November 2014

PLANT NOISE ASSESSMENT - TORRINGTON PLACE PLANT ENCLOSURE, LONDON

1-19 Torrington Place, London

3512445

Issue 1

Final

Plant Noise Assessment - Torrington Place Plant Enclosure

3512445

FINAL

Prepared for
University College London
UCL Estates,
Gower St
London
WC1E 6BT

Prepared by
Parsons Brinckerhoff
6 Devonshire Square
London
EC2M 4YE
www.pbworld.com

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1 EXECUTIVE SUMMARY

1.1 Purpose

1.1.1 This report assesses the potential noise impact of the Torrington Place Plant Enclosure on nearby residential and commercial premises. It outlines the proposed plant that will be installed, the recommended noise mitigation measures designed to minimise noise impact and the predicted noise levels at the worst affected nearby receptors.

1.2 Summary of Findings

1.2.1 Background noise surveys were conducted in the area of 1-19 Torrington Place during September, October and November 2014. Noise data collected in 2013 was also considered. The background noise levels were used to determine the design levels of the proposed plant at the worst affected residential and commercial premises. The design levels were determined based on guidance from Camden development policy DP28 (noise and vibration). These levels are detailed in Section 5 of this report.

1.2.2 The specific noise level likely to arise from the plant was calculated using a noise model. Calculations were based on the sound pressure/power levels of the proposed plant as well as their general arrangement. The calculations were based on a worst case scenario whereby all plant was operating at full capacity during periods with the lowest background noise level.

1.2.3 Calculations show that the predicted levels including mitigation at the worst affected nearby receptors do not exceed the Local Authority's criteria of L_{A90} - 5 dB. The results of the calculations are detailed in Section 5 and 6 of this report. Therefore, it is concluded that the Torrington Place Plant Enclosure will not likely cause any significant noise impact on nearby residential and commercial buildings.

2 INTRODUCTION

2.1 General

2.1.1 Parsons Brinckerhoff Ltd (PB) has been commissioned to undertake a noise assessment for new external plant proposed to be installed at 1-19 Torrington Place, London WC1. The proposed plant would service the new data storage proposed to be installed at sub-basement level.

2.1.2 This assessment aims to determine the suitability of the site for the proposed plant installation, the various aspects included in this study are:

- Ambient survey and assessment of existing ambient noise levels.
- The potential impact of building services plant noise at the nearest noise sensitive receptors.
- Identification of noise limits for the building services plant that is proposed to be installed.

2.1.3 This report presents the approach and findings of the assessment.

2.1.4 A glossary of acoustics terminology is provided in Appendix A.

2.2 Site Description

2.2.1 The site 1-19 Torrington Place is an eleven storey building and is part of University College London (UCL). It is located in a mixed residential and commercial area with Tottenham Court Road to the west of the site and Torrington Place to the south.

2.2.2 Tottenham Court Road is a very busy road and sees a high level of road traffic movements from all types of vehicles including taxis, buses and heavy goods vehicles. Torrington place also sees a number of road traffic movements and there is a lot of pedestrian traffic in the surrounding area.

2.2.3 It is understood that the current proposal is for the installation of six chiller units to replace two chiller units already present, to be located within the courtyard at the rear of 1-19 Torrington Place. It is also proposed to install two emergency generators and a substation. The plant will be located at what is known as basement level but is in fact located above ground but just below 'street' level as there is a down ramp access to the courtyard. This courtyard area is currently being used as car and bicycle park and also contains existing mechanical plant servicing the building.

2.3 Nearest Sensitive Receptors

2.3.1 The closest identified residential property is located at Gordon Mansions, Torrington Place. The nearest potential noise sensitive window overlooks the courtyard approximately 35m from the site of the proposed plant.

2.3.2 Other sensitive receptors include a commercial premises to the north of the site approximately 10m from the site of the proposed plant and a small pub garden approximately 10m from the site of the proposed plant.

3 METHODOLOGY

3.1 Legislative Guidance

3.1.1 The legislative framework and guidelines that have been used during this assessment are listed below:

- BS 7445: 1991 '*Description and Measurement of Environmental Noise*' Parts 1 to 3, BSI
- BS 4142:1997 'Method of rating industrial noise affecting mixed residential and industrial areas'
- BS 8233:2014 'Guidance on Sound Insulation and noise reduction for buildings'
- World Health Organisation (WHO) Guidelines for Community Noise (1999)
- Camden Development Policy DP28 – Noise and Vibration

3.2 BS7445

3.2.1 All noise monitoring was conducted in accordance with the guidance set out in BS 7445-2: 1991 '*Description and measurement of environmental noise Part 2: Guide to the acquisition of data pertinent to land use'*. This standard details information that should be recorded in addition to the actual measured levels such as meteorological data, and a description of the noise source itself.

3.3 Industrial Noise Affecting Residential Dwellings

3.3.1 The British Standard BS4142:1997 'Method of rating industrial noise affecting mixed residential and industrial areas' is used for assessing the impact of noise from mechanical services plant. The standard provides guidance as to the likely community response to new fixed noise sources affecting sensitive residential receptors. The rating method detailed within this standard is widely accepted by local authorities as a means of assessing building plant noise. BS4142 requires separate analysis for day and night time periods. The Standard compares the 'rating level'[1] of the new noise with the existing 'background level'[2]. The greater this difference the greater the likelihood of complaints. The significance of the new noise based on this difference is given in **Table 1**.

Table 1: BS4142 Noise Rating Summary

Difference between Rating Level and Background Level	BS4142 Rating
-10 dB(A) or Less	Positive indication that complaints are unlikely
+5 dB(A)	Marginal significance
+10 dB(A) or more	Indicates complaints are likely

3.4 Camden Development Policy DP28 – Noise and Vibration

3.4.1 Camden development policy DP28 relates to noise and vibration. The following table is applicable for this assessment and states the following noise level from plant and machinery at which planning permission will not be granted.

[1] The Rating Level is the noise level attributable to the new source(s), plus a 5 dB(A) penalty if the new source has tonal or intermittent characteristics

[2] The Background Level is taken as the L_{A90}; this is the ambient noise level, which is exceeded for 90% of the measurement period.

Table 2: Local Authority Plant Noise Requirements – The London Borough of Camden Local Development Framework

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) $<L_{A90}$
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	10dB(A) $<L_{A90}$
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	10dB(A) $<L_{A90}$
Noise at 1 metre external to a sensitive façade where L_{A90}>60dB	Day, evening and night	0000-2400	55dB L_{Aeq}

4 BASELINE NOISE CONDITIONS

4.1 General

4.1.1 There has been an extensive assessment of the existing baseline conditions. Two unattended noise surveys and one attended noise survey have been carried out. Consideration has also been given to noise measurements taken in 2013 that were submitted as part of a previous successful planning application in the same area. Multiple measurements were taken in order to gather a more accurate representation of the current noise environment on site.

4.1.2 All the noise surveys were conducted using a Class 1 Sound Level Meter specifically a Rion NA-28. For each survey, a calibrator was used to perform a calibration check on the meter before and after the measurement period.

4.1.3 The calibration certificates for the equipment used are provided in Appendix B. Specific details of the equipment used including serial numbers and calibration data are provided on these certificates.

4.1.4 The unattended surveys were conducted over a period of 24-hours on a typical weekday. The attended survey was conducted using 15 minute measurement samples on a typical weeknight. Full details of the surveys are presented below.

4.2 Noise Measurements

<u>24 Hour Unattended Surveys</u>

4.2.1 The first unattended noise survey (M1) was carried out on the 4th September 2014. A semi-permanent noise monitoring kit was deployed in a weather-proof case on the 10th floor roof of the UCL building at 1-19 Torrington Place, London. The microphone was positioned 1.4m above the roof level in a façade measurement position. Concurrent 5 minute measurements were taken logging the following parameters: L_{Amin}, L_{Amax}, L_{A90}, L_{A10}, and L_{Aeq}. The noise monitoring kit was collected on 5th September 2014 after a complete 24-hour period.

4.2.2 The second unattended survey (M2) was carried out on the 22nd October 2014. A semi-permanent noise monitoring kit was deployed in a weather-proof case in the

north-west corner of the courtyard at Torrington Place. The microphone was positioned 1.4m from the ground and approximately 1.5m from the reflecting wall in a façade measurement position. Concurrent 5 minute measurements were taken logging the following parameters: L_{Amin}, L_{Amax}, L_{A90}, L_{A10}, and L_{Aeq}. The noise monitoring kit was collected on 23rd October 2014.

Attended Survey

4.2.3 Attended noise measurements were taken at five positions around the site of 1-19 Torrington Place. The measurements were taken during the night period (23:00–07:00) on 19th/20th November 2014. In order to obtain a robust dataset, the measurements were taken at a time to reflect the lowest ambient noise levels in the night period (typically between 02:00-04:00 in the morning). The microphone was positioned 1.4m above ground level and at least 1.5m from any reflective surfaces. Single 15 minute measurements were taken logging the following parameters: : L_{Amin}, L_{Amax}, L_{A90}, L_{A10}, and L_{Aeq}.

4.2.4 **Table 3** identifies the noise survey locations, and Figures 1 & 2 illustrate the locations.

