REPORT N^{O} 70018433-001-REV00

ALEXANDRA COLLEGE

CHP NOISE ASSESSMENT

CONFIDENTIAL

JANUARY 2016

WSP | PARSONS BRINCKERHOFF

ALEXANDRA COLLEGE

CHP NOISE ASSESSMENT

Haverstock Associates

Rev00
Confidential

Project no: 70018433
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WSP | Parsons Brinckerhoff
6 Devonshire Square
London EC2M 4YE

Tel: +44 (0) 203 116 6025
Mob: +44 (0) 7767 887 926
www.wspgroup.com
www.pbworld.com

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PRODUCTION TEAM

CLIENT

Architect	Haverstock Associates

WSP GLOBAL INC. (WSP)

Acoustics	Emma Greenland
M&E	Neville Rye

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1 EXECUTIVE SUMMARY

1.1 SCOPE

1.1.1 WSP Acoustics has been appointed by Haverstock Associates to provide an acoustic assessment for the proposed CHP flue extract serving Alexandra College, NW8 0SR, to support the planning application.

1.1.2 An acoustic report has been requested by LBC's Principal Planning Officer to ensure the plant does not result in noise disturbance to nearby residents.

1.1.3 A survey of existing background noise levels was carried out on 17-18 February 2014. The survey results and procedure are fully detailed in Report number *42934_Noise Survey Report_00* dated 10/03/2014.

1.1.4 The Architect has confirmed that there is no specific condition attached to the approval regarding plant noise.

1.1.5 The noise assessment has been based on criteria in London Borough of Camden's Unitary Development Plan in lieu of a specific planning condition. This has been agreed verbally with LBC's Principal Planning Officer.

1.1.6 This acoustic assessment covers the CHP unit, flue connection and flue design only. Cumulative noise levels from other plant items have not been considered as part of this assessment.

1.1.7 This report is technical in nature and to assist the reader a glossary of acoustic terms are included in Appendix A.

1.1.8 Limitations to this report are contained in Appendix F.

2 PROJECT BACKGROUND

2.1 LOCATION OF PLANT

2.1.1 1 no. CHP unit (CHP1) is proposed to serve Alexandra College. It is to be located off site in the energy centre, which also serves the Ainsworth Estate. The location of the flue outlet is shown in Figure 1 Location 1.

2.2 NEAREST RESIDENTIAL RECEPTORS

2.2.1 The nearest residential receptors to CHP1 have been identified in Figure 1 and Table 2-1.

Figure 1: Nearest Residential Receptors

2.2.2 Table 1 describes the nearest residential receptors and the respective distance from CHP1.

Table 2-1 Nearest residential receptors

REFERENCE	DESCRIPTION	DISTANCE FROM FLUE EXHAUST (m)
1	CHP1 Location	N/A
2	100G Rowley Way	51
3	Residential properties to north on Rowley Way	83
4*	St John's Wood Care Home	84

*Equivalent to Monitoring Position A (see attached report *42934_Noise Survey Report_00)*

3 INFORMATION PROVIDED TO THE CONSULTANT

3.1 PROPOSED PLANT & FLUE DESIGN

3.1.1 1 no. CHP unit (CHP1) is proposed to serve Alexandra College. It is to be located off site in the energy centre, which also serves the Ainsworth Estate, see Figure 2.

3.1.2 The CHP exhaust is to be ducted remotely via a flue. The location of the flue outlet is indicated in Figure 2 and Figure 3.

3.1.3 Figures 2 and 3 are taken from drawings issued by Haverstock (*Community Centre Site Boundary Wall CHP flue pipe penetration.* Ref*: 1036_2421.* Date: *201115).*

Figure 2: Boundary fence contextual location & energy centre (highlighted)

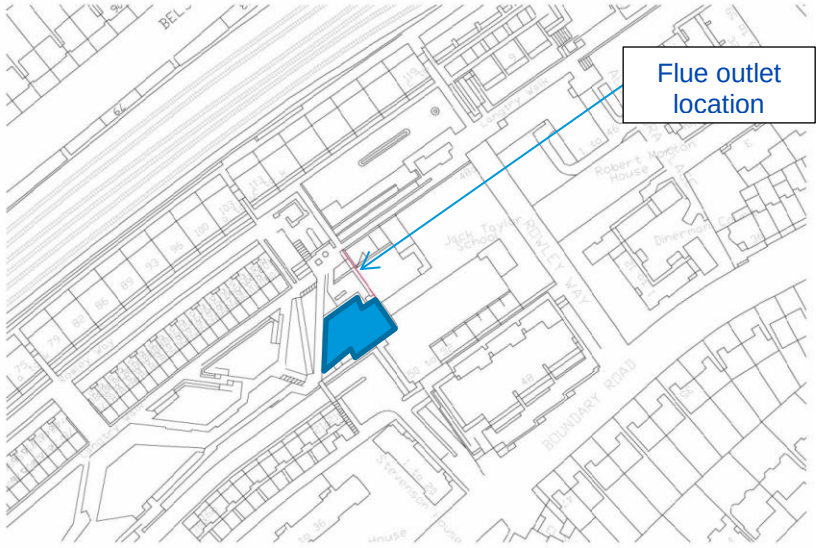
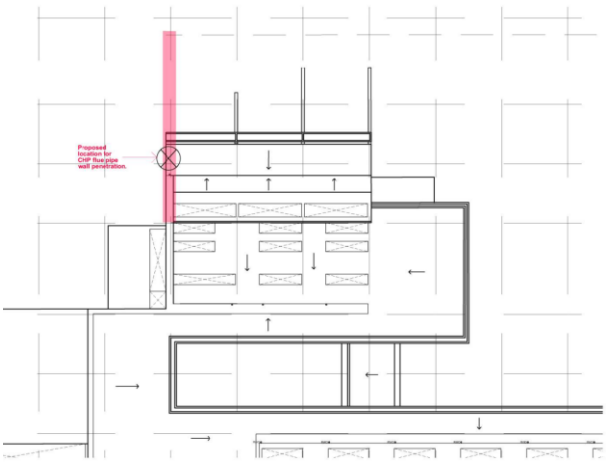


Figure 3: Fence site location plan



3.1.4 A Gas Turbine CHP unit is proposed with twin wall flue. The flue design has been procured by the Contractor (Brith Services).

