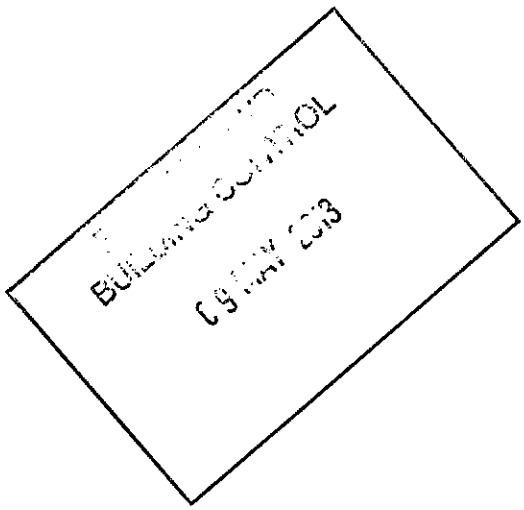
Synergy House
Manchester Science Park

ENVIRONMENTAL NOISE SURVEY
AND PLANT NOISE ASSESSMENT
REPORT 17852/PNA1

Revision 5



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3 May 2013

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REPORT 17852/PNA1
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APPENDIX A

APPENDIX B

TIME HISTORY GRAPHS

PLANT NOISE SCHEDULE

This report has been prepared by Hann Tucker Associates Limited (HTA) with all reasonable skill, care and diligence in accordance with generally accepted acoustic consultancy principles and the purposes and terms agreed between HTA and our Client. Any information provided by third parties and referred to herein may not have been checked or verified by HTA unless expressly stated otherwise. This document contains confidential and commercially sensitive information and shall not be disclosed to third parties. Any third party relies upon this document at their own risk.

1.0 INTRODUCTION

It is proposed to install 26No. new condenser units and replace the 4No. existing emergency standby generators with 3No. new units at Synergy House, Manchester Science Park.

Hann Tucker Associates have therefore been commissioned to undertake a detailed environmental noise survey of the site and propose suitable plant noise emission criteria based on the results of the survey and the requirements of the Local Authority.

The survey data has been used to assess the proposed plant in accordance with the BS 4142 methodology and comment on its acceptability. This report presents the survey methodology and findings.

2.0 OBJECTIVES

To establish, by means of detailed 24 hour daytime and night-time fully automated environmental noise monitoring, the existing A-weighted (dBA) L_{10}, L_{90}, L_{eq} and L_{max} environmental noise levels at measurement positions around the site.

To establish, by means of manned measurements, the existing plant noise levels at the windows of Unit 3 due to the operation of the existing plant from the Unit 3 plant compound.

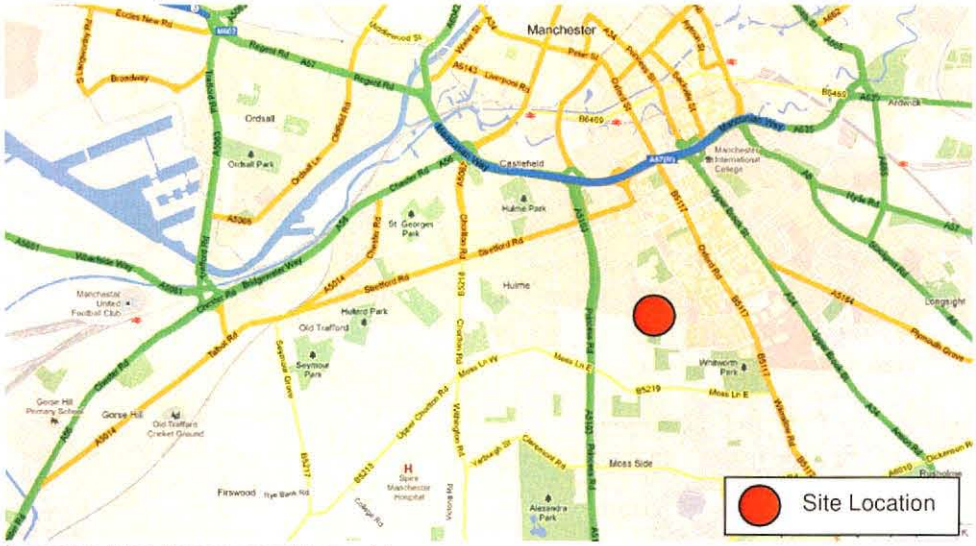
Based on the results of the noise surveys and the requirements of the Local Authority, to propose suitable plant noise emission criteria.

To assess the proposed plant items in accordance with the BS 4142 methodology and comment on its acceptability.

3.0 SITE DESCRIPTION

3.1 Location

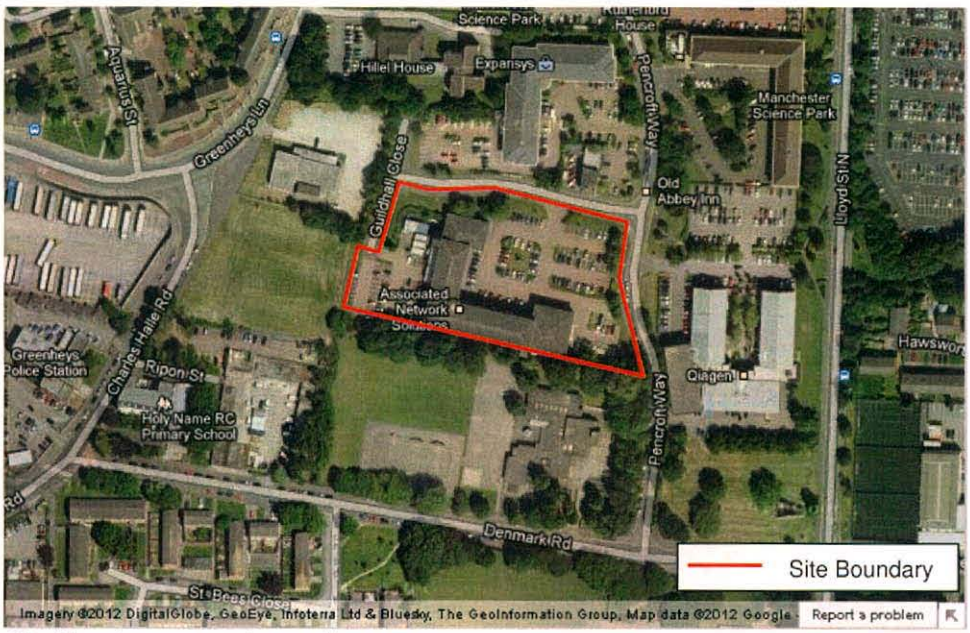
The site is located at Manchester Science Park and falls within Manchester City Council's jurisdiction. See Location Map below.



Location Map (maps.google.co.uk)

3.2 Description

The site comprises a 3 storey building (2 storey at each end) and is bound by Guildhall Close to the North, Pencroft Way to the East, Holy Name RC Primary School to the South and a religious centre/field to the West. Residential properties are situated to the South West on Denmark Road and to the North West on Greenheys Lane. See Site Plan below.



Site Plan (maps.google.co.uk)

4.0 ACOUSTIC TERMINOLOGY

For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.

5.0 METHODOLOGY

5.1 Procedure

5.1.1 Unmanned Surveys

Fully automated environmental noise monitoring was undertaken from approximately 12:25 hours on Wednesday 13 June 2012 to 12:50 hours on Thursday 14 June 2012 at Position 1 and from approximately 17:35 hours on Monday 16 July 2012 to 16:55 hours on Tuesday 17 July 2012 at Positions 2 and 3.

Due to the nature of the surveys, i.e. unmanned, it is not possible to accurately comment on the weather conditions throughout the entire survey period.

However, at the beginning and end of the survey period at Position 1 the wind conditions were calm and the sky was generally patchy cloud. There was no rainfall and road surfaces were dry. We understand that generally throughout the survey period the weather conditions were consistent with a brief period of rainfall between approximately 00:35 and 01:15 hours.

At the beginning and end of the survey period at Positions 2 and 3 the wind conditions were calm and the sky was generally overcast. There were periods of light rainfall and road surfaces were damp. We understand that generally throughout the survey period the weather conditions were consistent.

Measurements were taken continuously of the A-weighted (dBA) L_{10}, L_{90}, L_{eq} and L_{max} sound pressure levels over 5 minute periods. Octave band sound pressure levels were also measured.

5.1.2 Manned Survey

Fully manned noise measurements were undertaken between approximately 11:00 and 12:00 hours on Tuesday 15 January 2013.

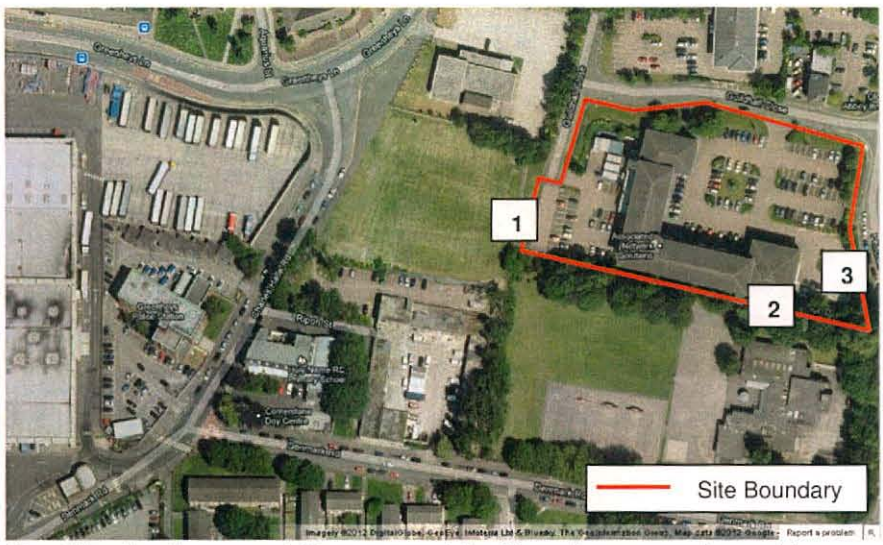
During the survey period the wind conditions were calm and the sky was generally overcast. There was no rainfall and road surfaces were dry.