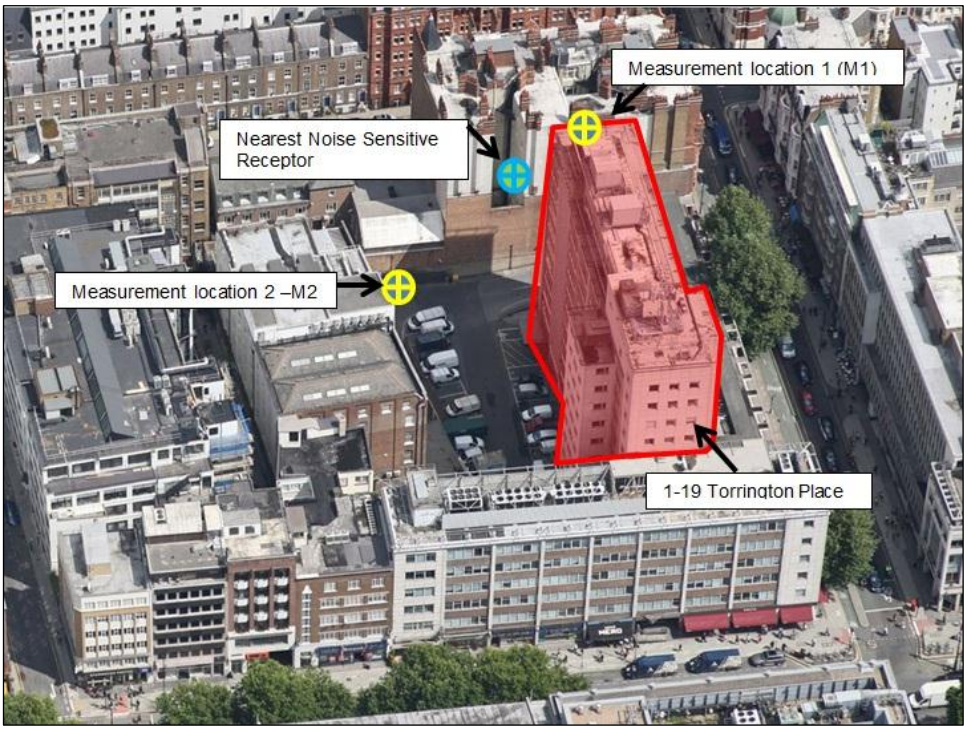
Table 3: Noise Survey – Ambient Noise Survey Measurement Locations

Measurement Location Number	Measurement Type	Measurement Location
M1	Unattended Continuous	10th Floor roof level, 1-19 Torrington Place – East side
M2	Unattended Continuous	Basement level, north-west corner of courtyard
M3	Attended	Entrance to courtyard at street level, Torrington Place
M4	Attended	Shropshire Place to the rear of site
M5	Attended	In front of Rockerfeller Nurses Home, Huntley Street
M6	Attended	Basement level, north-west corner of courtyard
M7	Attended	Basement level, beside entrance ramp to courtyard

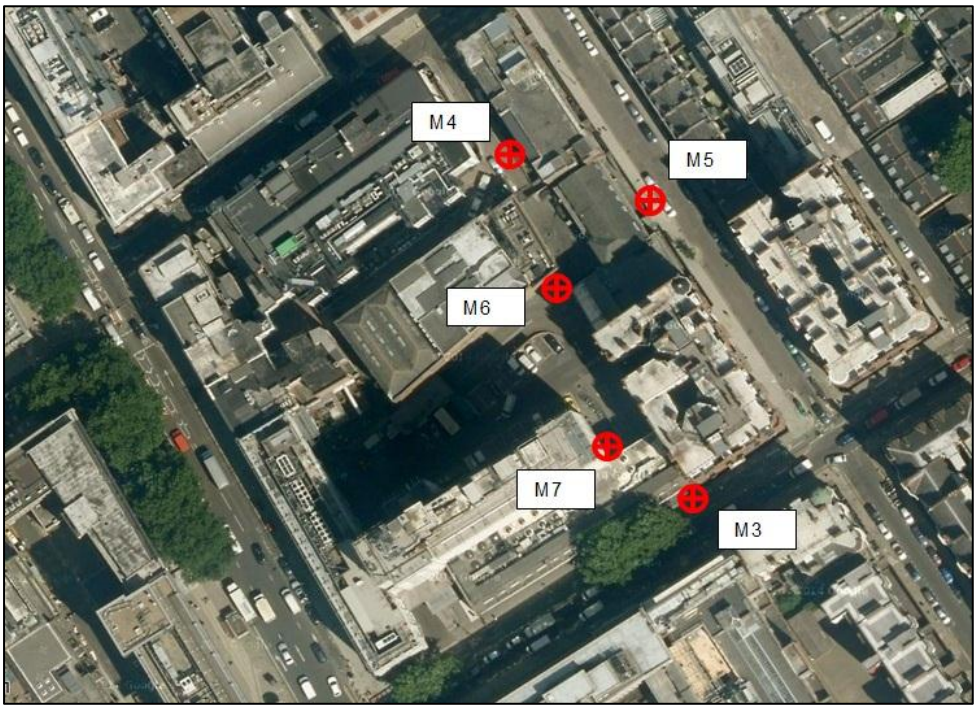
Weather Conditions

4.2.5 Weather conditions during the surveys were conducive to successful monitoring. The weather over the monitoring period was mostly clear and sunny during the daytime with low wind speeds.

4.2.6 **Figure 1 – *Unattended* Noise Survey Measurement Locations**



4.2.7 **Figure 2 – *Attended* Noise Survey Measurement Locations**



4.3 Noise Survey Results

4.3.1 It is current practice to quote all statistics to one decimal place, apart from L_{A90} data which are rounded to the nearest whole numbers.

4.3.2 **Table 4** presents a summary of the unattended 24 hour noise survey measurements.

Table 4: Summary of the Unattended Noise Surveys

Measurement	Date	Measurement Period	Average	Minimum
			$L_{Aeq, T}$ (dB)	$L_{A90\ T}$ (dB)
M1	04/09/2014 - 05/09/2014	Day (0700-1900)	58.6	57
		Evening (1900-2300)	57.7	55
		Night (2300-0700)	55.5	54
		24hrs (00:00-24:00)	57.5	54
M2	22/10/2014 - 23/10/2014	Day (0700-1900)	60	54
		Evening (1900-2300)	58.6	53
		Night (2300-0700)	54.7	53
		24hrs (00:00-24:00)	58.3	53

4.3.3 **Table 5** presents a summary of the attended noise survey measurements taken.

Table 5: Summary of the Attended Noise Survey

Measurement	Date	Measurement Time	Measurement Period	$L_{Aeq, T, 15\ mins}$ (dB)	$L_{A90\ T, 15\ mins}$ (dB)
M3	20/11/2014	02:19 - 02:34	15 mins	58.1	47
M4	20/11/2014	02:48 - 03:03	15 mins	55.6	55
M5	20/11/2014	03:06 - 03:21	15 mins	50.4	47
M6	20/11/2014	03:25 – 03:40	15 mins	53.2	52
M7	20/11/2014	03:42 – 03:57	15 mins	50.3	49

4.3.4 The noise climate was characterised by mechanical plant noise at attended measurement locations 3,4,6,7 from mechanical plant in the surrounding area. Occasional road traffic movements were also audible at all attended measurement locations

4.3.5 The time history results of the 24 hour noise surveys are reported in Appendix C. The noise survey data is presented in a numerical form (in a table) in Appendix D.

4.4 Previous Noise Survey Data

4.4.1 Previous noise survey data was collected in 2013. The report by EEC entitled *1/19 Torrington Place, WC1, Plant Noise Assessment ref DP/EC12881-005* dated 26

September 2013 was provided as part of supporting information for a previous planning application of a similar scheme. The following table has extrapolated the noise data from this report:

Table 6: Summary of 2013 Noise survey (ref EEC Report 2013)

Measurement	Date	Measurement Period	Average	Minimum
			$L_{Aeq,\ T}$, dB	$L_{A90\ T}$, dB
2013	15:15 25/07/2013 - 19:20 26/07/2013	Day (0700-1900)	54.2	44
		Evening (1900-2300)	52.6	41
		Night (2300-0700)	50.5	35
		24hrs (00:00-24:00)	52.7	35

5 ASSESSMENT OF PLANT NOISE

5.1 Determining Design Criteria

5.1.1 In accordance with Local Authority criteria, noise emissions from new plant items should be controlled to at least 5 dB below the existing background noise level at 1m from the façade of the nearest noise sensitive window.

5.1.2 In addition, the new noise sources introduced should be designed to not cause levels to be unreasonable at nearest commercial premises, for example, offices and open spaces.

5.2 Recommended Design Levels

5.2.1 **Table 7** below shows the *lowest* representative background noise level measured for the relevant plant operating periods.

Table 7 – Summary of Noise levels for Plant Operational Period

Measure-ment	Measure-ment Type	Period	Measurement Time	Background Noise Level Min $L_{A90,T}$	'Average' Background Noise Level $L_{A90,T}$
M2	Unattended	Day 07:00-2300	21.59 22/10/14	54	-
M2	Unattended	00:00 – 24:00	01:39 23/10/14	53	45
M3	Attended	00:00 – 24:00	02:19 20/11/14	47	
2013 Survey	Unattended	00:00 – 24:00	01:45 26/07/13	35	

5.2.2 It can be seen from Table 7 that the lowest background noise level measured for the unattended surveys in 2014 was 53 dB $L_{A90\ 5mins}$. For the attended survey carried out, the lowest background level measured was 47 dB $L_{A90\ 5mins}$.However, consideration has been given to noise levels measured previously in 2013 as they were significantly lower as the minimum background level measured was 35 dB $L_{A90\ 5mins.}$

5.2.3 In order to determine a representative background noise level, an average level of 45 dB $L_{A90\ 5mins}$ has been calculated taking into consideration surveys M2 and M3 conducted in 2014 and the 2013 survey.

5.2.4 **Table 8** below presents the recommended design levels for the noise sensitive receptors.

Table 8 – Recommended Design Levels

Receptor Premises	Description	Approx Distance (m)	Background Level $L_{A90,T}$ (dB)	Design Level L_{Aeq} (dB)
Residential	Gordon Mansions	35	45	**40**
Commercial	Commercial window	10	54	**49**
Commercial	The Bar at TCR Outdoor Garden	10	54	**49**

5.2.5 It is therefore necessary to control noise emissions from the plant to 40 dB $L_{Aeq,\ T}$ at the nearest noise sensitive window of the residential receptor and 49dB $L_{Aeq,\ T}$ at the nearest commercial receptor.

5.3 Installation of New Plant items

5.3.1 The scheme will see the installation of new plant items which in turn will introduce new noise sources to the area. The proposed plant to be installed is detailed below:

Table 9 – Summary of Proposed New Plant Items

Plant/ Equipment	Type	Quantity	Location	Operating Hours	Sound Power Level per unit - dB(A)	Sound Pressure Level per unit- dB(A)
Liebert AFC	Chiller Unit	6	Basement Level - Courtyard	24 hrs	88.9	-
2500KvA	Transformer	1	Basement Level - Courtyard	24 hrs	74.0	-
3150KvA	Transformer	1	Basement Level - Courtyard	24hrs	75.0	-
Cummins C1100	Diesel Generator	2	Basement Level - Courtyard	Emergency Use Only	-	85.0 @ 1m

5.3.2 The noise from the new plant is assumed such that it does not contain any temporal or tonal qualities. This includes bangs, clicks, clatters and thumps, (temporal) or hums, hissing, screeches and whines (tonal).

5.3.3 Within the BS 4142 assessment guidelines a 5 point penalty should be applied to any item of plant equipment that is found to have tonal noise characteristics. Due to this, any manufacturers plant equipment that is later found to contain tonal characteristics

should be designed to achieve a sound pressure level of 5dB(A) below the limits given in this study.

5.3.4 The main assessment has considered the total noise from the chiller units and the transformers. The generators have been assessed separately as they are understood to be for emergency use only.