3.1.5 An SAV XRGI 9 CHP unit is proposed. Delta Test Report DANAK 100/1735: Noise emission from Power Unit XRGI 9 has been received for review. This contains measurements of the casing radiated sound power level according to ISO 3744 together with sound pressure level measurements around the equipment at full load. Relevant extracts from the report are provided in Appendix B.

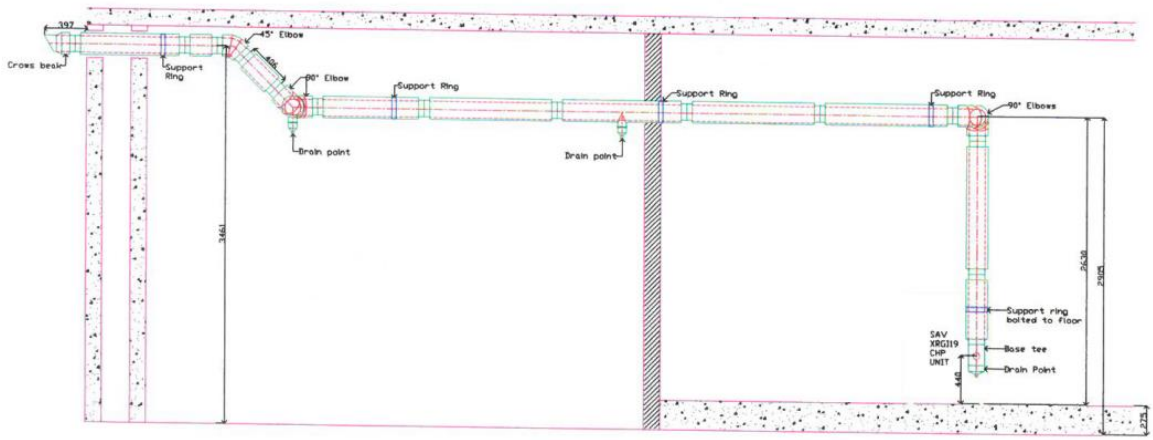
3.1.6 The Power Unit contains a gas powered piston engine and a generator. The reported noise emission from the Power Unit does not include noise from the exhaust system since in the test arrangement the exhaust from the piston engine was led away through a sound proofed metal pipe and emitted outside the building.

3.1.7 The manufacturer has confirmed that no measurements of the in-duct sound power level at the exhaust point are available.

3.1.8 For the purposes of this assessment and in lieu of available data, it is considered that the induct exhaust sound power level may be estimated using the sound pressure level measured at the open air inlet to the unit (location 8 see Appendix B for details).

3.1.9 It is understood that the CHP is directly connected to a 100 mm diameter twin wall insulated flue with a horizontal termination. The route of the flue is indicated on the sketch in Figure 4.

Figure 4: Route of proposed flue



3.1.10 The location of the flue exhaust is shown in section in Figures 2 and 3, and photographs of the proposed location are included in Appendix C

3.1.11 The sound attenuation achieved by the Flue Design (including 14 m circular duct run, and a series of radiused 90 degree bends) has been included in the assessment. However due to the use of circular unlined ductwork and unlined radiused 90 degree bends, the sound attenuation achieved by this route is negligible.

3.1.12 It is understood that the CHP unit will be operation 24 hrs a day and will not contain tonal or attention catching characteristics.

4 NOISE ENVIRONMENT

4.1 BACKGROUND NOISE LEVELS

4.1.1 A noise monitoring survey was carried out to establish background noise levels occurring at the nearest residential premises over a 24-hour period. Full details of the background noise survey, carried out on 17-18 February 2014 are provided in Report 42934_Noise Survey Report_00 dated 10/03/2014.

4.1.2 Monitoring Position A (equivalent to Receptor 4 in Figure 1 of this report) was used for unattended long term continuous monitoring for a period of 24 hours.

4.1.3 Monitoring Position A (St John's Wood Care Home, located directly to the south of the site), was selected to represent the background noise level occurring at nearby noise sensitive receptors.

4.1.4 It was not possible to provide longer continuous monitoring or further sample measurements due to site access constraints.

4.1.5 The long term monitoring data from Position A is presented in tabular and graphical formats in Appendix D.

4.1.6 Statistical analysis of the background noise level has been undertaken in accordance with the example method set out in Section 8.1 of *BS 4142: 2014* to establish a representative background noise level rounded to the nearest whole number. Graphs of background noise level distribution are attached in Appendix E.

4.1.7 The typical free-field background noise levels according to the relevant assessment periods defined in BS4142: 2014 have been determined in Table 4-1 below.

Table 4-1 Free-Field representative background noise level results

PERIOD	L_{A90} (dB)	TIME OF OCCURRENCE
Daytime (07.00-23.00)	42 dB $L_{A90, 1hr}$*	17 February @ 20.00 hrs
Night time (23.00-07.00)	39 dB $L_{A90,15mim}$*	18 February @ 02.00 hrs

*Refer to Appendix E for determination of representative background noise level limits

5 CRITERIA

5.1 BACKGROUND

5.1.1 This report has been requested by LBC's Principal Planning Officer to ensure the plant does not result in noise disturbance to nearby residents.