Measurements were taken of the A-weighted (dBA) L_{10}, L_{90}, L_{eq} and L_{max} sound pressure levels over periods of not less than 5 minutes. Atypical noises were excluded as far as reasonably possible. The noise levels measured are therefore assumed to be representative of the noise climate during which the measurements were taken. Octave band sound pressure levels were also measured.

5.2 Measurement Positions

5.2.1 Unmanned Surveys

The noise level measurements were undertaken at 3No. positions at the site. The measurement positions are shown on the plan below and described in the subsequent table.



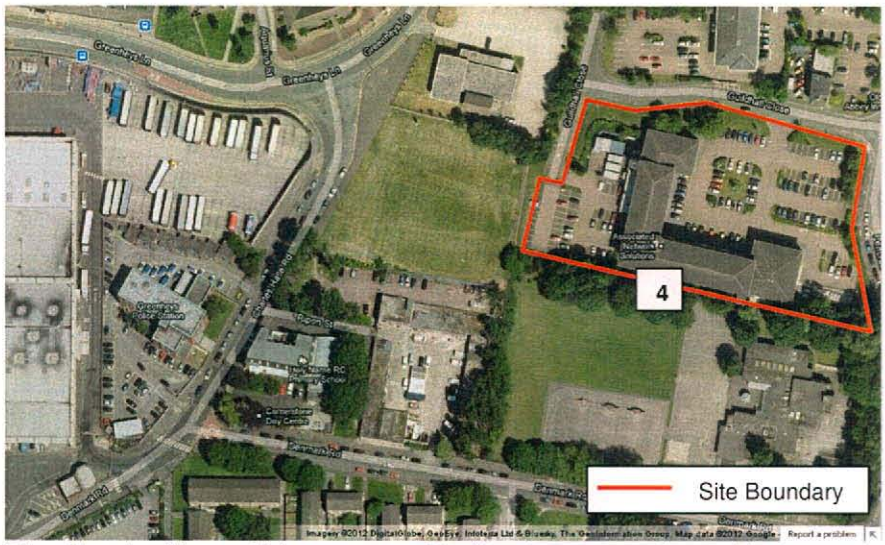
Plan Showing Unmanned Measurement Positions (maps.google.co.uk)

Position	Description
1	Situated at ground level on the Western site boundary overlooking the field. Microphone fixed to site fence at approximately 2m above ground level in free field conditions.
2	Situated at ground level on the Southern site boundary overlooking the school. Microphone fixed to plant enclosure fence at approximately 2m above ground level in free field conditions.
3	Situated at ground level toward the Eastern site boundary overlooking Pencroft Way. Microphone fixed to plant enclosure fence at approximately 2m above ground level in free field conditions.

The measurement positions were selected in order to obtain noise levels representative of those at the nearest noise sensitive receptors for subsequent use in the plant noise impact assessment.

5.2.2 Manned Survey

The noise level measurements were undertaken at a single position at the site. The measurement position is shown on the plan below and described in the subsequent table.



Plan Showing Manned Measurement Position (maps.google.co.uk)

Position	Description
4	Situated at ground level on the Southern site boundary adjacent to Unit 3 and the Unit 3 plant compound. Microphone at a height of approximately 2m above ground level at 1m from the facade.

The measurement position was selected in order to obtain the existing plant noise levels at the windows of Unit 3 due to the operation of the existing plant from the Unit 3 plant compound for subsequent use in the plant noise impact assessment.

5.3 Instrumentation

5.3.1 Unmanned Surveys

The instrumentation used during the surveys is presented in the Table below:

Description	Manufacturer	Type	Serial Number	Latest Verification
Type 1 Data Logging Sound Level Meter	Larson Davis	824	3699	26/04/2012
Type 1 Data Logging Sound Level Meter	Larson Davis	824	3701	10/03/2011
Type 1 Calibrator	Larson Davis	CAL200	3083	01/02/2012

Each sound level meter was located in an environmental case with the microphone connected to the sound level meter via an extension cable. Each microphone was fitted with a Larson Davis windshield.

Each sound level meter, including the extension cable, was calibrated prior to and on completion of the survey. No significant changes were found to have occurred (no more than 0.1dB).

5.3.2 Manned Survey

The instrumentation used during the survey is presented in the Table below:

Description	Manufacturer	Type	Serial Number	Latest Verification
Type 1 Precision Sound Level Meter	Brüel and Kjær	2250	2600445	04/01/2013
Type 1 Calibrator	Brüel and Kjær	4231	2642557	03/01/2013

The sound level meter was fitted with a Brüel and Kjær microphone windshield.

The sound level meter was calibrated prior to and on completion of the survey. No significant changes were found to have occurred (no more than 0.1dB).

6.0 RESULTS

6.1 Unmanned Surveys

The results have been plotted on Time History Graphs 17852/TH1 to 17852/TH6 enclosed presenting the 5 minute A-weighted (dBA) L_{10}, L_{90}, L_{eq} and L_{max} levels at each measurement position throughout the duration of the surveys.

The lowest measured A-weighted (dBA) $L_{A90\ (5min)}$ background noise levels at each measurement position during the daytime and night-time survey periods are presented in the table below along with the octave band noise levels for each measurement.

Position	Period	Background L_{90} Noise Level (dB) at Octave Band Centre Frequency (Hz)								dBA
		63	125	250	500	1k	2k	4k	8k	
1	Daytime	50	45	39	39	38	31	20	19	42
	Night-time	44	43	38	36	33	26	19	19	38
2	Daytime	43	49	52	51	51	50	41	36	55
	Night-time	46	53	54	52	50	50	40	35	55
3	Daytime	59	69	63	55	58	55	46	38	62
	Night-time	59	68	63	55	58	54	45	37	62

6.2 Manned Survey

The measured A-weighted (dBA) $L_{A90\ (5min)}$ existing Unit 3 plant noise level at the measurement position during the survey period is presented in the table below along with the octave band noise levels for the measurement.

Position	Period	Background L_{90} Noise Level (dB) at Octave Band Centre Frequency (Hz)								dBA
		63	125	250	500	1k	2k	4k	8k	
4	-	63	64	64	56	53	47	41	38	59

7.0 DISCUSSION OF NOISE CLIMATE

7.1 Unmanned Surveys

Due to the nature of the survey, i.e. unmanned, it is not possible to accurately describe the dominant noise sources, or specific noise events throughout the entire survey period.

However, at the beginning and end of the survey periods the dominant noise source at Position 1 was noted to be road traffic on the surrounding road network and children playing in the playground adjacent to the site. A brief period of rainfall can be seen to elevate noise levels between approximately 00:35 and 01:15 hours.

At Positions 2 and 3 the dominant noise source was noted to be existing items of building services plant serving the site comprising heat rejection plant and a transformer. As can be seen from the Time History graphs at Positions 2 and 3, the plant operates over a 24 hour period.

Since the background noise levels measured at Positions 2 and 3 were affected by plant noise emissions we would propose to use the background noise levels measured at Position 1 for subsequent assessments to the school and residential properties on Denmark Road.

7.2 Manned Survey

The dominant noise source at Position 4 was noted to be existing plant from the Unit 3 plant compound. It should be noted that the ambient temperature was approximately 2°C during the survey period. As such, the existing Unit 3 plant items would not be expected to be operating at maximum duty. The measured Unit 3 plant noise levels should therefore be considered worst case, i.e. at there lowest.

8.0 PLANT NOISE EMISSION CRITERIA

8.1 Non-Emergency Plant Items

The site falls within the jurisdiction of Manchester City Council, who we understand have the following requirements with regard to external plant noise emissions for normal non-emergency items of plant:-

> *"Externally mounted ancillary plant, equipment and servicing shall be acoustically treated in accordance with a scheme designed so as to achieve a noise level of 5dB below the existing background (L_{A90}) in each octave band at the nearest noise sensitive location."*

Based on the above and the results of the environmental noise survey we propose the following non-emergency plant noise emission limits to be achieved at 1m from the nearest noise sensitive location based on the minimum measured $L_{A90(5min)}$ background noise levels.

Period	Non-Emergency Plant Noise Emission Limit (dB) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Daytime	45	40	34	34	33	26	15	14	37
Night-time	39	38	33	31	28	21	14	14	33

If plant contains tonal or impulsive characteristics the external design criteria should be reduced by 5dB. It should be noted that the above non-emergency plant noise emission criteria are subject to the final approval of Manchester City Council.

With regard to Unit 3, we would propose that new items of plant are designed so as to achieve a noise level of 5dB below the existing Unit 3 L_{A90} plant noise levels in each octave band at the windows of Unit 3.

Period	Unit 3 Non-Emergency Plant Noise Emission Limit (dB) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
24 Hours	58	59	59	51	48	42	36	33	54

8.2 Emergency Plant Items

The proposed emergency standby generator units will only operate under mains power failure (highly unlikely) until mains power is restored and for weekly short duration maintenance checks (which should be restricted to weekday daytime hours only).

Due to the limited operation of the proposed emergency standby generator units we would propose that they are exempt from the above criteria. Instead, we would propose that noise emissions from the new emergency standby generator units are lower than those from the existing emergency standby generator units which they are replacing.

9.0 BS 4142: 1997

BS 4142: 1997 – Rating industrial noise affecting mixed residential & industrial areas, describes a method of determining the level of noise of an industrial nature, together with procedures for assessing whether the noise in question is likely to give rise to complaints from persons living in the vicinity.

The likelihood of complaints is indicated by the difference between the rating level (i.e. noise level from the proposed items of plant), and the existing background noise level.

The standard states that:

- a difference of around +10dB or more indicates that complaints are likely;
- a difference of around +5dB is of marginal significance;
- if the rating level is more than 10dB below the measured background noise level then this is a positive indication that complaints are unlikely.

The noise from the new development is expressed in terms of a rating level and given as an $L_{Aeq,T}$ noise level. The existing background noise level is expressed in terms of a $L_{A90,T}$ noise level.

T is the assessment time interval, which is 1-hour for operations during daytime hours (07:00 to 23:00 hours) and 5-minutes for operations during night-time hours (23:00 to 07:00 hours).

It states that if the noise source contains an 'acoustic feature', such as tonality, irregularity or impulsiveness, a 5dB penalty should be applied.

Acoustic definitions as given by BS 4142: 1997 can be found in Appendix B.

