16/09/2013	20:15:00	00:05:00	37.9	54.2	34
16/09/2013	20:20:00	00:05:00	37.8	51.1	33
16/09/2013	20:25:00	00:05:00	38	52.7	33
16/09/2013	20:30:00	00:05:00	43.1	58.8	34.5
16/09/2013	20:35:00	00:05:00	37.5	52.9	33.5
16/09/2013	20:40:00	00:05:00	39	56.1	32
16/09/2013	20:45:00	00:05:00	37.7	51.4	33
16/09/2013	20:50:00	00:05:00	39.8	55.5	33
16/09/2013	20:55:00	00:05:00	34.7	47.6	32
16/09/2013	21:00:00	00:05:00	35.5	44.9	33
16/09/2013	21:05:00	00:05:00	34.5	48	32
16/09/2013	21:10:00	00:05:00	38.7	57.7	32
16/09/2013	21:15:00	00:05:00	34.8	45.4	31.5
16/09/2013	21:20:00	00:05:00	33.9	43.6	31.5
16/09/2013	21:25:00	00:05:00	43.1	55.4	31.5
16/09/2013	21:30:00	00:05:00	34.8	46.7	32
16/09/2013	21:35:00	00:05:00	37	47.4	32.5
16/09/2013	21:40:00	00:05:00	35.2	52.2	33
16/09/2013	21:45:00	00:05:00	35.3	54.1	33
16/09/2013	21:50:00	00:05:00	38.8	54.7	33.5
16/09/2013	21:55:00	00:05:00	38.5	53.5	33.5

TABLE C5: CARDINAL AVENUE MEASURED NOISE LEVELS (WEEKEND)					
Start date	Start time	Duration	L_{Aeq}	L_{AFmax}	L_{AF90}
29/09/2013	13:00:38	00:05:00	53.1	77.1	43.5
29/09/2013	13:05:38	00:05:00	55.3	80.7	42.5
29/09/2013	13:10:38	00:05:00	56.6	75.1	43.5
29/09/2013	13:15:38	00:05:00	46.1	56.7	43
29/09/2013	13:20:38	00:05:00	45.4	59.6	43
29/09/2013	13:25:38	00:05:00	51.5	69.8	44
29/09/2013	13:30:38	00:05:00	44.3	54.1	42.5
29/09/2013	13:35:38	00:05:00	45.6	62.6	43
29/09/2013	13:40:38	00:05:00	46.9	63.2	43
29/09/2013	13:45:38	00:05:00	46.9		
29/09/2013	13:50:38	00:05:00	49.2		
29/09/2013	13:55:38	00:05:00	49.5	67.3	41.5
29/09/2013	14:00:38	00:05:00	46.6	61.1	42
29/09/2013	14:05:38	00:05:00	46.6	59.2	41.5
29/09/2013	14:10:38	00:05:00	44.2	61.5	42
29/09/2013	14:15:38	00:05:00	54.2	70.1	43
29/09/2013	14:20:38	00:05:00	47.2	59.8	42
29/09/2013	14:25:38	00:05:00	45.8	64.8	42.5
29/09/2013	14:30:38	00:05:00	Residents talking loudly by SLM		
29/09/2013	14:35:38	00:05:00	47	60.5	42.5
29/09/2013	14:40:38	00:05:00	49.6	68.9	43.5
29/09/2013	14:45:38	00:05:00	45.3	59.4	43
29/09/2013	14:50:38	00:05:00	53.7	70.7	43.5
29/09/2013	14:55:38	00:05:00	52.9	71.1	42.5
29/09/2013	15:00:38	00:05:00	48.1	65.2	42.5
29/09/2013	15:05:38	00:05:00	56.3	81.1	43
29/09/2013	15:10:38	00:05:00	49.5	63.1	44
29/09/2013	15:15:38	00:05:00	50.5	67	43

TABLE C5: CARDINAL AVENUE MEASURED NOISE LEVELS (WEEKEND)					
Start date	Start time	Duration	L_{Aeq}	L_{AFmax}	L_{AF90}
29/09/2013	15:20:38	00:05:00	49.3	65.2	42.5
29/09/2013	15:25:38	00:05:00	54.1	71	42.5
29/09/2013	15:30:38	00:05:00	47.8	63.7	43
29/09/2013	15:35:38	00:05:00	50.7	64.5	43
29/09/2013	15:40:38	00:05:00	Surveyor talking to resident		
29/09/2013	15:45:38	00:05:00			
29/09/2013	15:50:38	00:05:00			
29/09/2013	15:55:38	00:05:00	45.7	56.8	42.5
29/09/2013	16:00:38	00:05:00	52.9	65.1	43.5
29/09/2013	16:05:38	00:05:00	44.1	50.3	42
29/09/2013	16:10:38	00:05:00	44.1	55.2	42
29/09/2013	16:15:38	00:05:00	48.6	67.9	42
29/09/2013	16:20:38	00:05:00	51.7	71.7	42
29/09/2013	16:25:38	00:05:00	54.9	75.5	41.5
29/09/2013	16:30:38	00:05:00	53	75.3	41.5
29/09/2013	16:35:38	00:05:00	45.9	58.5	41
29/09/2013	16:40:38	00:05:00	49.2	68.9	41.5
29/09/2013	16:45:38	00:05:00	44.2	50.8	42
29/09/2013	16:50:38	00:05:00	43.9	51.4	41.5
29/09/2013	16:55:38	00:05:00	50.4	69.1	42