5.1.2 LBC's website states that the noise, vibration and ventilation assessment should include the following information:

- existing background noise levels measured over a 24-hour period (including the cumulative noise levels of all existing units)
- proposed background noise levels (including the cumulative noise levels of all proposed units)
- any proposed measures to reduce noise, fume emissions and vibration
- the system manufacturers specification of the proposed equipment to be installed, altered or replaced
- details of the method used to compile the report and examples of the calculations and assumptions made

5.1.3 The Architect has confirmed that there is no specific condition attached to the approval regarding plant noise.

5.2 UNITARY DEVELOPMENT PLAN (UDP)

5.2.1 Appendix 1 Table E of LBC's Replacement Unitary Development Plan (UDP) adopted June 2006 contains noise level limits from plant and machinery at which planning permission will not be granted. These criteria are reproduced in Figure 5 below.

Figure 5: LBC's UDP Noise limits for plant and machinery

Camden Replacement Unitary Development Plan
Appendix 1 – Noise and Vibration Thresholds

Table E: Noise levels from plant and machinery at which planning permission will not be granted

Noise description and location of measurement	Period	Time	Noise level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	5dB(A) <LA90
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive facade	Day, evening and night	0000-2400	10dB(A) <LA90
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive facade	Day, evening and night	0000-2400	10dB(A) <LA90
Noise at 1 metre external to sensitive façade where LA90 >60dB	Day, evening and night	0000-2400	55dB L_{Aeq}

5.3 PROPOSED CRITERION

5.3.1 The above noise limits suggest that an appropriate limit at which planning permission would normally be granted is for plant noise not to exceed 5 dB(A) below the pre-existing background noise level L_{A90} at 1 metre external to the nearest sensitive façade, assuming that the noise source does not contain distinguishable discrete notes or distinct impulses.

5.3.2 The above criterion has been agreed verbally with LBC's Principal Planning Officer, Jenna Litherland for application to the CHP flue assessment.

5.3.3 Plant noise emissions shall be assessed in accordance with BS4142: 2014 'Method for rating industrial noise affecting mixed residential and industrial areas'.

5.3.4 Based on the pre-existing background noise levels reported in Table 4-1, in order to ensure that the CHP does not result in noise disturbance to nearby residents, it is proposed that the CHP exhaust noise level shall not exceed a free-field sound pressure level at 1 m from the nearest residential premises as shown in Table 5-1.

Table 5-1 CHP1 noise emission limits

PERIOD	MAXIMUM L_{Aeq} (dB)	TIME OF OCCURRENCE
Daytime (07.00-23.00)	37 dB	17 February @ 20.00 hrs
Night time (23.00-07.00)	34 dB	18 February @ 02.00 hrs

6 ASSESSMENT

6.1 ASSUMPTIONS

6.1.1 The assessment is based on the following assumptions

- Continuous operation, 24 hrs a day
- No distinguishable discrete notes or distinct impulse content from noise source
- Hemispherical noise propagation
- Nearest receiver located at 90 degrees off-axis to flue outlet
- Nearest receiver located at a distance of 51 m from the flue outlet
- Receptor 3 and 4 are equivalent (equal distance attenuation and 90 degrees off-axis)
- Noise level at CHP unit inlet is equivalent to noise level at exhaust outlet (in lieu of available test data
- Noise break-in from other plant items located within the energy centre plant room via the twin wall flue is negligible and therefore the sound power level of the CHP Exhaust is dominant.

6.2 IN-DUCT SOUND POWER LEVEL AT EXHAUST

6.2.1 The in-duct sound power level at the exhaust is estimated from the calculated sound power level at the air inlet.

6.2.2 The Sound Power Level of the inlet is predicted from the measured Sound pressure level at test location 8, (see Appendix B), as shown in Table 6-1.

Table 6-1 Calculation of Inlet sound power level

	Octave Band, Hz							
	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz
SPL, point 8 L_p (dB)	63.3	64.9	59.2	49.5	52.2	48.1	49.2	43.2
Environmental correction K2, dB	0.8	1.8	0.5	0.3	0.1	0	0	0
10 logS, dB (from Appendix B)	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4
Sound Power Level at inlet, L_w (dB)	73.9	74.5	70.1	60.6	63.5	59.5	60.6	54.6

6.2.3 Assuming that the air-inlet sound power level is equivalent to the exhaust sound power level, the assessment of the noise level due to the CHP exhaust flue at the nearest residential premises (receiver locations 4 and 2) is demonstrated in Figure 6 and Figure 7.

6.2.4 The highest calculated free-field noise level due to the CHP1 flue at the nearest residential premises is 20 dB L_{Aeq}.

6.2.5 The calculated noise level meets the maximum criterion of 38 dB L_{Aeq} as proposed in Table 5-1 to ensure that the CHP does not result in noise disturbance to nearby residents.

Figure 6: CHP1 Flue noise calculation: Receptor Location 4 (St John's Wood Care Home)

Ductborne Fan Noise Calculation																			
								AHU/Fan:	CHP 1			Job no:	70018433					
								Path:	Exhaust			Date:	20-Jan-16					
Alexandra College								Space Served:	Receiver 4			By:	EG					
Data: Manufacturer's								Octave Band Centre Frequency, Hz										
Type: Bkwd Ctrf			Pres:	300Pa		Vol:	5.0m³/s	63	125	250	500	1000	2000	4000	8000			
							In duct sound power levels from fan:	73.9	74.5	70.1	60.6	63.5	59.5	60.6	54.6			
Duct	Circular	14	200					1	1	1	1	1	1	1	1			
Bend	Radiused	100mm						0	0	0	0	0	0	0	0			
No Element																		
No Element																		
No Element																		
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Grille:	300 x 250	mm		Calc. Type:	Atmosphere side			72.9	73.5	69.1	59.6	62.5	58.5	59.6	53.6			
Break-ou	300		After Element:	3	No Element			72.9	73.5	69.1	59.6	62.5	58.5	59.6	53.6			
Duct width:	900mm	Rectangular		Standard guage ductwork				7	10	15	20	28	32	35	35			
Roomside	Room:				Mineral fibre			2	4	6	8	10	10	10	10			
	Direct	1	Distance		Flush			######	######	######	######	######	######	######	######			
	Reverb	1	Suspended acoustic ceiling					######	######	######	######	######	######	######	######			
Atmosphere	Directivity	90°	45°	Distance	83.0m			38	39	39	40	40	44	47	47			
		Hemispherical						8	8	8	8	8	8	8	8			
	NR 15		19dB(A)	Lp				**27**	**27**	**22**	**12**	**15**	**6**	**4**	**-2**			
				NR	25			55	44	35	29	25	22	20	18			
				Excess:				-	-	-	-	-	-	-	-			