5.4 Assessment Results

5.4.1 The nearest obvious residential premises have been identified as Gordon Mansions. Gordon Mansions is a residential block of flats to the east of the site. The nearest noise sensitive window is located at the rear of the block overlooking the courtyard, approximately 35m from the proposed plant location.

5.4.2 The nearest commercial premises has been identified as the building to the north of site approximately 10m from the proposed plant location. The outdoor garden of the bar at TCR is also approximately 10m from the proposed plant location.

5.4.3 Calculations have been carried out to predict the noise level 1 metre from the window of the sensitive properties identified above including distance and any screening effects. A safety margin has been applied to the predicted levels.

5.4.4 The calculation method that has been used is in line with the formula contained within the following international standard: ISO 9613-2:1996 Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation. The standard describes a method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental sound at a distance from a variety of sources.

5.4.5 The calculations have been carried out using the noise modelling software CadnaA which implements the formula in ISO 9613: 1996.

5.4.6 **Table 10** reports the predicted noise levels at the receptors from the proposed plant items.

Table 10: Assessment Summary – Torrington Place Plant Enclosure

Receptor Premises	Description	Design Level L_{Aeq} (dB)	Acoustic Feature Correction (dB)	Predicted Level L_{Aeq} (dB)	Background Level L_{A90} (dB)	Predicted Level 'minus' Background Level
Residential property	Gordon Mansions	40	0	54	45	+9
Commercial (North)	Commercial window	49	0	64	54	+10
Outdoor (North)	The Bar at TCR Outdoor Garden	49	0	65	54	+11

5.4.7 The predicted level from the plant exceeds the background level by 9 dB at the nearest residential receptor, Gordon Mansions and by 10 dB and 11 dB at the commercial premises and outdoor garden respectively. Therefore, the predicted levels do not meet the criteria that has been set. However, Section 6 details the mitigation required to meet the relevant criteria.

6 MITIGATION

6.1.1 In order to design levels set out in Table 8 and thus meet the noise criteria of 5 dB below background at the nearest noise sensitive receptors it is necessary to apply mitigation in the form of an acoustic enclosure for the chiller units The acoustic enclosure will have to provide attenuation of least 16 dB per unit.

6.2 Assessment Results With Mitigation

6.2.1 The calculation methodology has been repeated incorporating the mitigation stated above. **Table 11** reports the predicted noise levels at the receptors from the proposed plant items with mitigation applied.

Table 11: Assessment Summary – Torrington Place Plant Enclosure (with mitigation)

Receptor Premises	Description	Design Level L_{Aeq} (dB)	Acoustic Feature Correction (dB)	Predicted Level L_{Aeq} (dB)	Background Level L_{A90} (dB)	Predicted Level 'minus' Background Level	Meets Local Authority Criteria
Residential property	Gordon Mansions	40	0	40	45	-5	✓
Commercial (North)	Commercial window	49	0	49	54	-5	✓
Outdoor (North)	The Bar at TCR Outdoor Garden	49	0	49	54	-5	✓

6.2.2 The predicted level from plant noise emissions is 5 dB below the minimum background level at the nearest residential noise sensitive receptor, Gordon Mansions, and therefore meets the Local Authority criteria as stated in development policy DP28.

6.2.3 The predicted level from plant noise emissions at the Commercial window and outdoor garden is 5 dB below the minimum background level and therefore also meets the set criteria. The level predicted at the outdoor garden also falls below the threshold level for moderate annoyance, daytime and evening for outdoor living areas as stated in the WHO guidelines for community noise (1999).

6.2.4 According to the criteria in BS4142, the predicted noise levels at all receptors fall between the rating of marginal significance and a positive indication that complaints are unlikely.

6.3 Considerations

6.3.1 It should be noted that the assessment is based on worse case assumptions considering all plant running at 100%. However, the cooling strategy has been designed to afford some system resilience, so under normal operating circumstances, 6 chillers units shall operate at only 80% of their rated capacity (with corresponding reductions in noise). It is therefore likely that noise levels at the receptors will be lower than the predicted levels in **Table 11**.

Emergency Generators

6.3.2 The generators have not been included in the assessment as they are for emergency use only. Including both generators running at 100% as well as the other plant would see a predicted level 57 dB L_{Aeq} at the nearest residential receptor. Although this level is above the design criteria, it should be noted that the operation of the generators will be limited. It is understood that they will only be operational in the following circumstances:

- 2hrs/ month for testing
- 8 hrs/year for maintenance
- In the unlikely event of a power outage

6.3.3 In line with the Local Authority's advice of demonstration of best practical means of noise reduction - It has been advised by the project team, that due to space constraints, the generator selections have been attenuated as reasonably practicable to achieve a noise level of 85dBA at 1 metre.

6.4 Plant Design Limits

6.4.1 In order to meet the predicted levels stated in **table 11** above, the following design noise design limits are recommended:

Chiller Units

6.4.2 For the proposed location and selection of 6 chiller units, each chiller unit should have 16 dB attenuation reduction from mitigation and should not exceed a maximum sound power level of 73dB(A) at the louvres. If a different selection is made, the 'chiller unit complex' should not exceed a maximum sound power level of 81dB(A) at the louvres.

Transformers

6.4.3 The 3150kVa transformer should not exceed a maximum sound power level of 75dB(A) and the 2500kVA should not exceed a maximum sound power level of 74dB(A).

Generators

6.4.4 The proposed emergency generator selection is designed to meet a sound pressure level of 85 dB(A) at 1 metre from the louvres. Note that the emergency generators will not meet the predicted levels in **Table 11** (see section 6.3.2).

7 CONCLUSIONS

7.1.1 Ambient noises survey have been completed at 1-19 Torrington Place, London. The noise level from the proposed new plant has subsequently been assessed using Local Authority criteria from and guidance from British Standards.

7.1.2 The measured background noise levels were used to recommend design noise limits to which the proposed items of plant equipment should adhere.

7.1.3 The report provides predicted noise levels at the worst case receptors. Based on the noise predictions with mitigation applied, the noise level from plant emissions at the nearest sensitive buildings identified meet the set criteria and are therefore unlikely to have an adverse impact on amenity.

PARSONS
BRINCKERHOFF

APPENDIX A

GLOSSARY OF ACOUSTIC TERMINOLOGY

Glossary of Acoustics Terminology

Decibel (dB)	The decibel scale is used in relation to sound because it is a logarithmic rather than a linear scale. The decibel scale compares the level of a sound relative to another. The human ear can detect a wide range of sound pressures, typically between $2x10^{-5}$ and 200 Pa, so the logarithmic scale is used to quantify these levels using a more manageable range of values.
Sound Pressure Level (SPL)	The Sound Pressure Level has units of decibels, and compares the level of a sound to the smallest sound pressure generally perceptible by the human ear, or the reference pressure. It is defined as follows: $SPL\ (dB) = 20\ Log_{10}(P/P_{ref})$ where P = Sound Pressure (in Pa), P_{ref} = Reference Pressure $2x10^{-5}$ Pa An SPL of 0 dB suggests the Sound Pressure is equal to the reference pressure. This is known as the *threshold of hearing*. An SPL of 140 dB represents the *threshold of pain*.
A-Weighting	The human ear can detect a wide range of frequencies, from 20 Hz to 20 kHz, but it is more sensitive to some frequencies than others. Generally, the ear is most sensitive to frequencies in the range 1 to 4 kHz. The A-weighting is a filter that can be applied to measured results at varying frequencies, to mimic the frequency response of the human ear, and therefore better represent the likely perceived loudness of the sound. SPL readings with the A-weighting applied are represented in dB(A).
L_{10} or L_{A10} and other percentile measures	This represents the SPL which is exceeded 10% of the time, expressed in dB or dB(A). L_{A10} is used to quantify road noise levels. Other percentiles exist and are used for various types of noise assessment. These include L_{01}, L_{50}, L_{90}, L_{99}.
Noise	A noise can be described as an unwanted sound. Noise can cause nuisance.
Noise Sensitive Receptors (NSR's)	Any identified receptor likely to be affected by noise. These are generally human receptors, which may include residential dwellings, work places, schools, hospitals, and recreational spaces.

APPENDIX B

CALIBRATION CERTIFICATES

CERTIFICATE OF CALIBRATION

Date of Issue: 03 December 2013 **Certificate Number: TCRT13/1375**

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Approved Signatory

M. Breslin [ ] K. Mistry [ ]

Customer	Parsons Brinckerhoff Ltd Amber Court, William Armstrong Newcastle Business Park Newcastle upon Tyne NE4 7YQ
Order No.	PB83176
Description	Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Identification

Manufacturer	*Instrument*	*Type*	*Serial No. / Version*
Rion	Sound Level Meter	NA-28	01070573
Rion	Firmware		1.8
Rion	Pre Amplifier	NH-23	70589
Rion	Microphone	UC-59	00367
Brüel & Kjær	Calibrator	4231	3002998
	Calibrator adaptor type if applicable		UC 0210

Performance Class 1

Test Procedure TP 2.SLM 61672-3 TPS-49

Procedures from IEC 61672-3:2006 were used to perform the periodic tests.

Type Approved to IEC 61672-1:2002 Yes Approval Number 21.21/07.01

If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003

Date Received 29 November 2013 ANV Job No. TRAC13/11218

Date Calibrated 03 December 2013

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	16 November 2011	CAL111131	ANV Measurement Systems

This certificate provides traceability of measurement to recognised national standards, and to units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

CERTIFICATE OF CALIBRATION

Certificate Number
TCRT13/1375

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	Sound Level Meter	NA-28
SLM instruction manual ref / issue		06-11
SLM instruction manual source		Manufacturer
Internet download date if applicable		N/A
Case corrections available		Yes
Uncertainties of case corrections		Yes
Source of case data		Manufacturer
Wind screen corrections available		Yes
Uncertainties of wind screen corrections		Yes
Source of wind screen data		Manufacturer
Mic pressure to free field corrections		Yes
Uncertainties of Mic to F.F. corrections		Yes
Source of Mic to F.F. corrections		Manufacturer
Total expanded uncertainties within the requirements of IEC 61672-1:2002		Yes
Specified or equivalent Calibrator		Specified
Customer or Lab Calibrator		Lab Calibrator
Calibrator adaptor type if applicable		UC 0210
Calibrator cal. date		11 November 2013
Calibrator cert. number		UCRT13/1183
Calibrator cal cert issued by Lab		ANV Measurement Systems
Calibrator SPL @ STP	94.12 dB	Calibration reference sound pressure level
Calibrator frequency	1000.00 Hz	Calibration check frequency
Reference level range	20 - 120 dB	

Accessories used or corrected for during calibration - Wind Shield
Note - if a pre-amp extension cable is listed then it was used between the SLM and the pre-amp.