TABLE C6: CARDINAL AVENUE MEASURED NOISE LEVELS (WEEKDAY EVENING)					
Start date	Start time	Duration	L_{Aeq}	L_{AFmax}	L_{AF90}
24/09/2013	18:00:01	00:05:00	50.7	72.5	43.5
24/09/2013	18:05:01	00:05:00	53.4	75.3	42.5
24/09/2013	18:10:01	00:05:00	48	72.5	43
24/09/2013	18:15:01	00:05:00	55.9	76.5	42.5
24/09/2013	18:20:01	00:05:00	45.6	58.7	41.5
24/09/2013	18:25:01	00:05:00	44.5	58.6	42
24/09/2013	18:30:01	00:05:00	44.2	51.9	41.5
24/09/2013	18:35:01	00:05:00	45.5	59	41.5
24/09/2013	18:40:01	00:05:00	46.8	65.4	42
24/09/2013	18:45:01	00:05:00	Deleted due to extraneous noise		
24/09/2013	18:50:01	00:05:00			
24/09/2013	18:55:01	00:05:00	51.7	72.1	41.5
24/09/2013	19:00:01	00:05:00	48.6	67	40.5
24/09/2013	19:05:01	00:05:00	51.3	71	41
24/09/2013	19:10:01	00:05:00	46.4	59.8	41
24/09/2013	19:15:01	00:05:00	49.2	69.6	41
24/09/2013	19:20:01	00:05:00	50.9	73.4	40.5
24/09/2013	19:25:01	00:05:00	44.2	65.4	40.5
24/09/2013	19:30:01	00:05:00	47.8	62.9	40
24/09/2013	19:35:01	00:05:00	48.6	62.1	39.5
24/09/2013	19:40:01	00:05:00	42.9	50.4	40
24/09/2013	19:45:01	00:05:00	47	63.5	40
24/09/2013	19:50:01	00:05:00	42.3	53.7	38.5
24/09/2013	19:55:01	00:05:00	52.8	69.1	39.5
24/09/2013	20:00:01	00:05:00	42.5	56.8	38
24/09/2013	20:05:01	00:05:00	51.8	72.7	38.5
24/09/2013	20:10:01	00:05:00	51.2	67.9	38.5
24/09/2013	20:15:01	00:05:00	40.3	55.9	37

TABLE C6: CARDINAL AVENUE MEASURED NOISE LEVELS (WEEKDAY EVENING)					
Start date	Start time	Duration	L_{Aeq}	L_{AFmax}	L_{AF90}
24/09/2013	20:20:01	00:05:00	40.9	60.2	36.5
24/09/2013	20:25:01	00:05:00	51.6	72.8	37.5
24/09/2013	20:30:01	00:05:00	47	59.5	38
24/09/2013	20:35:01	00:05:00	41.9	48.6	39
24/09/2013	20:40:01	00:05:00	45.2	63.4	39
24/09/2013	20:45:01	00:05:00	45.2	60.8	37
24/09/2013	20:50:01	00:05:00	43.3	62.8	37.5
24/09/2013	20:55:01	00:05:00	39.8	48.5	38
24/09/2013	21:00:01	00:05:00	43.2	51.9	40
24/09/2013	21:05:01	00:05:00	40.2	49.4	38
24/09/2013	21:10:01	00:05:00	44.2	58.5	37.5
24/09/2013	21:15:01	00:05:00	41.7	53.3	37.5
24/09/2013	21:20:01	00:05:00	40.4	58.8	36
24/09/2013	21:25:01	00:05:00	40.5	65.4	36.5
24/09/2013	21:30:01	00:05:00	49	62.6	36.5
24/09/2013	21:35:01	00:05:00	42.2	54.9	36
24/09/2013	21:40:01	00:05:00	39.6	51.6	35.5
24/09/2013	21:45:01	00:05:00	38.7	61.6	34.5
24/09/2013	21:50:01	00:05:00	36	39.7	34
24/09/2013	21:55:01	00:05:00	38	56.8	35

APPENDIX D PLYMOUTH CITY COUNCIL'S CODE OF CONSTRUCTION PRACTICE NOISE RESTRICTIONS

Appendix 2

Construction Noise - Code of Practice

General noise restrictions (subject to modification in special circumstances). Measured at 1m from the nearest (most affected) noise sensitive façade

Existing ambient Leq (measured on fast response over the appropriate hr period given in note 2 below)	**Normal weekday working (excluding Bank Holidays)**							
	Daytime (8am to 6pm)			**Evening (6pm to 10pm)**			**Nightime (10pm to 8am)**	
	Leq (10 hrs)	**Leq (any 3 hrs)**	**Leg (any 5 mins)**	**Leq (4 hrs)**	**Leq (any 1 hr)**	**Leq (any 5 mins)**	**Leq (any 1 hr)**	**Lmax**
35	60	64	80	50	53	60	40	45
40	65	69	81	55	58	60	45	50
45	65	69	81	60	63	66	50	55
50	70	74	86	60	63	66	55	60
55	70	74	86	65	68	71	60	65
60	75	79	91	65	68	71	65	70
65	75	79	91	70	73	76	70	75
70	75	79	91	75	78	81	75	80
75	80	84	96	80	83	90	80	85

1 All noise levels are given in dB(A) as measured on **fast** response.

2 Existing ambient Leq's should be measured during 8am to 10am, 7pm to 9pm or 2am to 4am as appropriate.

3 Saturday morning levels (0800 - 1000 hours) should be as for week-day **daytime**.

4 Saturday afternoons should be as for week-day **evening**.

5 Sundays and Bank Holidays should be as for **weekday nights**