Figure 7: CHP 1 Flue noise location: Receptor Location 2 (100 G Rowley Way)

Ductborne Fan Noise Calculation	AHU/Fan: CHP 1	Job no: 70018433
	Path: Exhaust	Date: 20-Jan-16
Alexandra College	Space Served: Receiver 2	By: EG

Data: Manufacturer's		Octave Band Centre Frequency, Hz							
Type: Bkwd Ctrf	Pres: 300Pa Vol: 5.0m³/s	63	125	250	500	1000	2000	4000	8000
	In duct sound power levels from fan:	73.9	74.5	70.1	60.6	63.5	59.5	60.6	54.6
Duct	Circular 14 200	1	1	1	1	1	1	1	1
Bend	Radiused 100mm	0	0	0	0	0	0	0	0
No Element									
No Element									
No Element									
No Element									
No Element									
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No Element									
No Element									
Grille: 300 x 250 mm	**Calc. Type:** Atmosphere side	72.9	73.5	69.1	59.6	62.5	58.5	59.6	53.6
Break-ou 300	After Element: 3 No Element	72.9	73.5	69.1	59.6	62.5	58.5	59.6	53.6
Duct width: 900mm	Rectangular Standard guage ductwork	7	10	15	20	28	32	35	35
Roomside	Room: Mineral fibre	2	4	6	8	10	10	10	10
Direct 1	Distance Flush	######	######	######	######	######	######	######	######
Reverb 1	Suspended acoustic ceiling	######	######	######	######	######	######	######	######
Atmosphere	Directivity 180° 45° Distance 51.0m	34	36	37	39	44	45	45	45
	Hemispherical	8	8	8	8	8	8	8	8
NR 13	**20dB(A)** **Lp**	**31**	**30**	**24**	**13**	**11**	**5**	**6**	**0**
	NR 25	55	44	35	29	25	22	20	18
	Excess:	-	-	-	-	-	-	-	-

7 CONCLUSIONS

7.1.1 WSP Acoustics has been appointed by Haverstock Associates to provide an acoustic assessment for the proposed CHP flue extract serving Alexandra College, NW8 0SR, to ensure the plant does not result in noise disturbance to nearby residents.

7.1.2 The noise assessment has been based on criteria in London Borough of Camden's Unitary Development Plan in lieu of a specific planning condition. This has been agreed verbally with LBC's Principal Planning Officer.

7.1.3 The acoustic assessment for the CHP flue as detailed in this report demonstrates that noise emissions from the flue at 1m outside the nearest residential receptors are expected to comfortably achieve the maximum criteria agreed with LBC's Principal Planning Officer in order to minimise noise disturbance to nearby residents.

Appendix A

GLOSSARY

NOISE

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

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

The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90} etc, according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

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

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

ACOUSTIC TERMINOLOGY

TERMINOLOGY	MEANING
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ($2x10^{-5}$Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' - weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq,T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L_{Amax}	L_{Amax} is the maximum A - weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L_1 and L_{90}	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence $L_{10}$is the level exceeded for 1% of the time, and the L_{90} is the level exceeded for 90% of the time.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally as measured outside and away from buildings.
Façade Level	A sound field determined at a distance of 1m in front of a large sound reflecting object such as a building façade.

Appendix B

CHP 1TEST DATA

Figure 8: Extract from Delta Test Report DANAK 100/1735: Annex 1 Noise emission from Power unit XRGI 9 (Full Load)

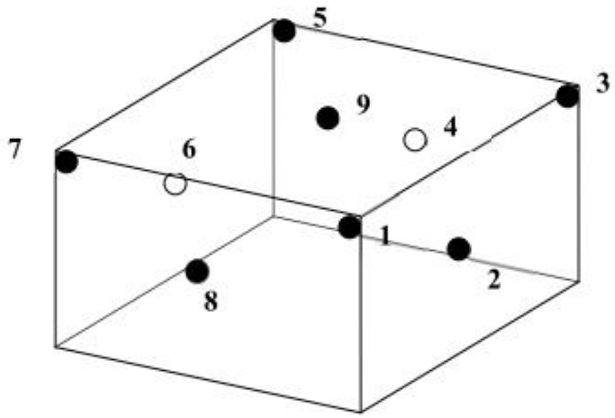
NB Measurement point 8 represents location of air inlet to unit.