10.0 NON-EMERGENCY PLANT NOISE ASSESSMENT

10.1 Plant Noise Data

The proposed 26No. new condenser units are detailed in the enclosed Plant Noise Schedule 17852/PNS1. This details manufacturers noise level data used in our acoustic analysis for each item of plant. It has been based upon plant data received from Airedale.

It should be noted that the noise data is representative of the proposed new condenser units at 100% duty i.e. 32°C ambient temperature. As such, for the vast majority of the year the actual plant noise levels will be significantly lower than indicated.

This data presents "maximum" sound pressure levels, which shall not, therefore, be exceeded. The sound pressure levels shown have been based upon manufacturer's data for the specific items of plant at their respective duties.

It should be noted that the proposed new condenser units have been re-selected in order to achieve the criteria without the requirement for additional acoustic treatment measures such as acoustic screens or enclosures.

It is not possible to accurately assess tonality based on octave band data alone. However, it is widely accepted that provided no one octave band is elevated by more then 5dB above adjacent octave bands then the noise generated is unlikely to be tonal in nature. A review of the octave band plant noise data in the enclosed Plant Noise Schedule indicates that none of the proposed new condenser units are likely to emit tonal noise.

Furthermore, the proposed new condenser units will feature EC type fans with variable speed control. As such the fan speed will vary gradually rather than cutting on/off. Additionally, the new condenser units have been selected to achieve a noise level of 5dB below the existing background (L_{A90}) in each octave band at the nearest noise sensitive location. Plant noise emissions should therefore not be considered" irregular enough to attract attention".

Based on the above, a 5dB 'acoustic feature' penalty has therefore not been applied to the proposed 26No. new condenser units.

10.2 Operating Hours

The proposed new units have the potential to operate simultaneously at any time over a 24 hour period.

10.3 Drawings

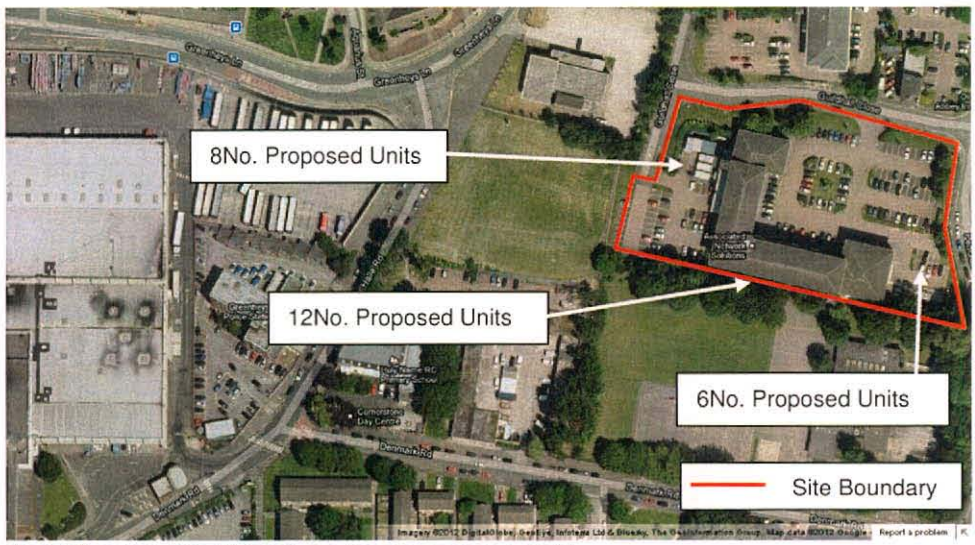
The following drawings have been used to form the basis for our assessment.

Author	Reference	Revision	Date
Leach Rhodes Walker, Architects	7199 L(90)03	F	03.05.13

10.4 Plant Locations

Of the proposed 26No. new condenser units, 6No. will be situated within the existing car park to the East of Unit 1 (Group A and B), 12No. will be situated to the South of Unit 3 (Group C, D and G) and 8No. will be situated within the existing service yard to the West of Unit 6 (Group E and F).

The plant locations are shown on the plan below.



Plan Showing Plant Locations (maps.google.co.uk)

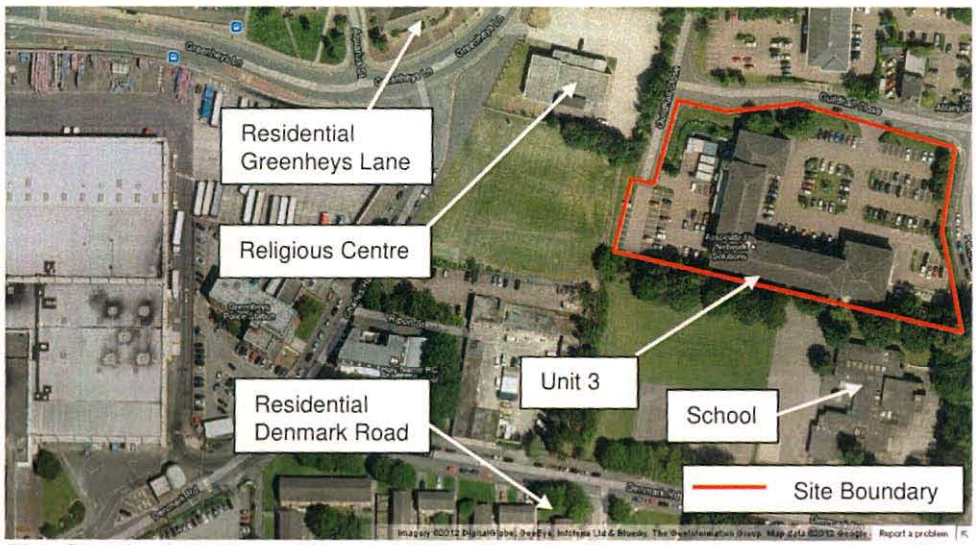
10.5 Nearest Noise Sensitive Receptors

The nearest noise sensitive receptor to the proposed 6No. new condenser units to the East of the site is Holy Name RC Primary School situated on Denmark Road to the South of the site. However, during the night-time period the nearest noise sensitive receptor will be residential properties situated on Denmark Road to the South West of the site.

The nearest noise sensitive receptor to the proposed 12No. new condenser units to the South of the site is Holy Name RC Primary School situated on Denmark Road to the South of the site. However, during the night-time period the nearest noise sensitive receptor will be residential properties situated on Denmark Road to the South West of the site. Additionally, the windows of Unit 3 will also be assessed to.

The nearest noise sensitive receptor to the proposed 8No. new condenser units to the West of the site is a religious situated on Greenheys Lane to the North West of the site. However, during the night-time period the nearest noise sensitive receptor will be residential properties situated on Greenheys Lane to the North West of the site.

The locations of the nearest noise sensitive receptors are shown on the plan below.



Plan Showing Locations of Nearest Noise Sensitive Receptors (maps.google.co.uk)

10.6 Reflections

A +3dB correction has been applied to the following items of plant to account for reflections from the facades of Synergy House toward the nearest noise sensitive receptors.

Plant Item	Facade	Receptor
12No. Proposed Units	South	School / Residential
8No. Proposed Unit	West	Religious Centre / Residential

10.7 Assessment

We have undertaken an assessment of the rating level of the proposed new condenser units to the facades of the nearest noise sensitive receptors and Unit 3 for comparison with the background noise level.

Since the proposed 26No. new condenser units will have the potential to run 24 hours a day we have assessed to the lowest daytime background noise levels at the school and religious centre and the lowest night-time background noise levels at the residential properties. Additionally, the existing Unit 3 plant noise levels have been assessed to at Unit 3.

The assessment time intervals are taken over the daytime period of 1 hour and night-time period of 5 minutes in accordance with BS 4142. The assessment considers a **worst case** scenario with all plant items operational at 100% duty for the full assessment time interval of 1 hour/5 minutes.

Based on the above, our BS 4142 assessments are summarised in the following tables.

10.7.1 Daytime School – North Facade

Period	Sound Pressure Level (dB) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
4No. Condenser Units (Group A) L_p at 10m	39	31	29	27	26	23	17	14	31
4No. Units (10*log(#))	+6	+6	+6	+6	+6	+6	+6	+6	-
Reflections (+3dB)	0	0	0	0	0	0	0	0	-
Distance Loss to 30m (20*log(10/dist))	-10	-10	-10	-10	-10	-10	-10	-10	-
Calculated Rating Level	**35**	**27**	**25**	**23**	**22**	**19**	**13**	**10**	**27**
2No. Condenser Units (Group B) L_p at 10m	41	33	31	29	28	25	19	16	33
2No. Units (10*log(#))	+3	+3	+3	+3	+3	+3	+3	+3	-
Reflections (+3dB)	0	0	0	0	0	0	0	0	-
Distance Loss to 30m (20*log(10/dist))	-10	-10	-10	-10	-10	-10	-10	-10	-
Calculated Rating Level	**34**	**26**	**24**	**22**	**21**	**18**	**12**	**9**	**26**
Total Calculated Rating Level	**38**	**30**	**28**	**26**	**25**	**22**	**16**	**13**	**29**
Lowest Measured Daytime Background Noise Level	50	45	39	39	38	31	20	19	41
Difference between Rating Level and Background Noise Level	-12	-15	-11	-13	-13	-9	-4	-6	-12

The assessment indicates that the proposed new condenser units will achieve the proposed non-emergency plant noise emission criteria of 5dB below the existing background (L_{A90}) in each octave band at the nearest noise sensitive receptor. The only exception to this is at 4kHz where a level of 4dB below the existing background (L_{A90}) is calculated. We would consider an exceedance of 1dB at 4kHz to be imperceptible. Furthermore, as stated in Section 10.1, the noise data is representative of the proposed new condenser units at 100% duty i.e. 32°C ambient temperature. As such, for the vast majority of the year the actual plant noise levels will be significantly lower than indicated.

With reference to the BS 4142: 1997 assessment criteria (described in Section 9.0) the dBA rating level of 12dB below the night-time background noise level falls beyond "a positive indication that complaints are unlikely".

As such, the proposals should be considered acceptable.