Environmental conditions during tests	Start	End	
Temperature	22.03	22.18	± 0.20 °C
Humidity	41.5	41.5	± 3.00 %RH
Ambient Pressure	101.81	101.76	± 0.03 kPa

Response to associated Calibrator at the environmental conditions above.

Initial indicated level	94.4 dB		Adjusted indicated level	94.1	dB
The uncertainty of the associated calibrator supplied with the sound level meter ±				0.10	dB

Self Generated Noise	This test is currently not performed by this Lab.								
Microphone installed (if requested by customer) = Less Than						N/A	dB	A Weighting	
Uncertainty of the microphone installed self generated noise ±						N/A	dB		
Microphone replaced with electrical input device -				UR = Under Range indicated					
Weighting	A			C			Z		
	10.3	dB	UR	15.1	dB	UR	21.9	dB	UR
Uncertainty of the electrical self generated noise ±						0.12	dB		

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

For the test of the frequency weightings as per paragraph 12. of IEC 61672-3:2006 the Actual microphone free field response was used.

The acoustical frequency tests of a frequency weighting as per paragraph 11 of IEC 61672-3:2006 were carried out using an electrostatic actuator.

..... END .....

Calibrated by: A Patel

Additional Comments

None

Calibration Report

Certificate Number:-16651

Manufacturer:	**Rion**
Type:	**NC-74**
Serial no:	**00830766**

Customer:	**Parsons Brinckerhoff Ltd**
Department:	
Address:	**Queen Victoria House, Redland Hill, Bristol. BS6 6US.**
Order No:	
Contact Person:	**Adam Price.**

Measurement Results:

	Level: (dB)	P. Stab : (dB)	Frequency: (Hz)	F. Stab : (%)	Distortion: (% TD)
1:	93.91	0.06	1002.65	0.00	1.22
2:	93.90	0.01	1002.64	0.00	1.24
3:	93.91	0.01	1002.64	0.00	1.21
Result (Average):	**93.91**	**0.03**	**1002.64**	**0.00**	**1.22**
Expanded Uncertainty:	0.10	0.06	1.00	0.01	0.10
Degree of Freedom:	>100	4	>100	>100	>100
Coverage Factor:	2.00	3.31	2.00	2.00	2.00

The stated level is relative to 20µPa.

The stated level is valid at measurement conditions.
Reference microphone: WSM5 - B&K4192-2496459. Volume correction: 0.043 dB
Records:K:\C A\Calibration\Nor-1504\Nor-1018 CalCal\2014\RIONNC74_00830766_M1.nmf
Measurement procedure: TP-01
All results quoted are directly traceable to National Physical Laboratory, London

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k = 2, which for a normal distribution corresponds to coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA publication EA-4/02.

Environmental conditions:

Pressure:	Temperature:	Relative humidity:
101.461 ± 0.044 kPa	21.2 ± 0.2 °C	55.0 ± 0.9 %RH

Date of calibration: 23/07/2014
Date of issue: 23/07/2014

Supervisor : Darren Batten TechIOA
Engineer :

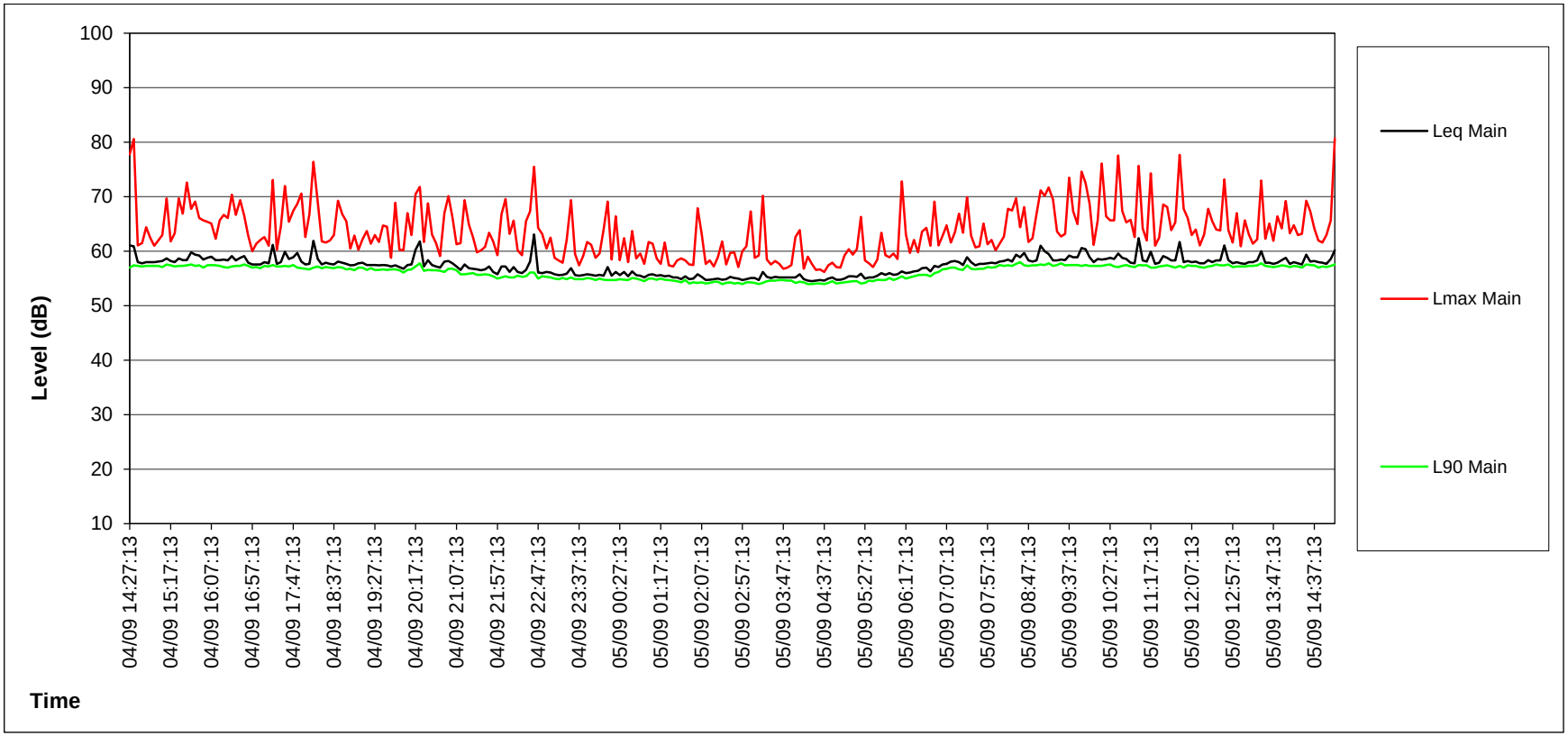
Michael Tickner
Software version: 6.0b

Campbell Associates
www.campbell-associates.co.uk

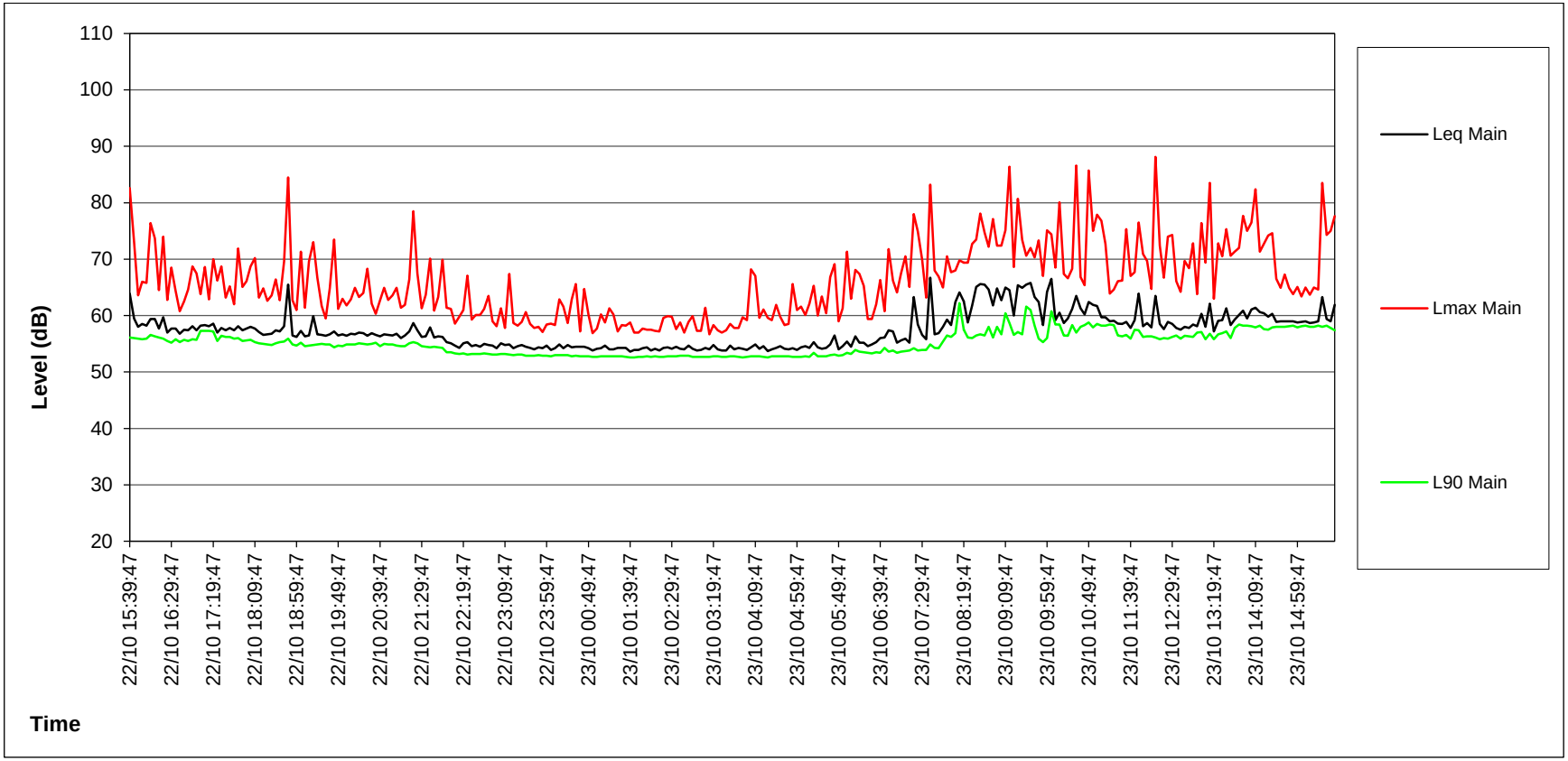
APPENDIX C

UNATTENDED SURVEY TIME HISTORY GRAPHS

Unattended noise survey – M1 Roof Level, 1-19 Torrington Place – Levels are A-weighted