Full load

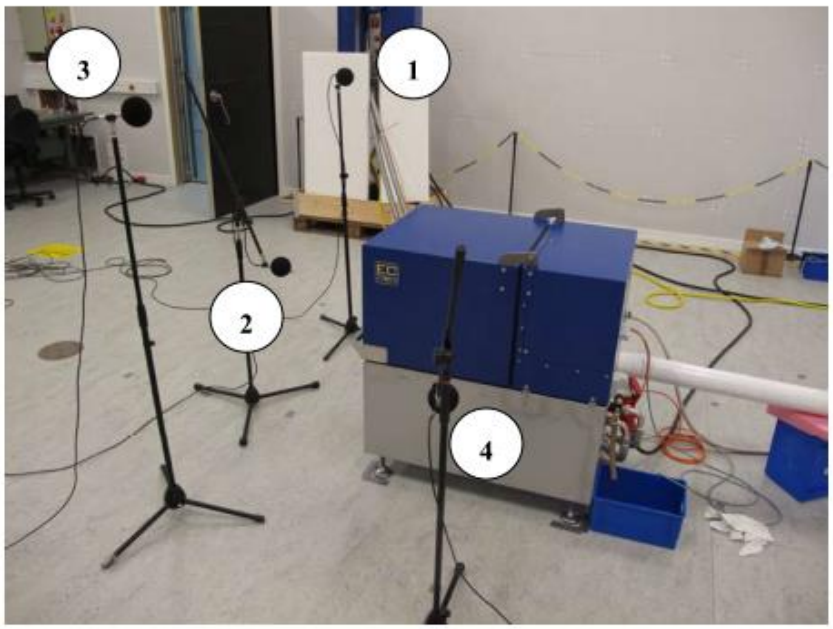
Measurement point	Sound pressure level, dB re 20 µPa									
	Octave Band, Hz									
	63	125	250	500	1000	2000	4000	8000	LIN	A
1	56.4	54.4	49.2	45.3	41.2	39.4	40.9	34.8	66.2	48.8
2	62.2	61.4	52.2	49.8	42.2	36.7	32.1	24.0	72.2	50.5
3	57.3	54.0	50.7	43.9	39.8	39.2	37.9	30.9	66.8	48.1
4	62.7	58.3	56.7	50.8	46.2	44.9	45.3	38.0	72.0	54.1
5	54.1	53.3	51.3	44.1	41.1	39.2	39.5	34.6	65.0	48.4
6	60.7	57.4	53.6	50.5	43.5	38.7	39.0	33.7	71.8	51.1
7	55.0	54.6	51.1	43.9	44.1	41.4	42.2	39.3	65.3	50.4
8	63.3	64.9	59.2	49.5	52.2	48.1	49.2	43.4	74.2	57.8
9	60.4	62.5	54.5	45.2	43.3	40.5	39.3	34.0	68.4	51.1
Average surface sound pressure Level, L'_p	60.2	59.7	54.3	47.9	45.6	42.4	43.0	37.4	70.3	52.4
Background noise correction K_1, dB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-
Environmental correction K_2, dB	0.8	1.8	0.5	0.3	0.1	0.0	0.0	0.0	-	-
10 logS, dB	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	-	-
	Sound power level, dB re 1 pW									
	Octave Band, Hz									
	63	125	250	500	1000	2000	4000	8000	Sum	
Sound power level, L_W	70.8	69.3	65.2	59.0	56.9	53.8	54.4	48.7	74.1 dB(lin)	
Sound power level, L_{WA}	44.6	53.2	56.6	55.8	56.9	55.0	55.4	47.6	63.6 dB(A)	
Uncertainty K_{WA} ;(from ISO 4871) [dB]										2.5
Measured sound pressure level at operator position, L'_{pA} [dB(A) re 20 µPa]										48.8
Local environmental correction K_{3A} [dB]										0.0
Corrected sound pressure level at operator position L_{pA} [dB(A) re 20 µPa]										48.8
Uncertainty K_{pA} ;(from ISO 4871) [dB]										2.5
K_{3A} is calculated from DS/EN ISO 11202 annex A.1 based on K_{2A} and the mean sound pressure level for the surface used for sound power level determination										

Figure 9: Extract from Delta Test Report DANAK 100/1735: Annex 2 Measurement Points

Annex 2 - Measurement points

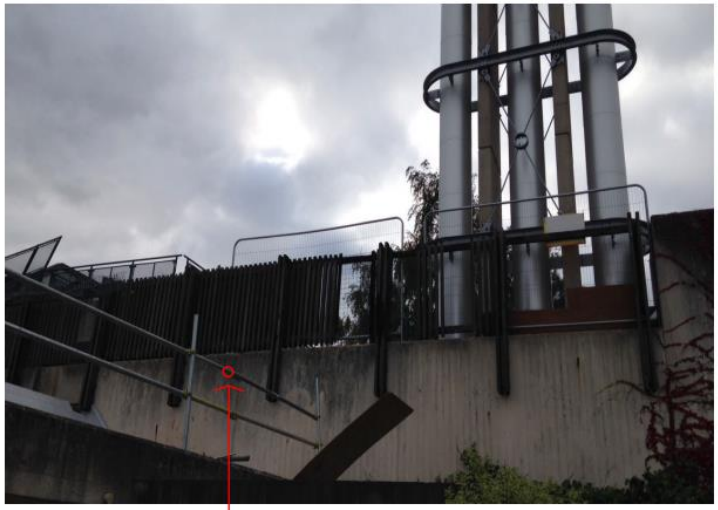


Point 2, 4, 6, 8	Height 0.75 m above the floor at the midpoint of each side of the measurement box
Point 1, 3, 5, 7	Height 1.50 m above the floor at the upper corner of each side of the measurement box
Point 9	Height 1.50 m above the floor at the midpoint of the top of the measurement box



Appendix C

FLUE LOCATION



LOCATION OF CHP FLUE EXTRACT 220mm diameter, 150mm projection from wall

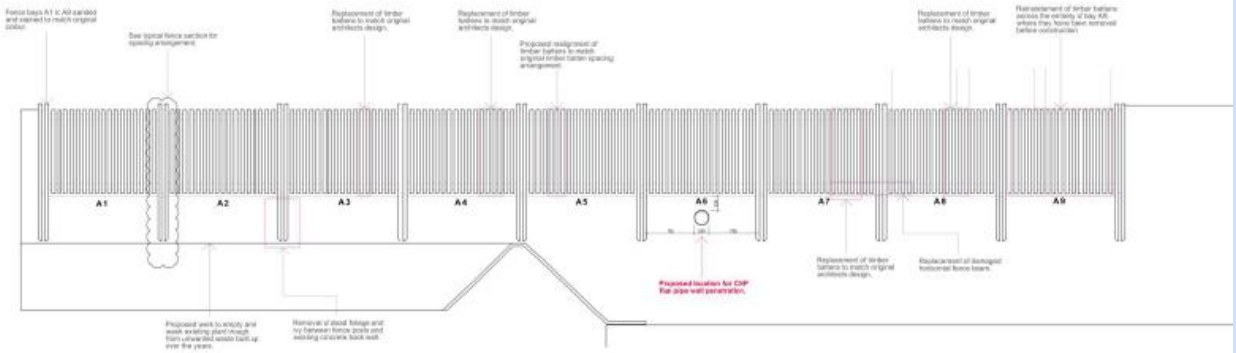
Haverstock
Studio 10, Cliff Road Studios
Cliff Road, London NW1 9AN