10.7.2 Daytime School – West Facade

Period	Sound Pressure Level (dB) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
8No. Condenser Units (Group C) L_p at 10m	39	31	29	27	26	23	17	14	31
8No. Units (10*log(#))	+9	+9	+9	+9	+9	+9	+9	+9	-
Reflections (+3dB)	+3	+3	+3	+3	+3	+3	+3	+3	-
Distance Loss to 50m (20*log(10/dist))	-14	-14	-14	-14	-14	-14	-14	-14	-
Calculated Rating Level	**37**	**29**	**27**	**25**	**24**	**21**	**15**	**12**	**29**
3No. Condenser Units (Group D) L_p at 10m	35	34	33	28	25	21	15	11	31
3No. Units (10*log(#))	+5	+5	+5	+5	+5	+5	+5	+5	-
Reflections (+3dB)	+3	+3	+3	+3	+3	+3	+3	+3	-
Distance Loss to 50m (20*log(10/dist))	-14	-14	-14	-14	-14	-14	-14	-14	-
Calculated Rating Level	**29**	**28**	**27**	**22**	**19**	**15**	**9**	**5**	**25**
1No. Condenser Unit (Group G) L_p at 10m	24	14	16	16	17	11	2	0	20
1No. Unit (10*log(#))	0	0	0	0	0	0	0	0	-
Reflections (+3dB)	+3	+3	+3	+3	+3	+3	+3	+3	-
Distance Loss to 50m (20*log(10/dist))	-14	-14	-14	-14	-14	-14	-14	-14	-
Calculated Rating Level	**13**	**3**	**5**	**5**	**6**	**0**	**0**	**0**	**10**
Total Calculated Rating Level	**38**	**32**	**30**	**27**	**25**	**22**	**16**	**13**	**30**
Lowest Measured Daytime Background Noise Level	50	45	39	39	38	31	20	19	42
Difference between Rating Level and Background Noise Level	-12	-13	-9	-12	-13	-9	-4	-6	-11

The assessment indicates that the proposed new condenser units will achieve the proposed non-emergency plant noise emission criteria of 5dB below the existing background (L_{A90}) in each octave band at the nearest noise sensitive receptor. The only exception to this is at 4kHz where a level of 4dB below the existing background (L_{A90}) is calculated. We would consider an exceedance of 1dB at 4kHz to be imperceptible. Furthermore, as stated in Section 10.1, the noise data is representative of the proposed new condenser units at 100% duty i.e. 32°C ambient temperature. As such, for the vast majority of the year the actual plant noise levels will be significantly lower than indicated.

With reference to the BS 4142: 1997 assessment criteria (described in Section 9.0) the dBA rating level of 11dB below the daytime background noise level falls beyond "a positive indication that complaints are unlikely".

As such, the proposals should be considered acceptable.

10.7.3 Daytime Religious Centre

Period	Sound Pressure Level (dB) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
4No. Condenser Units (Group E) L_p at 10m	39	31	29	27	26	23	17	14	31
4No. Units (10*log(#))	+6	+6	+6	+6	+6	+6	+6	+6	-
Reflections (+3dB)	+3	+3	+3	+3	+3	+3	+3	+3	-
Distance Loss to 45m (20*log(10/dist))	-13	-13	-13	-13	-13	-13	-13	-13	-
Calculated Rating Level	**35**	**27**	**25**	**23**	**22**	**19**	**13**	**10**	**27**
4No. Condenser Units (Group F) L_p at 10m	35	34	33	28	25	21	15	11	31
4No. Units (10*log(#))	+6	+6	+6	+6	+6	+6	+6	+6	-
Reflections (+3dB)	+3	+3	+3	+3	+3	+3	+3	+3	-
Distance Loss to 45m (20*log(10/dist))	-13	-13	-13	-13	-13	-13	-13	-13	-
Calculated Rating Level	**31**	**30**	**29**	**24**	**21**	**17**	**11**	**7**	**27**
Total Calculated Rating Level	**36**	**32**	**30**	**27**	**25**	**21**	**15**	**12**	**30**
Lowest Measured Daytime Background Noise Level	50	45	39	39	38	31	20	19	42
Difference between Rating Level and Background Noise Level	-14	-13	-9	-12	-13	-10	-5	-7	-15

The assessment indicates that the proposed new condenser units will achieve the proposed non-emergency plant noise emission criteria of 5dB below the existing background (L_{A90}) in each octave band at the nearest noise sensitive receptor.

With reference to the BS 4142: 1997 assessment criteria (described in Section 9.0) the dBA rating level of 15dB below the daytime background noise level falls beyond "a positive indication that complaints are unlikely".

As such, the proposals should be considered acceptable.

10.7.4 Night-time Residential Denmark Road

Period	Sound Pressure Level (dB) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
4No. Condenser Units (Group A) L_p at 10m	39	31	29	27	26	23	17	14	31
4No. Units (10*log(#))	+6	+6	+6	+6	+6	+6	+6	+6	-
Reflections (+3dB)	0	0	0	0	0	0	0	0	-
Distance Loss to 180m (20*log(10/dist))	-25	-25	-25	-25	-25	-25	-25	-25	-
Calculated Rating Level	**20**	**12**	**10**	**8**	**7**	**4**	**0**	**0**	**12**
2No. Condenser Units (Group B) L_p at 10m	41	33	31	29	28	25	19	16	33
2No. Units (10*log(#))	+3	+3	+3	+3	+3	+3	+3	+3	-
Reflections (+3dB)	0	0	0	0	0	0	0	0	-
Distance Loss to 180m (20*log(10/dist))	-25	-25	-25	-25	-25	-25	-25	-25	-
Calculated Rating Level	**19**	**11**	**9**	**7**	**6**	**3**	**0**	**0**	**11**
8No. Condenser Units (Group C) L_p at 10m	39	31	29	27	26	23	17	14	31
8No. Units (10*log(#))	+9	+9	+9	+9	+9	+9	+9	+9	-
Reflections (+3dB)	+3	+3	+3	+3	+3	+3	+3	+3	-
Distance Loss to 120m (20*log(10/dist))	-22	-22	-22	-22	-22	-22	-22	-22	-
Calculated Rating Level	**29**	**21**	**19**	**17**	**16**	**13**	**7**	**4**	**21**
3No. Condenser Units (Group D) L_p at 10m	35	34	33	28	25	21	15	11	31
3No. Units (10*log(#))	+5	+5	+5	+5	+5	+5	+5	+5	-
Reflections (+3dB)	+3	+3	+3	+3	+3	+3	+3	+3	-
Distance Loss to 120m (20*log(10/dist))	-22	-22	-22	-22	-22	-22	-22	-22	-
Calculated Rating Level	**21**	**20**	**19**	**14**	**11**	**7**	**1**	**0**	**17**
1No. Condenser Unit (Group G) L_p at 10m	24	14	16	16	17	11	2	0	20
1No. Unit (10*log(#))	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	-
Reflections (+3dB)	+3	+3	+3	+3	+3	+3	+3	+3	-
Distance Loss to 120m (20*log(10/dist))	-22	-22	-22	-22	-22	-22	-22	-22	-
Calculated Rating Level	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**
Total Calculated Rating Level	**30**	**24**	**22**	**19**	**17**	**14**	**9**	**7**	**22**
Lowest Measured Night-time Background Noise Level	44	43	38	36	33	26	19	19	38
Difference between Rating Level and Background Noise Level	-14	-19	-16	-17	-15	-11	-9	-11	-15

The assessment indicates that the proposed new condenser units will achieve the proposed non-emergency plant noise emission criteria of 5dB below the existing background (L_{A90}) in each octave band at the nearest noise sensitive receptor.

With reference to the BS 4142: 1997 assessment criteria (described in Section 9.0) the dBA rating level of 15dB below the night-time background noise level falls beyond "a positive indication that complaints are unlikely".

As such, the proposals should be considered acceptable.

10.7.5 Night-time Residential Greenheys Lane

Period	Sound Pressure Level (dB) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
4No. Condenser Units (Group E) L_p at 10m	39	31	29	27	26	23	17	14	31
4No. Units (10*log(#))	+6	+6	+6	+6	+6	+6	+6	+6	-
Reflections (+3dB)	+3	+3	+3	+3	+3	+3	+3	+3	-
Distance Loss to 110m (20*log(10/dist))	-21	-21	-21	-21	-21	-21	-21	-21	-
Calculated Rating Level	**27**	**19**	**17**	**15**	**14**	**11**	**5**	**2**	**19**
4No. Condenser Units (Group F) L_p at 10m	35	34	33	28	25	21	15	11	31
4No. Units (10*log(#))	+6	+6	+6	+6	+6	+6	+6	+6	-
Reflections (+3dB)	+3	+3	+3	+3	+3	+3	+3	+3	-
Distance Loss to 110m (20*log(10/dist))	-21	-21	-21	-21	-21	-21	-21	-21	-
Calculated Rating Level	**23**	**22**	**21**	**16**	**13**	**9**	**3**	**0**	**19**
Total Calculated Rating Level	**28**	**24**	**22**	**19**	**17**	**13**	**7**	**4**	**22**
Lowest Measured Night-time Background Noise Level	44	43	38	36	33	26	19	19	38
Difference between Rating Level and Background Noise Level	-16	-19	-16	-17	-16	-13	-12	-15	-19

The assessment indicates that the proposed new condenser units will achieve the proposed non-emergency plant noise emission criteria of 5dB below the existing background (L_{A90}) in each octave band at the nearest noise sensitive receptor.

With reference to the BS 4142: 1997 assessment criteria (described in Section 9.0) the dBA rating level of 19dB below the night-time background noise level falls beyond "a positive indication that complaints are unlikely".

As such, the proposals should be considered acceptable.