Unattended noise survey – M2, Courtyard 1-19 Torrington Place – Levels are A-weighted



APPENDIX D

UNATTENDED NOISE SURVEY DATA

M1

Data number	Start Time	L_{Aeq}	L_{Amax}	L_{A90}
1	04/09/2014 14:27	61.1	77.8	57
2	04/09/2014 14:32	60.9	80.6	57.4
3	04/09/2014 14:37	58	61.1	57.3
4	04/09/2014 14:42	57.8	61.5	57.2
5	04/09/2014 14:47	58	64.4	57.3
6	04/09/2014 14:52	58	62.5	57.3
7	04/09/2014 14:57	58	61	57.3
8	04/09/2014 15:02	58.1	62	57.3
9	04/09/2014 15:07	58.2	63	57.1
10	04/09/2014 15:12	58.7	69.7	57.6
11	04/09/2014 15:17	58.2	61.8	57.4
12	04/09/2014 15:22	58	63.3	57.2
13	04/09/2014 15:27	58.7	69.7	57.3
14	04/09/2014 15:32	58.4	66.9	57.3
15	04/09/2014 15:37	58.4	72.6	57.4
16	04/09/2014 15:42	59.8	67.8	57.6
17	04/09/2014 15:47	59.4	69.1	57.3
18	04/09/2014 15:52	59.2	66.1	57.4
19	04/09/2014 15:57	58.5	65.7	57
20	04/09/2014 16:02	58.8	65.4	57.4
21	04/09/2014 16:07	59	65.1	57.5
22	04/09/2014 16:12	58.4	62.3	57.4
23	04/09/2014 16:17	58.4	65.7	57.3
24	04/09/2014 16:22	58.5	66.7	57.1
25	04/09/2014 16:27	58.3	66.1	57
26	04/09/2014 16:32	59.1	70.4	57.2
27	04/09/2014 16:37	58.3	66.7	57.3
28	04/09/2014 16:42	58.8	69.4	57.3
29	04/09/2014 16:47	59.1	66.5	57.6
30	04/09/2014 16:52	57.9	62.8	57.3
31	04/09/2014 16:57	57.6	60	57
32	04/09/2014 17:02	57.6	61.4	57.1
33	04/09/2014 17:07	57.6	62.1	56.9
34	04/09/2014 17:12	58	62.6	57.3
35	04/09/2014 17:17	57.8	61	57.2
36	04/09/2014 17:22	61.2	73.1	57.5
37	04/09/2014 17:27	57.7	60.3	57.2
38	04/09/2014 17:32	58	64.5	57.2
39	04/09/2014 17:37	59.9	72	57.3
40	04/09/2014 17:42	58.6	65.4	57.2
41	04/09/2014 17:47	58.9	67.4	57.5
42	04/09/2014 17:52	59.7	68.7	57
43	04/09/2014 17:57	58.1	70.6	56.9
44	04/09/2014 18:02	57.6	62.6	56.8
45	04/09/2014 18:07	57.7	66.8	56.7
46	04/09/2014 18:12	61.9	76.4	57
47	04/09/2014 18:17	58.6	69	57.2
48	04/09/2014 18:22	57.6	61.8	56.9
49	04/09/2014 18:27	57.9	61.6	57.1

50	04/09/2014 18:32	57.7	62	57
51	04/09/2014 18:37	57.6	63	56.9
52	04/09/2014 18:42	58.1	69.3	57.1
53	04/09/2014 18:47	57.9	66.8	57
54	04/09/2014 18:52	57.7	65.5	56.7
55	04/09/2014 18:57	57.4	60.5	56.8
56	04/09/2014 19:02	57.5	62.9	56.5
57	04/09/2014 19:07	57.8	60.3	57
58	04/09/2014 19:12	57.9	62.2	57
59	04/09/2014 19:17	57.5	63.7	56.6
60	04/09/2014 19:22	57.5	61.4	56.9
61	04/09/2014 19:27	57.5	63	56.6
62	04/09/2014 19:32	57.4	61.7	56.6
63	04/09/2014 19:37	57.5	64.7	56.7
64	04/09/2014 19:42	57.4	64.5	56.6
65	04/09/2014 19:47	57.2	58.8	56.7
66	04/09/2014 19:52	57.4	68.9	56.7
67	04/09/2014 19:57	57.1	60.3	56.5
68	04/09/2014 20:02	56.8	60.2	56.1
69	04/09/2014 20:07	57.5	67	56.6
70	04/09/2014 20:12	57.6	63	56.7
71	04/09/2014 20:17	60.3	70.5	57.2
72	04/09/2014 20:22	61.8	71.8	57.8
73	04/09/2014 20:27	57.2	61.7	56.4
74	04/09/2014 20:32	58.4	68.8	56.6
75	04/09/2014 20:37	57.5	63.1	56.5
76	04/09/2014 20:42	57.2	61.5	56.5
77	04/09/2014 20:47	57	59.1	56.4
78	04/09/2014 20:52	58.1	67	56.2
79	04/09/2014 20:57	58.2	70.1	56.8
80	04/09/2014 21:02	57.8	66.2	56.8
81	04/09/2014 21:07	57.2	61.3	56.5
82	04/09/2014 21:12	56.6	61.5	55.8
83	04/09/2014 21:17	57.6	69.4	55.8
84	04/09/2014 21:22	56.9	64.9	55.9
85	04/09/2014 21:27	56.8	62.6	56
86	04/09/2014 21:32	56.7	59.8	55.7
87	04/09/2014 21:37	56.5	60.2	55.7
88	04/09/2014 21:42	56.7	60.8	55.8
89	04/09/2014 21:47	57.2	63.4	55.7
90	04/09/2014 21:52	56.2	61.8	55.4
91	04/09/2014 21:57	55.8	59.3	55
92	04/09/2014 22:02	57.2	66.8	55.2
93	04/09/2014 22:07	57.2	69.6	55.4
94	04/09/2014 22:12	56.2	63.2	55.2
95	04/09/2014 22:17	57.1	65.6	55.2
96	04/09/2014 22:22	56.2	60.2	55.5
97	04/09/2014 22:27	56	59.3	55.3
98	04/09/2014 22:32	56.6	65.5	55.4
99	04/09/2014 22:37	58.1	67.3	56.1
100	04/09/2014 22:42	63.1	75.5	56.1
101	04/09/2014 22:47	56.1	64.3	55

102	04/09/2014 22:52	56	63.2	55.4
103	04/09/2014 22:57	56.2	60.5	55.3
104	04/09/2014 23:02	56.1	62.5	55.2
105	04/09/2014 23:07	55.8	58.8	55
106	04/09/2014 23:12	55.6	58.3	54.9
107	04/09/2014 23:17	55.7	57.9	55.1
108	04/09/2014 23:22	55.9	62.1	54.9
109	04/09/2014 23:27	56.9	69.4	55.2
110	04/09/2014 23:32	55.6	59.5	54.9
111	04/09/2014 23:37	55.5	57.4	54.9
112	04/09/2014 23:42	55.6	59.1	54.9
113	04/09/2014 23:47	55.8	61.7	55.1
114	04/09/2014 23:52	55.7	61.2	55
115	04/09/2014 23:57	55.5	58.8	54.7
116	05/09/2014 00:02	55.7	59.6	55
117	05/09/2014 00:07	55.5	64	54.8
118	05/09/2014 00:12	57.1	69.1	54.7
119	05/09/2014 00:17	55.5	58.5	54.7
120	05/09/2014 00:22	56.2	66.4	54.7
121	05/09/2014 00:27	55.6	58.4	54.9
122	05/09/2014 00:32	56.2	62.4	54.8
123	05/09/2014 00:37	55.4	58	54.7
124	05/09/2014 00:42	56.3	63.7	55.1
125	05/09/2014 00:47	55.6	58.7	55
126	05/09/2014 00:52	55.5	59.6	54.8
127	05/09/2014 00:57	55.2	57.7	54.5
128	05/09/2014 01:02	55.7	61.7	55
129	05/09/2014 01:07	55.8	61.4	55
130	05/09/2014 01:12	55.5	58.7	54.8
131	05/09/2014 01:17	55.6	57.7	55
132	05/09/2014 01:22	55.4	61.6	54.8
133	05/09/2014 01:27	55.5	57.4	54.7
134	05/09/2014 01:32	55.2	57.2	54.6
135	05/09/2014 01:37	55.2	58.3	54.5
136	05/09/2014 01:42	54.9	58.7	54.3
137	05/09/2014 01:47	55.4	58.3	54.7
138	05/09/2014 01:52	54.9	57.6	54.1
139	05/09/2014 01:57	55	57.5	54.3
140	05/09/2014 02:02	55.8	67.9	54.2
141	05/09/2014 02:07	55.3	63.2	54.3
142	05/09/2014 02:12	54.7	57.7	54.1
143	05/09/2014 02:17	54.8	58.3	54.2
144	05/09/2014 02:22	54.9	57.2	54.4
145	05/09/2014 02:27	55	58.9	54.4
146	05/09/2014 02:32	54.8	61.8	54
147	05/09/2014 02:37	54.9	57.6	54.2
148	05/09/2014 02:42	55.3	59.7	54.3
149	05/09/2014 02:47	55.1	59.8	54.1
150	05/09/2014 02:52	55	57.1	54.2
151	05/09/2014 02:57	54.7	60	54
152	05/09/2014 03:02	54.9	60.9	54.3
153	05/09/2014 03:07	55.1	67.3	54.3