tel+ 44 (0)20 7267 7676
info@haverstock.com
www.haverstock.com

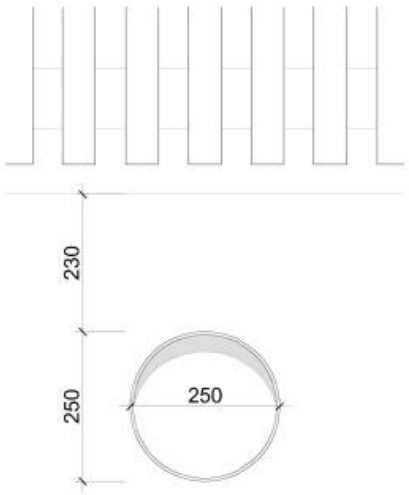
Alexandra College

1036_D222_CHP flue location_261015

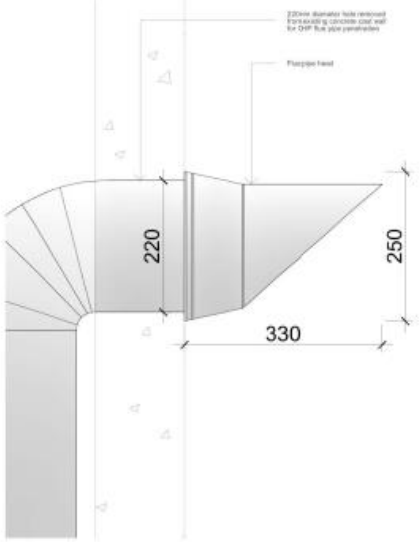
EXISTING BOUNDARY FENCE
Scale 1:50@a1



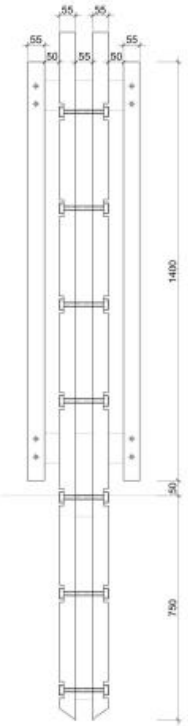
BOUNDARY FENCE ELEVATION A1-A9
PROPOSED REPAIR WORK
Scale 1:50@a1