10.7.6 Unit 3

Period	Sound Pressure Level (dB) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
4No. Condenser Units (Group C) L_p at 10m	39	31	29	27	26	23	17	14	31
4No. Units (10*log(#))	+6	+6	+6	+6	+6	+6	+6	+6	-
Reflections (+3dB)	0	0	0	0	0	0	0	0	-
Distance Loss to 3m (20*log(10/dist))	+10	+10	+10	+10	+10	+10	+10	+10	-
Calculated Rating Level	**55**	**47**	**45**	**43**	**42**	**39**	**33**	**30**	**47**
4No. Condenser Units (Group C) L_p at 10m	39	31	29	27	26	23	17	14	31
4No. Units (10*log(#))	+6	+6	+6	+6	+6	+6	+6	+6	-
Reflections (+3dB)	0	0	0	0	0	0	0	0	-
Distance Loss to 5m (20*log(10/dist))	+6	+6	+6	+6	+6	+6	+6	+6	-
Calculated Rating Level	**51**	**43**	**41**	**39**	**38**	**35**	**29**	**26**	**43**
3No. Condenser Units (Group D) L_p at 10m	35	34	33	28	25	21	15	11	31
3No. Units (10*log(#))	+5	+5	+5	+5	+5	+5	+5	+5	-
Reflections (+3dB)	0	0	0	0	0	0	0	0	-
Distance Loss to 5m (20*log(10/dist))	+6	+6	+6	+6	+6	+6	+6	+6	-
Calculated Rating Level	**46**	**45**	**44**	**39**	**36**	**32**	**26**	**22**	**42**
1No. Condenser Unit (Group G) L_p at 10m	24	14	16	16	17	11	2	0	20
1No. Unit (10*log(#))	0	0	0	0	0	0	0	0	-
Reflections (+3dB)	0	0	0	0	0	0	0	0	-
Distance Loss to 5m (20*log(10/dist))	+6	+6	+6	+6	+6	+6	+6	+6	-
Calculated Rating Level	**30**	**20**	**22**	**22**	**23**	**17**	**8**	**6**	**26**
Total Calculated Rating Level	**57**	**50**	**48**	**46**	**44**	**41**	**35**	**32**	**49**
Existing Measured Plant Noise Level	63	64	64	56	53	47	41	38	59
Difference between Rating Level and Background Noise Level	-6	-14	-16	-10	-9	-6	-6	-6	-10

The assessment indicates that the proposed new condenser units will achieve the proposed non-emergency plant noise emission criteria of 5dB below the existing Unit 3 L_{A90} plant noise levels in each octave band at the windows of Unit 3.

With reference to the BS 4142: 1997 assessment criteria (described in Section 9.0) the dBA rating level of 10dB below the existing background noise level is "a positive indication that complaints are unlikely".

As such, the proposals should be considered acceptable.

11.0 EMERGENCY PLANT NOISE ASSESSMENT

11.1 Plant Noise Data

The existing 4No. emergency standby generators (which are to be replaced) have a specified noise level of 81dBA at 1m.

Each of the proposed 3No. emergency standby generators will be housed within acoustic enclosures which have been specified to achieve a noise level of 75dBA at 1m in any direction.

Detailed octave band noise data is not available for either the existing or proposed emergency standby generators. For the purposes of the assessment we assume that neither the existing or proposed emergency standby generators exhibit tonal characteristics. If this is not the case a +5dB penalty should be added to the calculated Rating Levels.

11.2 Operating Hours

The emergency standby generators have the potential to operate simultaneously at any time over a 24 hour period. These items of plant will only operate under mains power failure (highly unlikely) until mains power is restored and for weekly short duration maintenance checks (which should be restricted to weekday daytime hours only).

11.3 Drawings

The following drawings have been used to form the basis for our assessment.

Author	Reference	Revision	Date
Leach Rhodes Walker, Architects	7199 L(90)03	F	03.05.13

11.4 Plant Locations

Of the existing to be replaced 4No. emergency standby generator units, 3No. are situated to the South East of the site to the rear of Unit 1 and 1No. is situated to the West of the site to the rear of Unit 6.

Of the proposed 3No. emergency standby generator units, 2No. will be situated within the existing car park to the East of Unit 1 and 1No. will be situated to the West of the site within the existing service yard to the rear of Unit 6.

The plant locations are shown on the plan below.



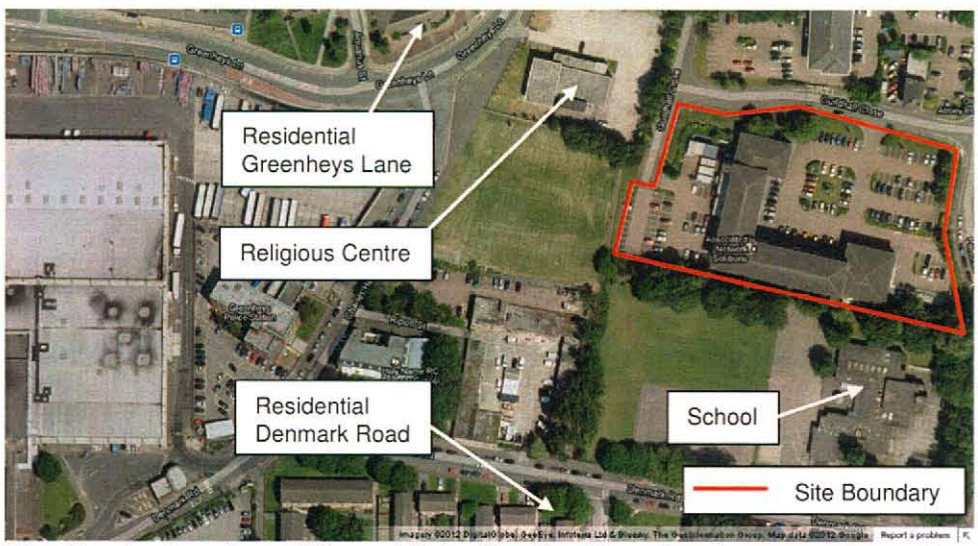
Plan Showing Plant Locations (maps.google.co.uk)

11.5 Nearest Noise Sensitive Receptors

The nearest noise sensitive receptor to the proposed 2No. emergency standby generator units to the East of the site is Holy Name RC Primary School situated on Denmark Road to the South of the site. However, during the night-time period the nearest noise sensitive receptor will be residential properties situated on Denmark Road to the South West of the site.

The nearest noise sensitive receptor to the proposed 1No. emergency standby generator unit to the West of the site is a religious situated on Greenheys Lane to the North West of the site. However, during the night-time period the nearest noise sensitive receptor will be residential properties situated on Greenheys Lane to the North West of the site.

The locations of the nearest noise sensitive receptors are shown on the plan below.



Plan Showing Locations of Nearest Noise Sensitive Receptors (maps.google.co.uk)

11.6 Reflections

A +3dB correction has been applied to the following items of plant to account for reflections from the facades of Synergy House toward the nearest noise sensitive receptors.

Plant Item	Facade	Receptor
3No. Existing Units	South	School / Residential
1No. Existing Unit	West	Religious Centre / Residential
1No. Proposed Unit	West	Religious Centre / Residential

11.7 Assessment

We have undertaken an assessment of the rating level of both the existing and proposed emergency standby generator units to the facades of the nearest noise sensitive receptors for comparison with the background noise level.

Since the proposed 3No. emergency standby generator units will have the potential to run 24 hours a day we have assessed to the lowest daytime background noise levels at the school and religious centre and the lowest night-time background noise levels at the residential properties. The assessment time intervals are taken over the daytime period of 1 hour and night-time period of 5 minutes in accordance with BS 4142. The assessment considers a worst case scenario with all plant items operational at 100% duty for the full assessment time interval of 1 hour/5 minutes.

Based on the above, our BS 4142 assessments are summarised in the following tables.

11.7.1 Daytime School

11.7.1.1 Existing

	Sound Pressure Level (dBA)
Emergency Standby Generator L_p at 1m	81
3No. Units (10*log(#))	+5
Reflections (+3dB)	+3
Distance Loss to 15m (20*log(dist))	-23
Calculated Rating Level	66
Lowest Measured Daytime Background Noise Level	42
Difference between Rating Level and Background Noise Level	+24

11.7.1.2 Proposed

	Sound Pressure Level (dBA)
Emergency Standby Generator L_p at 1m	75
2No. Units (10*log(#))	+3
Reflections (+3dB)	0
Distance Loss to 30m (20*log(dist))	-29
Calculated Rating Level	49
Lowest Measured Daytime Background Noise Level	42
Difference between Rating Level and Background Noise Level	+7

11.7.2 Daytime Religious Centre

11.7.2.1 Existing

	Sound Pressure Level (dBA)
Emergency Standby Generator L_p at 1m	81
1No. Units (10*log(#))	0
Reflections (+3dB)	+3
Distance Loss to 45m (20*log(dist))	-33
Calculated Rating Level	51
Lowest Measured Daytime Background Noise Level	42
Difference between Rating Level and Background Noise Level	+9

11.7.2.2 Proposed

	Sound Pressure Level (dBA)
Emergency Standby Generator L_p at 1m	75
1No. Units (10*log(#))	0
Reflections (+3dB)	+3
Distance Loss to 45m (20*log(dist))	-33
Calculated Rating Level	45
Lowest Measured Daytime Background Noise Level	42
Difference between Rating Level and Background Noise Level	+3

11.7.3 Night-time Residential Denmark Road

11.7.3.1 Existing

	Sound Pressure Level (dBA)
Emergency Standby Generator L_p at 1m	81
3No. Units (10*log(#))	+5
Reflections (+3dB)	+3
Distance Loss to 150m (20*log(dist))	-43
Calculated Rating Level	46
Lowest Measured Night-time Background Noise Level	38
Difference between Rating Level and Background Noise Level	+8

11.7.3.2 Proposed

	Sound Pressure Level (dBA)
Emergency Standby Generator L_p at 1m	75
2No. Units (10*log(#))	+3
Reflections (+3dB)	0
Distance Loss to 180m (20*log(dist))	-45
Calculated Rating Level	33
Lowest Measured Night-time Background Noise Level	38
Difference between Rating Level and Background Noise Level	-5

11.7.4 Night-time Residential Greenheys Lane

11.7.4.1 Existing

	Sound Pressure Level (dBA)
Emergency Standby Generator L_p at 1m	81
1No. Units (10*log(#))	0
Reflections (+3dB)	+3
Distance Loss to 110m (20*log(dist))	-40
Calculated Rating Level	44
Lowest Measured Night-time Background Noise Level	38
Difference between Rating Level and Background Noise Level	+6

11.7.4.2 Proposed

	Sound Pressure Level (dBA)
Emergency Standby Generator L_p at 1m	75
1No. Units (10*log(#))	0
Reflections (+3dB)	+3
Distance Loss to 110m (20*log(dist))	-40
Calculated Rating Level	38
Lowest Measured Night-time Background Noise Level	38
Difference between Rating Level and Background Noise Level	+0

11.7.5 Summary

The above results are summarised in the table below.