154	05/09/2014 03:12	55.1	58.8	54.2
155	05/09/2014 03:17	54.7	59.2	54
156	05/09/2014 03:22	56.2	70.2	54.2
157	05/09/2014 03:27	55.3	58.5	54.5
158	05/09/2014 03:32	55.1	57.6	54.6
159	05/09/2014 03:37	55.3	58.2	54.6
160	05/09/2014 03:42	55.2	57.7	54.7
161	05/09/2014 03:47	55.2	56.8	54.7
162	05/09/2014 03:52	55.2	57	54.6
163	05/09/2014 03:57	55.2	57.5	54.6
164	05/09/2014 04:02	55.2	62.6	54.2
165	05/09/2014 04:07	55.8	63.9	54.4
166	05/09/2014 04:12	54.9	56.8	54.3
167	05/09/2014 04:17	54.6	59	54
168	05/09/2014 04:22	54.5	57.7	54
169	05/09/2014 04:27	54.6	56.6	54.1
170	05/09/2014 04:32	54.7	56.7	54.1
171	05/09/2014 04:37	54.6	56.2	54
172	05/09/2014 04:42	55	57.4	54.2
173	05/09/2014 04:47	55.2	57.9	54.5
174	05/09/2014 04:52	54.8	57.1	54.1
175	05/09/2014 04:57	54.8	57	54.2
176	05/09/2014 05:02	55	59.2	54.3
177	05/09/2014 05:07	55.4	60.4	54.4
178	05/09/2014 05:12	55.4	59.4	54.5
179	05/09/2014 05:17	55.3	60.4	54.5
180	05/09/2014 05:22	55.9	66.3	54.1
181	05/09/2014 05:27	55	58.3	54.2
182	05/09/2014 05:32	55.2	57.8	54.6
183	05/09/2014 05:37	55.2	57.1	54.5
184	05/09/2014 05:42	55.5	58.5	54.8
185	05/09/2014 05:47	56	63.4	54.7
186	05/09/2014 05:52	55.7	59.3	54.7
187	05/09/2014 05:57	56	58.9	55.1
188	05/09/2014 06:02	55.7	59.6	54.7
189	05/09/2014 06:07	55.8	58.6	55
190	05/09/2014 06:12	56.3	72.8	55.4
191	05/09/2014 06:17	56	63.1	55
192	05/09/2014 06:22	56.1	59.7	55.2
193	05/09/2014 06:27	56.3	62.1	55.4
194	05/09/2014 06:32	56.4	59.8	55.6
195	05/09/2014 06:37	56.9	63.6	55.7
196	05/09/2014 06:42	57	64.3	55.7
197	05/09/2014 06:47	56.3	61	55.4
198	05/09/2014 06:52	57.3	69.1	56
199	05/09/2014 06:57	57.1	61.1	56.2
200	05/09/2014 07:02	57.6	62.8	56.7
201	05/09/2014 07:07	57.7	64.7	56.8
202	05/09/2014 07:12	58.1	61.6	57
203	05/09/2014 07:17	58.2	63.5	57
204	05/09/2014 07:22	58	66.9	56.7
205	05/09/2014 07:27	57.5	63.4	56.6

206	05/09/2014 07:32	58.9	69.9	57.4
207	05/09/2014 07:37	58	62.9	56.8
208	05/09/2014 07:42	57.4	60.7	56.7
209	05/09/2014 07:47	57.7	60.9	56.8
210	05/09/2014 07:52	57.7	65.1	56.8
211	05/09/2014 07:57	57.8	61.3	57.1
212	05/09/2014 08:02	57.9	62.1	57
213	05/09/2014 08:07	57.8	60.2	57.1
214	05/09/2014 08:12	58.1	61.4	57.5
215	05/09/2014 08:17	58.2	62.7	57.3
216	05/09/2014 08:22	58.5	67.8	57.4
217	05/09/2014 08:27	58.1	67.5	57.3
218	05/09/2014 08:32	59.4	69.7	57.7
219	05/09/2014 08:37	58.9	64.4	58
220	05/09/2014 08:42	59.7	68.1	57.4
221	05/09/2014 08:47	58.3	61.7	57.3
222	05/09/2014 08:52	58.1	62.4	57.4
223	05/09/2014 08:57	58.3	66.9	57.4
224	05/09/2014 09:02	61	71.2	57.6
225	05/09/2014 09:07	60	70.2	57.5
226	05/09/2014 09:12	59.5	71.7	57.8
227	05/09/2014 09:17	58.3	69.5	57.3
228	05/09/2014 09:22	58.3	63.6	57.5
229	05/09/2014 09:27	58.5	62.7	57.8
230	05/09/2014 09:32	58.4	63.2	57.4
231	05/09/2014 09:37	59.2	73.5	57.5
232	05/09/2014 09:42	58.9	67.3	57.5
233	05/09/2014 09:47	58.9	65	57.5
234	05/09/2014 09:52	60.6	74.6	57.3
235	05/09/2014 09:57	60.4	72.5	57.5
236	05/09/2014 10:02	58.9	68.7	57.3
237	05/09/2014 10:07	58	61.2	57.3
238	05/09/2014 10:12	58.6	65.7	57.3
239	05/09/2014 10:17	58.5	76.1	57.3
240	05/09/2014 10:22	58.6	66.4	57.5
241	05/09/2014 10:27	58.8	65.7	57.6
242	05/09/2014 10:32	58.6	65.7	57.2
243	05/09/2014 10:37	59.6	77.6	57.1
244	05/09/2014 10:42	58.8	67.4	57.3
245	05/09/2014 10:47	58.6	65.3	57.5
246	05/09/2014 10:52	57.9	65.8	57.2
247	05/09/2014 10:57	57.8	62.6	57.1
248	05/09/2014 11:02	62.4	75.7	57.5
249	05/09/2014 11:07	58.3	64.2	57.4
250	05/09/2014 11:12	58.1	62	57.4
251	05/09/2014 11:17	59.9	74.3	57
252	05/09/2014 11:22	57.7	61	57
253	05/09/2014 11:27	57.9	62.5	57.2
254	05/09/2014 11:32	59.1	68.6	57.3
255	05/09/2014 11:37	58.8	68.1	57.4
256	05/09/2014 11:42	58.3	63.9	57.2
257	05/09/2014 11:47	58.3	65.3	57

258	05/09/2014 11:52	61.7	77.7	57.3
259	05/09/2014 11:57	58	67.8	57
260	05/09/2014 12:02	58.2	66.1	57.4
261	05/09/2014 12:07	58	63	57.3
262	05/09/2014 12:12	58.1	64	57.3
263	05/09/2014 12:17	57.8	61.1	57.1
264	05/09/2014 12:22	57.8	63.1	57
265	05/09/2014 12:27	58.4	67.8	57.2
266	05/09/2014 12:32	58	65.5	57.3
267	05/09/2014 12:37	58.3	64	57.6
268	05/09/2014 12:42	58.3	63.8	57.4
269	05/09/2014 12:47	61.1	73.2	57.4
270	05/09/2014 12:52	58.4	63.9	57.6
271	05/09/2014 12:57	57.8	61.6	57.1
272	05/09/2014 13:02	58	67	57.2
273	05/09/2014 13:07	57.8	60.9	57.2
274	05/09/2014 13:12	57.7	65.7	57.2
275	05/09/2014 13:17	58	63.1	57.3
276	05/09/2014 13:22	58	61.4	57.3
277	05/09/2014 13:27	58.3	62.2	57.4
278	05/09/2014 13:32	60	73	57.8
279	05/09/2014 13:37	57.9	62.3	57.3
280	05/09/2014 13:42	57.9	65.1	57.2
281	05/09/2014 13:47	57.7	61.9	57.1
282	05/09/2014 13:52	57.9	66.4	57.2
283	05/09/2014 13:57	58.4	64.2	57.4
284	05/09/2014 14:02	58.8	69.2	57.3
285	05/09/2014 14:07	57.7	63.3	57.1
286	05/09/2014 14:12	58	64.8	57.3
287	05/09/2014 14:17	57.8	63	57.2
288	05/09/2014 14:22	57.6	63.2	57
289	05/09/2014 14:27	59.4	69.3	57.6
290	05/09/2014 14:32	58.1	67.3	57.5
291	05/09/2014 14:37	58.2	64.2	57.4
292	05/09/2014 14:42	58	62	57
293	05/09/2014 14:47	57.9	61.6	57.2
294	05/09/2014 14:52	57.7	63	57.1
295	05/09/2014 14:57	58.6	65.7	57.3
296	05/09/2014 15:02	60.2	80.7	57.6

M2

Data number	Start Time	L_{Aeq}	L_{Amax}	L_{A90}
1	22/10/2014 15:39	63.9	82.6	56.1
2	22/10/2014 15:44	59.5	73.1	56
3	22/10/2014 15:49	58	63.6	55.9
4	22/10/2014 15:54	58.5	66	55.8
5	22/10/2014 15:59	58.2	65.8	55.9
6	22/10/2014 16:04	59.4	76.4	56.6
7	22/10/2014 16:09	59.4	73.7	56.3
8	22/10/2014 16:14	57.7	64.5	56.1
9	22/10/2014 16:19	59.7	74	55.9
10	22/10/2014 16:24	57	62.8	55.5
11	22/10/2014 16:29	57.7	68.5	55.2
12	22/10/2014 16:34	57.7	64.3	55.8
13	22/10/2014 16:39	56.8	60.8	55.3
14	22/10/2014 16:44	57.5	62.5	55.7
15	22/10/2014 16:49	57.4	64.6	55.5
16	22/10/2014 16:54	58.1	68.7	55.8
17	22/10/2014 16:59	57.4	67.5	55.7
18	22/10/2014 17:04	58.2	63.8	57.3
19	22/10/2014 17:09	58.3	68.6	57.3
20	22/10/2014 17:14	58.1	62.9	57.3
21	22/10/2014 17:19	58.6	70	57.2
22	22/10/2014 17:24	57	66.2	55.5
23	22/10/2014 17:29	57.8	68.7	56.4
24	22/10/2014 17:34	57.4	63.2	56.2
25	22/10/2014 17:39	57.8	65.2	56.2
26	22/10/2014 17:44	57.4	62	55.9
27	22/10/2014 17:49	58.1	71.9	56
28	22/10/2014 17:54	57.4	65.1	55.5
29	22/10/2014 17:59	57.7	66.1	55.6
30	22/10/2014 18:04	58	68.7	55.7
31	22/10/2014 18:09	57.7	70.2	55.3
32	22/10/2014 18:14	57.1	63.2	55.1
33	22/10/2014 18:19	56.6	64.8	55
34	22/10/2014 18:24	56.7	62.6	54.9
35	22/10/2014 18:29	56.8	63.6	54.8
36	22/10/2014 18:34	57.4	66.4	55.1
37	22/10/2014 18:39	57.2	62.7	55.3
38	22/10/2014 18:44	58.1	69.6	55.4
39	22/10/2014 18:49	65.5	84.5	55.9
40	22/10/2014 18:54	56.5	62.7	54.9
41	22/10/2014 18:59	56.2	61	54.7
42	22/10/2014 19:04	57.3	71.3	55.2
43	22/10/2014 19:09	56.3	61.4	54.6
44	22/10/2014 19:14	56.5	69.6	54.7
45	22/10/2014 19:19	59.9	73	54.8
46	22/10/2014 19:24	56.7	66.7	54.9
47	22/10/2014 19:29	56.6	61.7	55
48	22/10/2014 19:34	56.4	59.5	54.9
49	22/10/2014 19:39	56.7	64.8	54.9