FLUE PIPE ELEVATION
Scale 1:5@a1



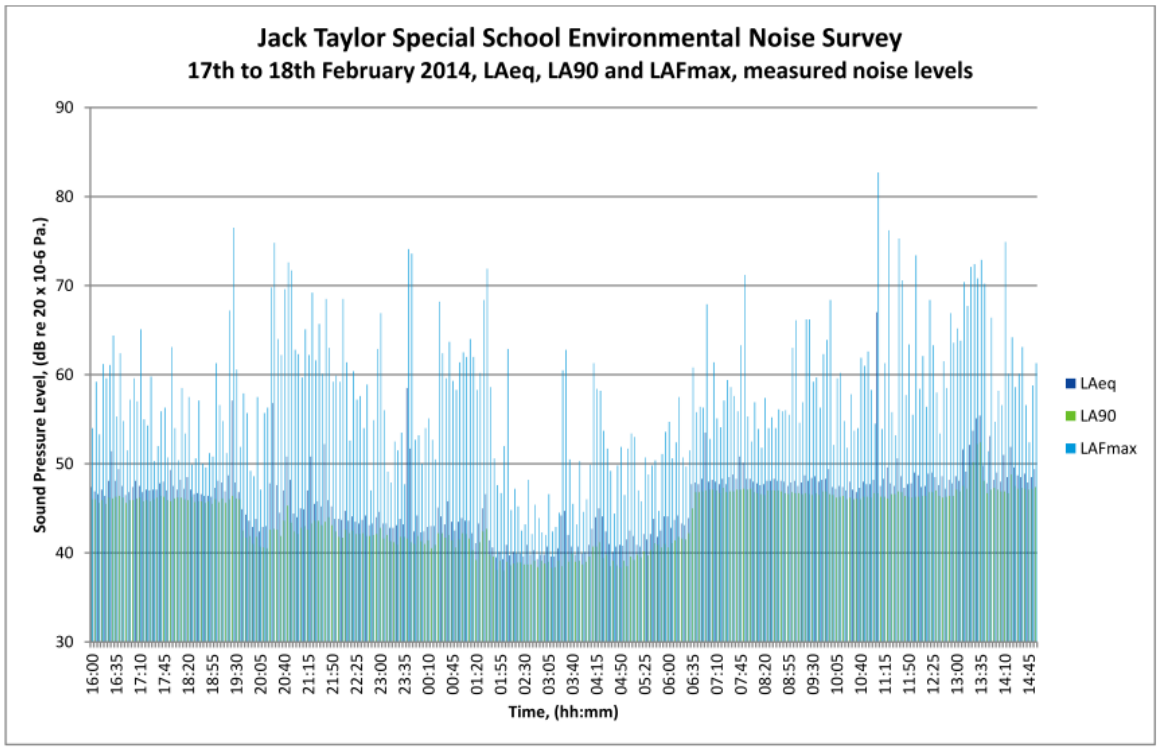
FLUE PIPE SECTION
Scale 1:5@a1



TYPICAL FENCE SECTION
Scale 1:10@a1

Appendix D

BACKGROUND NOISE SURVEY RESULTS

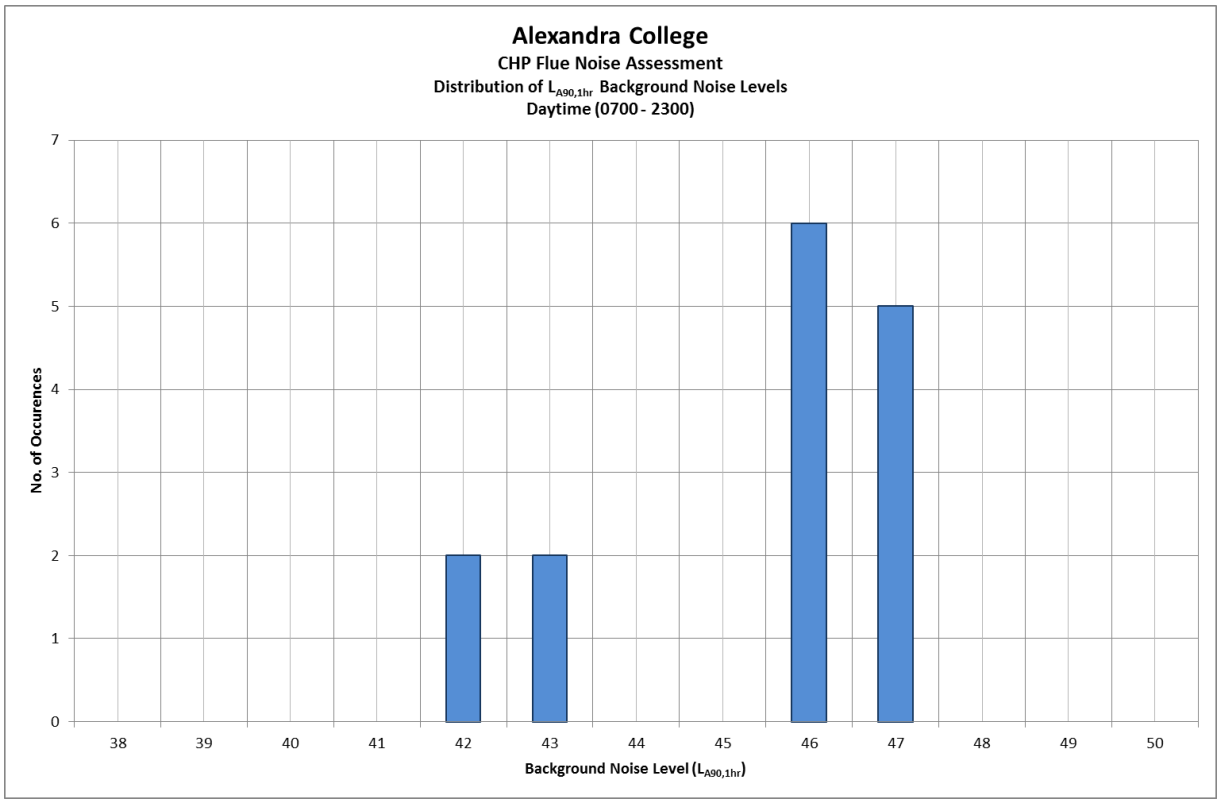

Jack Taylor Special School Environmental Noise Survey
17th to 18th February 2014, LAeq, LA90 and LAFmax, measured noise levels
Sound Pressure Level, (dB re 20 x 10-6 Pa.)
90
80
70
60
50
40
30
16:00
16:35
17:10
17:45
18:20
18:55
19:30
20:05
20:40
21:15
21:50
22:25
23:00
23:35
00:10
00:45
01:20
01:55
02:30
03:05
03:40
04:15
04:50
05:25
06:00
06:35
07:10
07:45
08:20
08:55
09:30
10:05
10:40
11:15
11:50
12:25
13:00
13:35
14:10
14:45
Time, (hh:mm)
LAeq
LA90
LAFmax