Period	Receptor	Calculated Differences Between Rating Level and Background Noise Level (dBA)		Difference Between Existing and Proposed Units (dBA)
		Existing	Proposed	
Daytime	School	+24	+7	-17
	Religious Centre	+9	+3	-6
Night-time	Residential Denmark Road	+8	-5	-13
	Residential Greenheys Lane	+6	0	-6

The table indicates that the proposed emergency standby generator units will result in reduced noise emission levels at all noise sensitive receptors when compared with the noise emission levels from the existing units.

As such, the proposals should be considered acceptable.

12.0 CONCLUSIONS

Detailed 24 hour daytime and night-time fully automated environmental noise surveys have been undertaken in order to establish the currently prevailing environmental noise climate at the site.

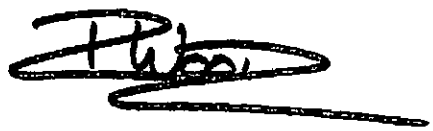
Based on the results of the noise surveys and the requirements of the Local Authority, suitable plant noise emission criteria have been proposed

An assessment of the proposed plant has been carried out in accordance with the BS 4142 methodology.

The assessment indicates that the proposed new condenser units will achieve the proposed non-emergency plant noise emission criteria at the nearest noise sensitive receptors and Unit 3. The only exception to this is at the North and West facades of the school where a level of 4dB below the existing background (L_{A90}) is calculated at 4kHz. We would consider an exceedance of 1dB at 4kHz to be imperceptible. Furthermore, as stated in Section 10.1, the noise data is representative of the proposed new condenser units at 100% duty i.e. 32°C ambient temperature. As such, for the vast majority of the year the actual plant noise levels will be significantly lower than indicated.

The assessment indicates that the proposed emergency standby generator units will result in reduced noise emission levels at all noise sensitive receptors when compared with the noise emission levels from the existing units.

As such, the proposals should be considered acceptable.



Robin Wood
HANN TUCKER ASSOCIATES

Appendix A

The acoustic terms used in this report are explained below:

dB : Decibel - Used as a measurement of sound pressure level. It is the logarithmic ratio of the noise being assessed to a standard reference level.

dB(A) : The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level.

Because of being a logarithmic scale noise levels in dB(A) do not have a linear relationship to each other. For similar noises, a change in noise level of 10dB(A) represents a doubling or halving of subjective loudness. A change of 3dB(A) is just perceptible.

L_{10} & 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 Ln 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 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the average minimum level and is often used to describe the background noise.

It is common practice to use the L_{10} index to describe traffic noise, as being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic noise.

L_{eq} : The concept of L_{eq} (equivalent continuous sound level) has up to recently been primarily used in assessing noise in industry but seems now to be finding use in defining many other types of noise, such as aircraft noise, environmental noise and construction noise.

L_{eq} is defined as a notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 1 hour).

The use of digital technology in sound level meters now makes the measurement of L_{eq} very straightforward.

L_{max} : L_{max} is the maximum sound pressure level recorded over the period stated. L_{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L_{eq} noise level.

Appendix B

Acoustic definitions as defined in BS 4142: 1997:

Specific Noise Source	:	The noise source under investigation for assessing the likelihood of complaints.
Specific Noise Level (L_{Aeq})	:	The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval.
Rating Level	:	The specific noise level plus any adjustment for the characteristic features of the noise.
Ambient Noise	:	Totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far.
Residual Noise (L_{Aeq})	:	The equivalent continuous A-weighted sound pressure level of the residual noise. The ambient noise remaining at a given position in a given situation when the specific noise source is suppressed to a degree such that it does not contribute to the ambient noise.
Background Noise Level (L_{A90}):		The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of a given time interval, T, measured using time weighting, F, and quoted to the nearest whole number of decibels.

PLANT NOISE SCHEDULE

SYNERGY HOUSE
MANCHESTER SCIENCE PARK

Hann Tucker Associates

Woking (Head Office)
Tel: 01483 770595

Manchester (Northern Office)
Tel: 0161 832 7041

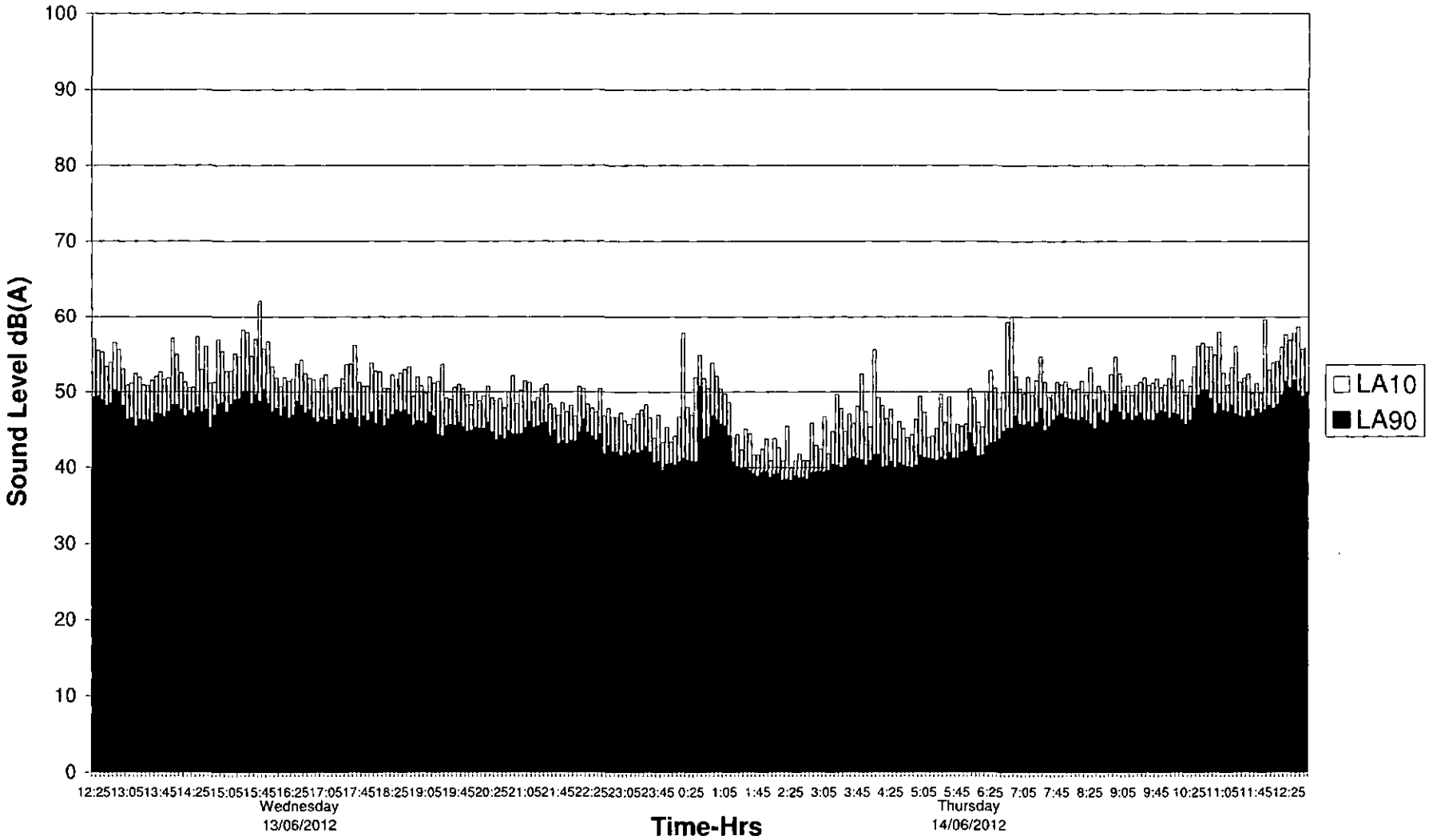
REF: HT: 17852/PNS1

Revision: 0	Date: 3 May 2013	Comments: None											
Plant Description	Location	Plant Type	Duty		Data: mfr/empir. Lw/Lp		Sound Level (dB) at Octave Band Centre Frequency (Hz)							
			m^3/s	Pa			63	125	250	500	1k	2k	4k	8k
4No. Condenser Units – Group A Guntner (GVHX 080.1B/1-LJ.E)	Existing car park to the East of Unit 1	Condensers	-	-	mfr per unit	Lp at 10m	39	31	29	27	26	23	17	14
2No. Condenser Units – Group B Guntner (GVHX 080.1A/2-LJ.E)	Existing car park to the East of Unit 1	Condensers	-	-	mfr per unit	Lp at 10m	41	33	31	29	28	25	19	16
8No. Condenser Units – Group C Guntner (GVHX 080.1B/1-LJ.E)	South of Unit 3	Condensers	-	-	mfr per unit	Lp at 10m	39	31	29	27	26	23	17	14
3No. Condenser Units – Group D Mitsubishi (PUHZ-RP60)	South of Unit 3	Condensers	-	-	mfr per unit	Lp at 10m	35	34	33	28	25	21	15	11
4No. Condenser Units – Group E Guntner (GVHX 080.1B/1-LJ.E)	Existing service yard to the West of Unit 6	Condensers	-	-	mfr per unit	Lp at 10m	39	31	29	27	26	23	17	14
4No. Condenser Units – Group F Mitsubishi (PUHZ-RP60)	Existing service yard to the West of Unit 6	Condensers	-	-	mfr per unit	Lp at 10m	35	34	33	28	25	21	15	11
1No. Condenser Unit – Group G Guntner (GVHZ 071.1B/1-ES.E)	South of Unit 3	Condenser	-	-	mfr per unit	Lp at 10m	24	14	16	16	17	11	2	0