50	22/10/2014 19:44	57.2	73.5	54.4
51	22/10/2014 19:49	56.5	61.2	54.7
52	22/10/2014 19:54	56.7	63	54.6
53	22/10/2014 19:59	56.4	61.8	54.9
54	22/10/2014 20:04	56.8	62.9	54.9
55	22/10/2014 20:09	56.7	64.9	54.9
56	22/10/2014 20:14	57	63.3	55.1
57	22/10/2014 20:19	56.9	64	55
58	22/10/2014 20:24	56.4	68.3	54.9
59	22/10/2014 20:29	56.9	62.1	55
60	22/10/2014 20:34	56.6	60.3	55.2
61	22/10/2014 20:39	56.3	62.7	54.6
62	22/10/2014 20:44	56.7	64.9	55
63	22/10/2014 20:49	56.6	62.8	54.9
64	22/10/2014 20:54	56.5	63.6	54.9
65	22/10/2014 20:59	56.8	64.9	54.7
66	22/10/2014 21:04	56	61.4	54.6
67	22/10/2014 21:09	56.5	61.9	54.6
68	22/10/2014 21:14	57.2	66.4	55.1
69	22/10/2014 21:19	58.7	78.5	55.3
70	22/10/2014 21:24	57.4	67.5	55.1
71	22/10/2014 21:29	56.2	61.3	54.6
72	22/10/2014 21:34	56.3	63.7	54.5
73	22/10/2014 21:39	57.9	70.1	54.4
74	22/10/2014 21:44	56.1	60.9	54.5
75	22/10/2014 21:49	56.3	63.3	54.4
76	22/10/2014 21:54	56.2	69.9	54.3
77	22/10/2014 21:59	55.3	61.4	53.5
78	22/10/2014 22:04	55.1	61.2	53.5
79	22/10/2014 22:09	54.7	58.6	53.3
80	22/10/2014 22:14	54.3	59.8	53.2
81	22/10/2014 22:19	55.1	61	53.3
82	22/10/2014 22:24	55.3	67.1	53.1
83	22/10/2014 22:29	54.6	59.3	53.2
84	22/10/2014 22:34	54.8	60.1	53.2
85	22/10/2014 22:39	54.5	60.1	53.2
86	22/10/2014 22:44	55	61.2	53.3
87	22/10/2014 22:49	54.8	63.5	53.2
88	22/10/2014 22:54	54.7	59	53.1
89	22/10/2014 22:59	54.2	58.1	53.1
90	22/10/2014 23:04	55.1	61.3	53.2
91	22/10/2014 23:09	54.8	57.8	53.2
92	22/10/2014 23:14	54.9	67.4	53.1
93	22/10/2014 23:19	54.2	58.7	53
94	22/10/2014 23:24	54.6	58.2	53.1
95	22/10/2014 23:29	54.8	58.9	53.1
96	22/10/2014 23:34	54.5	60.6	52.9
97	22/10/2014 23:39	54.3	58.5	52.9
98	22/10/2014 23:44	54	57.8	52.9
99	22/10/2014 23:49	54.4	58	53
100	22/10/2014 23:54	54.2	57.1	52.9
101	22/10/2014 23:59	54.7	58.4	52.9

102	23/10/2014 00:04	53.9	58.6	52.8
103	23/10/2014 00:09	54.2	58.3	53
104	23/10/2014 00:14	54.9	62.9	53
105	23/10/2014 00:19	54.2	61.6	53
106	23/10/2014 00:24	54.8	58.7	53
107	23/10/2014 00:29	54.4	62.9	52.8
108	23/10/2014 00:34	54.5	65.6	52.9
109	23/10/2014 00:39	54.5	57.2	52.8
110	23/10/2014 00:44	54.5	64.7	52.8
111	23/10/2014 00:49	54.2	60.1	52.8
112	23/10/2014 00:54	53.8	56.9	52.7
113	23/10/2014 00:59	54.1	57.7	52.7
114	23/10/2014 01:04	54.2	60.2	52.8
115	23/10/2014 01:09	54.7	58.8	52.8
116	23/10/2014 01:14	54	61.3	52.8
117	23/10/2014 01:19	54	60.2	52.8
118	23/10/2014 01:24	54.3	57.2	52.8
119	23/10/2014 01:29	54.3	58.3	52.8
120	23/10/2014 01:34	54.3	58.2	52.7
121	23/10/2014 01:39	53.6	58.8	52.6
122	23/10/2014 01:44	53.9	57	52.6
123	23/10/2014 01:49	53.9	57	52.7
124	23/10/2014 01:54	54.2	57.7	52.7
125	23/10/2014 01:59	54.4	57.5	52.8
126	23/10/2014 02:04	53.8	57.5	52.7
127	23/10/2014 02:09	54.1	57.3	52.8
128	23/10/2014 02:14	53.8	57.2	52.7
129	23/10/2014 02:19	54.3	59.6	52.7
130	23/10/2014 02:24	54.4	59.9	52.8
131	23/10/2014 02:29	54.1	59.8	52.8
132	23/10/2014 02:34	54.5	57.6	52.8
133	23/10/2014 02:39	54.1	58.8	52.9
134	23/10/2014 02:44	54	57	52.9
135	23/10/2014 02:49	54.7	58.9	52.9
136	23/10/2014 02:54	54.1	59.9	52.7
137	23/10/2014 02:59	53.8	57.3	52.7
138	23/10/2014 03:04	53.9	57.3	52.7
139	23/10/2014 03:09	54.3	61.4	52.7
140	23/10/2014 03:14	54	56.7	52.7
141	23/10/2014 03:19	54.8	58.3	52.8
142	23/10/2014 03:24	54	57.4	52.8
143	23/10/2014 03:29	53.8	57	52.7
144	23/10/2014 03:34	53.8	57.4	52.7
145	23/10/2014 03:39	54.7	58.5	52.8
146	23/10/2014 03:44	54	57.8	52.8
147	23/10/2014 03:49	54.3	57.8	52.7
148	23/10/2014 03:54	54.1	59.7	52.6
149	23/10/2014 03:59	53.9	59.2	52.7
150	23/10/2014 04:04	54.4	68.2	52.8
151	23/10/2014 04:09	54.9	67	52.8
152	23/10/2014 04:14	54.1	59.6	52.8
153	23/10/2014 04:19	54.6	61.1	52.7

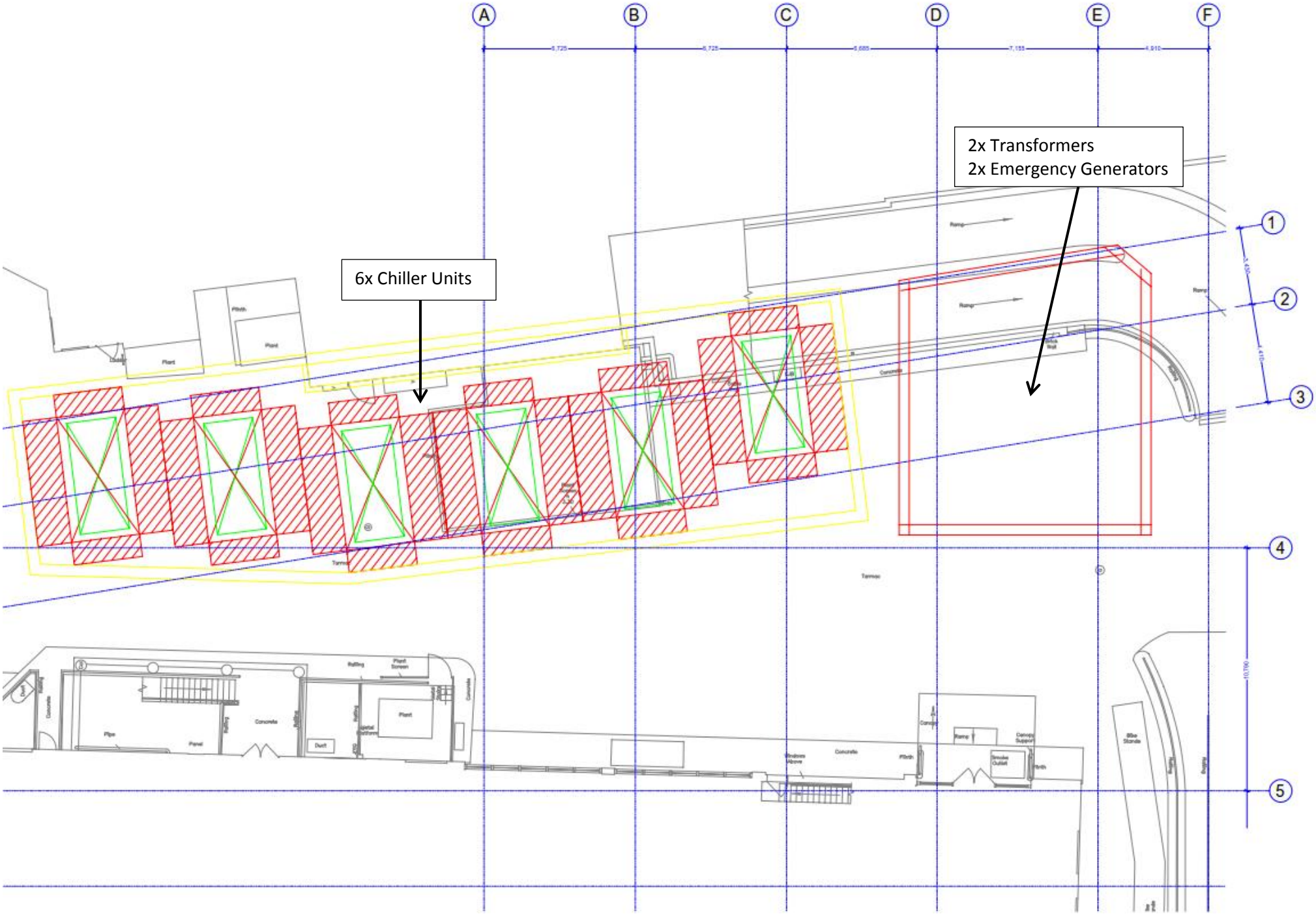
154	23/10/2014 04:24	53.7	59.6	52.6
155	23/10/2014 04:29	54	59.2	52.8
156	23/10/2014 04:34	54.3	61.9	52.8
157	23/10/2014 04:39	54.6	59.8	52.8
158	23/10/2014 04:44	54.1	58.3	52.8
159	23/10/2014 04:49	54	58.5	52.8
160	23/10/2014 04:54	54.2	65.6	52.7
161	23/10/2014 04:59	53.9	61	52.7
162	23/10/2014 05:04	54.4	61.6	52.7
163	23/10/2014 05:09	54.6	60.1	52.8
164	23/10/2014 05:14	54.3	62.1	52.7
165	23/10/2014 05:19	55.3	65.3	53.4
166	23/10/2014 05:24	54.4	60	52.8
167	23/10/2014 05:29	54.1	63.4	52.8
168	23/10/2014 05:34	54.3	60.4	52.8
169	23/10/2014 05:39	54.9	66.8	53
170	23/10/2014 05:44	56.5	69.1	53.1
171	23/10/2014 05:49	54	59	52.9
172	23/10/2014 05:54	54.6	61.3	53
173	23/10/2014 05:59	55.4	71.3	53.4
174	23/10/2014 06:04	54.5	63	53.2
175	23/10/2014 06:09	56.3	68.1	53.9
176	23/10/2014 06:14	55.2	67.4	53.6
177	23/10/2014 06:19	55.2	65.3	53.5
178	23/10/2014 06:24	54.6	59.4	53.4
179	23/10/2014 06:29	54.9	59.4	53.3
180	23/10/2014 06:34	55.3	62	53.5
181	23/10/2014 06:39	56	66.3	53.4
182	23/10/2014 06:44	56.1	60.8	54.3
183	23/10/2014 06:49	57.4	71.8	53.6
184	23/10/2014 06:54	57.2	66.2	53.8
185	23/10/2014 06:59	55.2	64.1	53.4
186	23/10/2014 07:04	55.6	67.5	53.6
187	23/10/2014 07:09	55.9	70.5	53.7
188	23/10/2014 07:14	55.2	65.1	53.8
189	23/10/2014 07:19	63.3	78	54.2
190	23/10/2014 07:24	58.4	74.9	53.8
191	23/10/2014 07:29	56.6	69.9	53.9
192	23/10/2014 07:34	55.8	63.2	53.9
193	23/10/2014 07:39	66.7	83.2	54.9
194	23/10/2014 07:44	56.7	68	54.3
195	23/10/2014 07:49	56.9	66.9	54.2
196	23/10/2014 07:54	58	65	55.4
197	23/10/2014 07:59	59.3	70.5	56.5
198	23/10/2014 08:04	58.3	67.7	56.2
199	23/10/2014 08:09	62.4	68	56.9
200	23/10/2014 08:14	64.1	69.8	62.2
201	23/10/2014 08:19	62.5	69.4	57.5
202	23/10/2014 08:24	58.8	69.4	56.1
203	23/10/2014 08:29	61.8	72.7	56
204	23/10/2014 08:34	65.1	73.5	56.5
205	23/10/2014 08:39	65.6	78.1	56.7