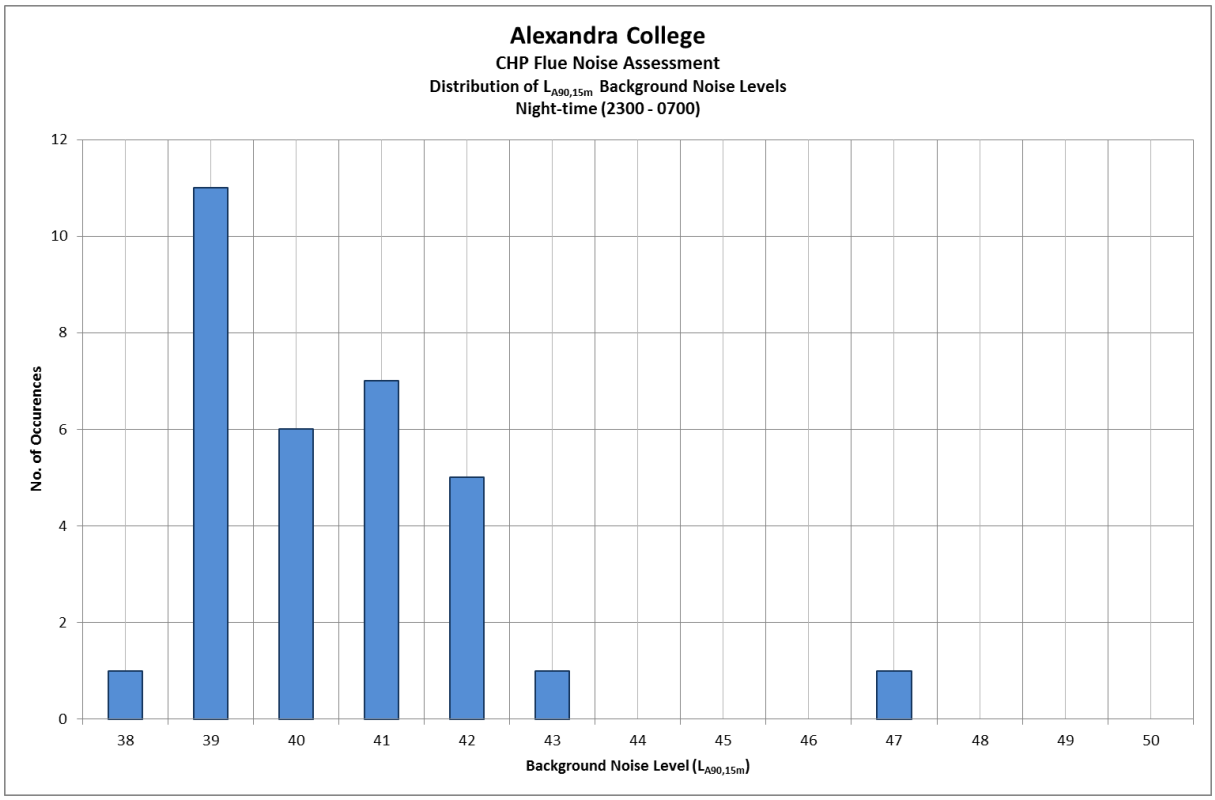
Period Start	Background Noise Level ($L_{A90, 15M}$)	Period Start	Background Noise Level ($L_{A90, 15M}$)
17/02/2014 15:30	46	18/02/2014 03:45	39
17/02/2014 15:45	46	18/02/2014 04:00	39
17/02/2014 16:00	46	18/02/2014 04:15	40
17/02/2014 16:15	46	18/02/2014 04:30	39
17/02/2014 16:30	46	18/02/2014 04:45	39
17/02/2014 16:45	46	18/02/2014 05:00	39
17/02/2014 17:00	46	18/02/2014 05:15	40
17/02/2014 17:15	46	18/02/2014 05:30	40
17/02/2014 17:30	46	18/02/2014 05:45	41
17/02/2014 17:45	46	18/02/2014 06:00	41
17/02/2014 18:00	46	18/02/2014 06:15	42
17/02/2014 18:15	46	18/02/2014 06:30	43
17/02/2014 18:30	46	18/02/2014 06:45	47
17/02/2014 18:45	46	18/02/2014 07:00	47
17/02/2014 19:00	46	18/02/2014 07:15	47
17/02/2014 19:15	46	18/02/2014 07:30	47
17/02/2014 19:30	43	18/02/2014 07:45	47
17/02/2014 19:45	41	18/02/2014 08:00	47
17/02/2014 20:00	41	18/02/2014 08:15	47
17/02/2014 20:15	41	18/02/2014 08:30	47
17/02/2014 20:30	42	18/02/2014 08:45	47
17/02/2014 20:45	43	18/02/2014 09:00	47
17/02/2014 21:00	43	18/02/2014 09:15	47
17/02/2014 21:15	43	18/02/2014 09:30	47
17/02/2014 21:30	43	18/02/2014 09:45	47
17/02/2014 21:45	43	18/02/2014 10:00	46
17/02/2014 22:00	42	18/02/2014 10:15	46
17/02/2014 22:15	42	18/02/2014 10:30	46
17/02/2014 22:30	42	18/02/2014 10:45	46
17/02/2014 22:45	42	18/02/2014 11:00	46
17/02/2014 23:00	42	18/02/2014 11:15	46
17/02/2014 23:15	41	18/02/2014 11:30	47
17/02/2014 23:30	42	18/02/2014 11:45	46
17/02/2014 23:45	41	18/02/2014 12:00	46
18/02/2014 00:00	41	18/02/2014 12:15	47
18/02/2014 00:15	41	18/02/2014 12:30	46
18/02/2014 00:30	42	18/02/2014 12:45	46
18/02/2014 00:45	41	18/02/2014 13:00	47
18/02/2014 01:00	42	18/02/2014 13:15	48

18/02/2014 01:15	40	18/02/2014 13:30	49
18/02/2014 01:30	40	18/02/2014 13:45	47
18/02/2014 01:45	39	18/02/2014 14:00	47
18/02/2014 02:00	38	18/02/2014 14:15	47
18/02/2014 02:15	39	18/02/2014 14:30	47
18/02/2014 02:30	39	18/02/2014 14:45	47
18/02/2014 02:45	39	18/02/2014 15:00	47
18/02/2014 03:00	39	18/02/2014 15:15	47
18/02/2014 03:15	39		
18/02/2014 03:30	40		

Appendix E

STATISTICAL DISTRIBUTION OF BACKGROUND NOISE LEVELS


Alexandra College
CHP Flue Noise Assessment
Distribution of $L_{A90,1hr}$ Background Noise Levels
Daytime (0700 - 2300)
No. of Occurences
0
1
2
3
4
5
6
7
38
39
40
41
42
43
44
45
46
47
48
49
50
Background Noise Level ($L_{A90,1hr}$)


Alexandra College
CHP Flue Noise Assessment
Distribution of $L_{A90,15m}$ Background Noise Levels
Night-time (2300 - 0700)
No. of Occurences
0
2
4
6
8
10
12
38
39
40
41
42
43
44
45
46
47
48
49
50
Background Noise Level ($L_{A90,15m}$)

Appendix F

LIMITATIONS TO THIS REPORT

This report has been prepared for the titled project or named part thereof and should not be used in whole or part and relied upon for any other project without the written authorisation of WSP|PB.

WSP|PB accepts no responsibility or liability for the consequences of this document if it is used for a purpose other than that for which it was commissioned. Persons wishing to use or rely upon this report for other purposes must seek written authority to do so from the owner of this report and/ or WSP|PB and agree to indemnify WSP|PB for any and all loss or damage resulting therefrom.

WSP|PB accepts no responsibility or liability for this document to any other party other than the person by whom it was commissioned.

The findings and opinions expressed are relevant to the dates of the site works and should not be relied upon to represent conditions at substantially later dates.

Opinions included therein are based on information gathered during the study and from our experience.

If additional information becomes available which may affect our comments, conclusions or recommendations WSP|PB reserve the right to review the information, reassess any new potential concerns and modify our opinions accordingly.