Synergy House, Manchester Science Park

$L_{A10,5min}$ and $L_{A90,5min}$ Noise Levels at Position 1

Wednesday 13/06/2012 - Thursday 14/06/2012

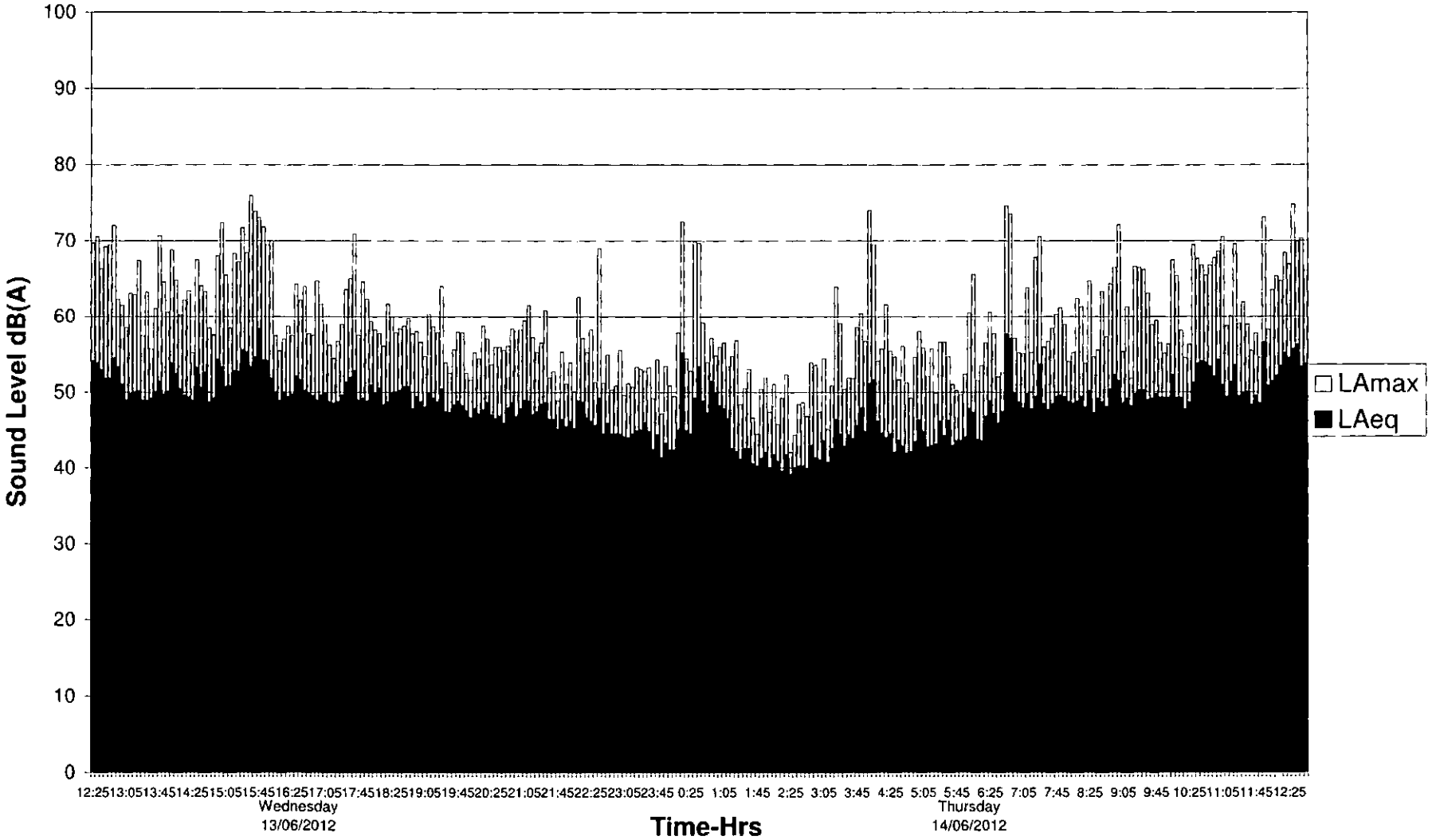


Time History Graph 17852/TH1

Synergy House, Manchester Science Park

$L_{Amax,5min}$ and $L_{Aeq,5min}$ Noise Levels at Position 1

Wednesday 13/06/2012 - Thursday 14/06/2012

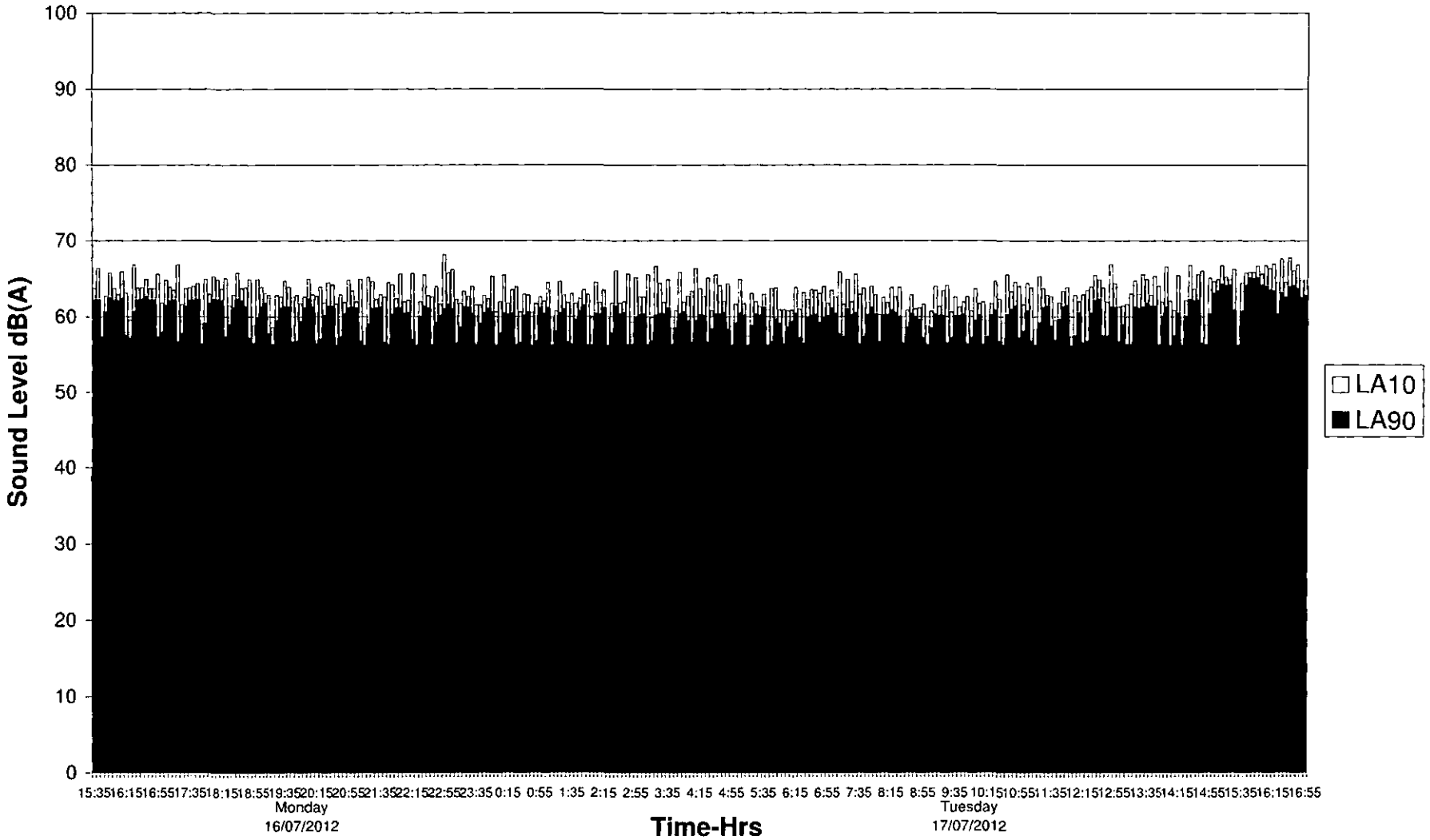


Time History Graph 17852/TH2

Synergy House, Manchester Science Park

$L_{A10,5min}$ and $L_{A90,5min}$ Noise Levels at Position 2

Monday 16/07/2012 - Tuesday 17/07/2012

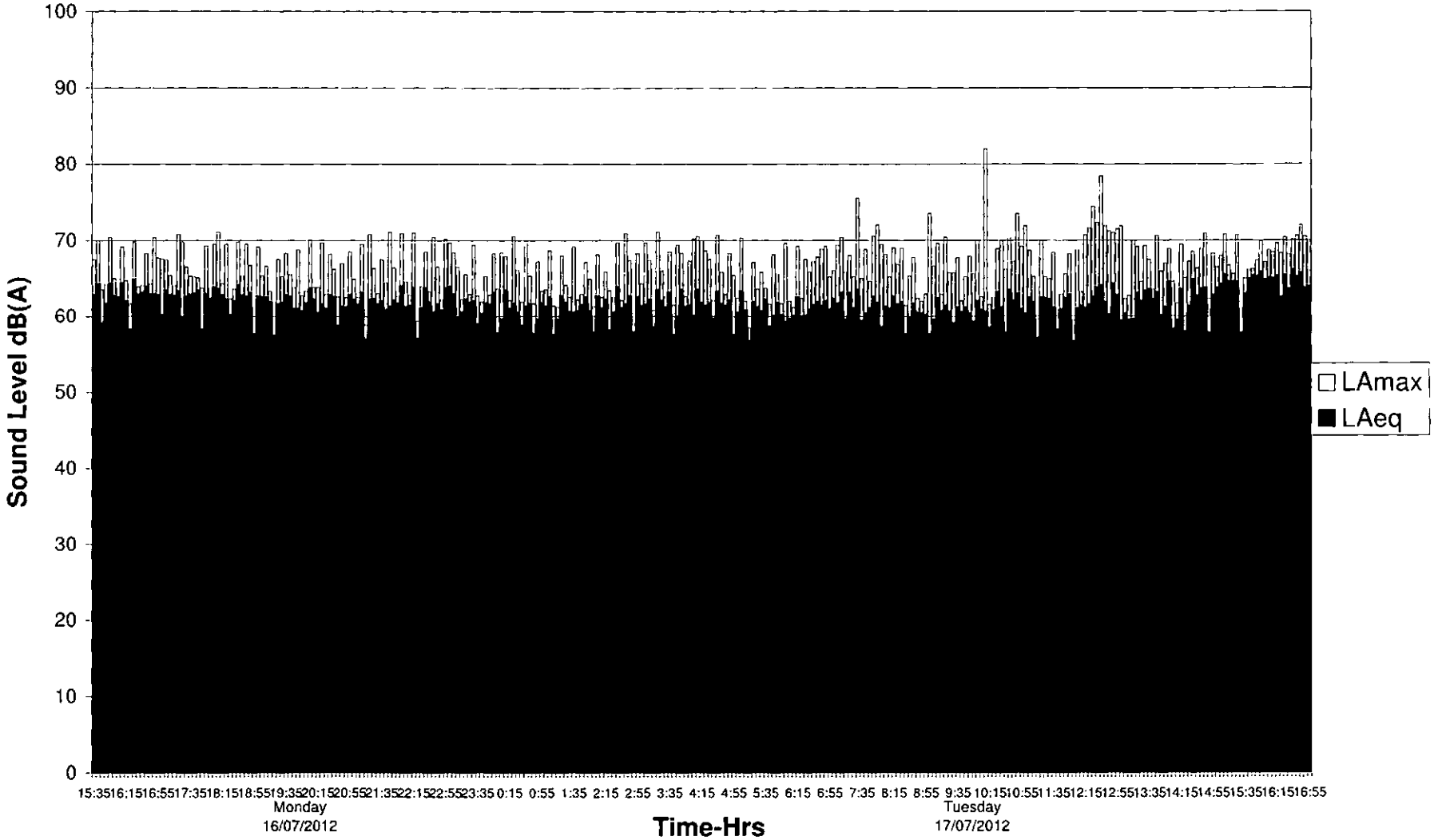