206	23/10/2014 08:44	65.5	74.7	56.5
207	23/10/2014 08:49	64.6	72.2	58
208	23/10/2014 08:54	61.8	77.1	56.1
209	23/10/2014 08:59	64.8	72.4	58
210	23/10/2014 09:04	62.7	72.4	56.7
211	23/10/2014 09:09	65	75.1	60.4
212	23/10/2014 09:14	64.5	86.4	58.7
213	23/10/2014 09:19	60	68.6	56.6
214	23/10/2014 09:24	65.4	80.7	57.1
215	23/10/2014 09:29	64.9	73.4	56.7
216	23/10/2014 09:34	65.5	70.6	61.6
217	23/10/2014 09:39	65.8	72	61
218	23/10/2014 09:44	63.3	70.3	58.2
219	23/10/2014 09:49	62.4	73.3	55.9
220	23/10/2014 09:54	58.3	67	55.3
221	23/10/2014 09:59	64.2	75.1	56
222	23/10/2014 10:04	66.5	74.4	60.8
223	23/10/2014 10:09	59.2	68.5	58.4
224	23/10/2014 10:14	60.5	80.1	58.4
225	23/10/2014 10:19	58.7	67.4	56.5
226	23/10/2014 10:24	59.5	66.6	56.4
227	23/10/2014 10:29	61.2	68.3	58.3
228	23/10/2014 10:34	63.5	86.6	57
229	23/10/2014 10:39	61.3	66.8	58
230	23/10/2014 10:44	60.2	65.4	58.3
231	23/10/2014 10:49	62.4	85.7	58.8
232	23/10/2014 10:54	61.9	75	57.9
233	23/10/2014 10:59	61.7	77.9	58.5
234	23/10/2014 11:04	59.7	76.8	58.2
235	23/10/2014 11:09	59.7	72.7	58.2
236	23/10/2014 11:14	59	63.9	58.4
237	23/10/2014 11:19	59.1	64.6	58.3
238	23/10/2014 11:24	58.6	66.1	56.5
239	23/10/2014 11:29	58.5	66.2	56.3
240	23/10/2014 11:34	58.9	75.3	56.6
241	23/10/2014 11:39	57.8	67	55.9
242	23/10/2014 11:44	59.2	67.7	57.5
243	23/10/2014 11:49	63.9	76.5	57.4
244	23/10/2014 11:54	58.1	70.9	56.2
245	23/10/2014 11:59	58.7	69.7	56.3
246	23/10/2014 12:04	57.9	64.7	56.3
247	23/10/2014 12:09	63.5	88.1	56.1
248	23/10/2014 12:14	58.5	72.4	55.8
249	23/10/2014 12:19	57.6	66.7	56
250	23/10/2014 12:24	58.9	74	55.9
251	23/10/2014 12:29	58.5	74.3	56.2
252	23/10/2014 12:34	57.8	66.1	56.5
253	23/10/2014 12:39	57.5	64.2	55.9
254	23/10/2014 12:44	58	69.7	56.4
255	23/10/2014 12:49	57.8	68.4	56.3
256	23/10/2014 12:54	58.4	72.8	56.2
257	23/10/2014 12:59	58.1	63.8	57

258	23/10/2014 13:04	60.3	76.4	57.1
259	23/10/2014 13:09	58	69.4	55.8
260	23/10/2014 13:14	62.1	83.5	56.8
261	23/10/2014 13:19	57.2	63	55.8
262	23/10/2014 13:24	59.1	72.8	56.7
263	23/10/2014 13:29	59.2	70.5	56.9
264	23/10/2014 13:34	61.3	75.3	57.2
265	23/10/2014 13:39	58.3	70.6	56
266	23/10/2014 13:44	59.3	71.3	57.8
267	23/10/2014 13:49	60.1	72	58.4
268	23/10/2014 13:54	60.9	77.7	58.2
269	23/10/2014 13:59	59.5	75	58.2
270	23/10/2014 14:04	61.1	76.5	58.1
271	23/10/2014 14:09	61.4	82.4	57.9
272	23/10/2014 14:14	60.6	71.3	58.2
273	23/10/2014 14:19	60.4	72.7	57.6
274	23/10/2014 14:24	59.8	74.2	57.5
275	23/10/2014 14:29	60.3	74.6	57.9
276	23/10/2014 14:34	58.9	66.5	58
277	23/10/2014 14:39	59	64.9	58
278	23/10/2014 14:44	59	67.3	58
279	23/10/2014 14:49	59	64.9	58.1
280	23/10/2014 14:54	59	63.8	58.2
281	23/10/2014 14:59	58.8	65.1	57.9
282	23/10/2014 15:04	58.9	63.4	58.1
283	23/10/2014 15:09	59	65	58.2
284	23/10/2014 15:14	58.7	63.7	58
285	23/10/2014 15:19	58.8	65	58
286	23/10/2014 15:24	59	64.6	58.2
287	23/10/2014 15:29	63.3	83.5	58
288	23/10/2014 15:34	59.4	74.3	58.2
289	23/10/2014 15:39	59	75	57.8
290	23/10/2014 15:44	61.9	77.6	57.4

APPENDIX E

PLANT ARRANGEMENT


A
B
C
D
E
F
1
2
3
4
5
6x Chiller Units
2x Transformers
2x Emergency Generators

APPENDIX F

NOISE MODEL SNAP-SHOT


529380
529400
529420
529440
529460
529480
529500
529520
529540
529560
529580
529600
529620
182060
182040
182020
182000
181980
181960
181940
181920

APPENDIX G

PHOTOS OF THE SITE AND SURROUNDING AREAS

View of proposed site for new plant with commercial property façade in background – looking north

View of down ramp to car park – looking north

View of nearest noise sensitive property façade – looking south

View of ramp to street level – looking south

APPENDIX H

CAMDEN COUNCIL ACOUSTIC REPORT CHECKLIST

Acoustic report checklist for planning applications

Please fill in the checklist and attach to the acoustic report with your planning application.

Please place a tick against one box for every item in each category, to indicate whether the relevant information has been included in the report, excluded, or does not apply.

Category ITEM	Yes	No	Not applicable- state why?
1. Introduction & Description of Development	✔		
2. Authors name and qualifications	✔		M. Edwards BEng(Hons) MIOA
3. Maps/Plans included	✔		
4. Photo of site and surroundings	✔		
5. Guidance/Standards Quoted?	✔		
6. Calibration and Sound Level Meter details	✔		
7. Is Development considered Noise Sensitive?		✔	
8. Is Development Potentially Noisy (see LAQs)?		✔	Mitigation and plant noise limits recommended
9. Existing Noise Environment assessed?	✔		
10. Impact of Noise Sources?	✔		
11. Proposed Working Hours and Methods?	✔		
12. Distance (nearest Noise sensitive receptor)?	✔		
13. Boundary Noise Limits?			N/A - Noise level predicted at closest receptors

Category ITEM	Yes	No	Not applicable – state why?
14. Building Orientation/Construction?	✔		
15. Noise Barriers/ attenuation proposed?	✔		
16. Equipment Specification?	✔		
17. Noise Management Plan?			N/A - Assessment for installation of mechanical plant
18. Background Noise measurement (General)?	✔		
19. Background Noise (Worse Case)?	✔		
20. LB Camden's Noise Conditions considered under DP28/DP29?	✔		
21. Evaluation/Analysis of measured levels?	✔		
22. Frequency Analysis done?			N/A - Equipment selection assumed to not be tonal
23. Vibration analysis done?		✔	

Other Considerations/comments (please specify)

Signed…… …… Print name..Mark Edwards ……

Company details..Parsons Brinckerhoff ……

Date..27/11/2014 ……

If you have any queries on filling in this form please see further guidance on the planning website, email helen.masterson@camden.gov.uk or ring our Noise duty officer on 0207 974 2163.