Time History Graph 17852/TH3

Synergy House, Manchester Science Park

$L_{Amax,5min}$ and $L_{Aeq,5min}$ Noise Levels at Position 2

Monday 16/07/2012 - Tuesday 17/07/2012

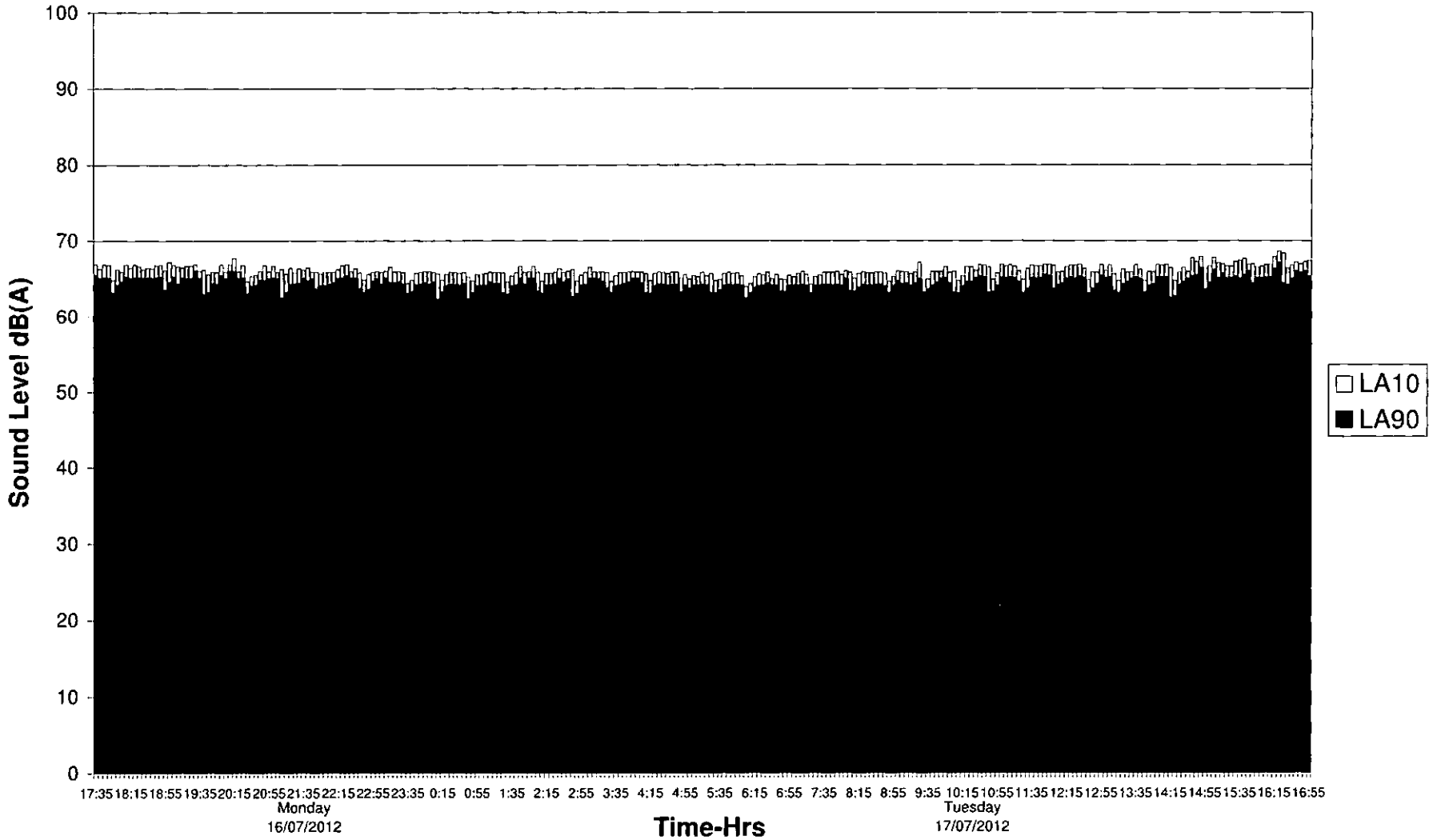


Time History Graph 17852/TH4

Synergy House, Manchester Science Park

$L_{A10,5min}$ and $L_{A90,5min}$ Noise Levels at Position 3

Monday 16/07/2012 - Tuesday 17/07/2012

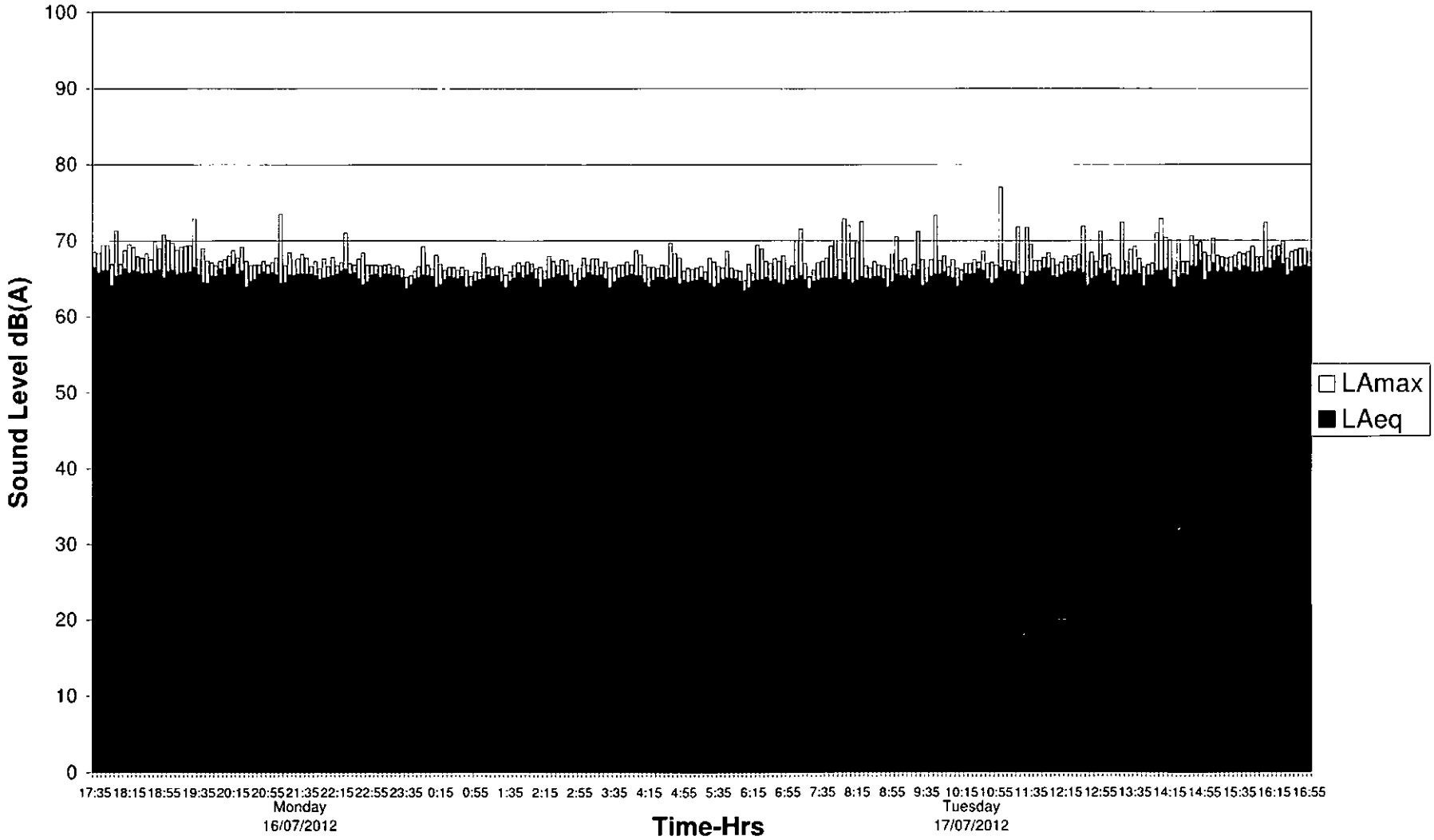


Time History Graph 17852/TH5

Synergy House, Manchester Science Park

$L_{Amax,5min}$ and $L_{Aeq,5min}$ Noise Levels at Position 3

Monday 16/07/2012 - Tuesday 17/07/2012



Time History Graph 17852/TH6