ARDENT CONSULTING ENGINEERS

THE DOCTORS LABORATORY LTD

SERVICING AND DELIVERY OPERATIONS

NOISE ASSESSMENT

REPORT REF. NO 2006550-02
PROJECT NO. 2006550
DECEMBER 2020

1 MABLEDON PLACE, LONDON

SERVICING AND DELIVERY OPERATIONS

Ardent Consulting Engineers
3rd Floor
The Hallmark Building
52-56 Leadenhall Street
London
EC3M 5JE
Tel: 02076804088
Enquiries@ardent-ce.co.uk

REPORT REF. 2006550-02
PROJECT NO. 2006550
DECEMBER 2020

CONTENTS Page

APPENDICES

DOCUMENT CONTROL SHEET

REV	ISSUE PURPOSE	AUTHOR	CHECKED	APPROVED	DATE
-	DRAFT	MNR	MNR	DRAFT ONLY	01/12/20
-	FINAL	MNR	MNR	LD	03/12/20

DISTRIBUTION

This report has been prepared for the exclusive use of the client. It should not be reproduced in whole or in part, or relied upon by third parties, without the express written authority of Ardent Consulting Engineers.

1.0 INTRODUCTION

1.1 Ardent Consulting Engineers has been appointed by The Doctors Laboratory Ltd to investigate and assess the noise impact of service and delivery vehicles associated with their premises as 1 Mabledon Place (hereafter referred to as the Lab).

1.2 The assessment was commissioned following issues raised by local residents of the Flaxman Court Building immediately opposite the Lab on Flaxman Terrace and to inform a revised Delivery Servicing Management Plan.

1.3 **Figure 1.1** below shows the lab in the context of the surrounding area.

Figure 1.1: Context of the area

1.4 The following overview of the laboratory's background and activities has been taken from the amended Delivery Servicing and Management Plan, prepared by DWD LLP:

"One Mabledon Place is an office and laboratory occupied, since 2015, by The Doctors Laboratory (TDL) and other group companies which include Health Service Laboratories (HSL). It provides critical testing and diagnostic support to the medical institutions in the locality and in North London such as UCLH, Royal Free Hospital and North Middlesex Hospital. The site comprises an 11-storey tower, located to the south of Euston Road close to Euston and St Pancras stations.

Logistics is a critical step in the pathology value chain as all centralised samples must be transported to the laboratory for testing. Many of the samples have limited stability and often test results are required urgently for critical patient care decisions and thus 24/7 delivery access is essential. The nature of pathology logistics has intensified in line with NHS ambitions for the provision of greater access to testing services.

The building receives patient samples for urgent and non-urgent testing as well as supply deliveries. It will be the responsibility of the site Facilities Management (FM) and Courier Control (CC) teams to co-ordinate and manage deliveries to the building."

1.5 The assessment is in accordance with BS4142:2014 *Methods for rating and assessing industrial and commercial sound* and provides details of the site surveys and subsequent qualitative and quantitative analysis. This assessment should be read in conjunction with The Delivery Servicing and Management Plan, prepared by DWD LLP dated December 2020 (Ref 9020)

2.0 GUIDANCE AND CRITERIA

2.1 In preparing this assessment all relevant guidance and policy was reviewed, including but not limited to the documents outlined below.

BS4142:2014 + A1 2019 Methods for Rating Industrial and Commercial Sound

2.2 BS4142:2014 uses a comparison between the Rating and Background Sound Levels to establish an Initial Estimate of the Likely Significance of Impact. The context of the assessment must then be considered, which can significantly alter the outcome of the assessment. A minor amendment to the standard was released in 2019 as amendment A1. This amendment has been considered within this assessment.

London Environmental Strategy – May 2018

2.3 The London Environmental Strategy[1] was published in May 2018 which provides new approaches to transforming London's environment in terms of air quality, green infrastructure, climate change, waste, noise and a transition to a low carbon economy. Chapter 8 of the Strategy outlines plans to improve amenity by controlling Ambient noise

London Borough of Camden Local Plan 2017

2.4 The LBC Local Plan 2017[2], replaced the Core Strategy and Development Policies documents. Policy A4 covers noise and vibration, referencing Camden's Noise and Vibration Thresholds in Appendix 3 of the plan.

[1] Greater London Authority, 2018. London Environment Strategy. London. GLA.

[2] London Borough of Camden, 2017.

2.5 Policy specific to delivery management is outlined at Paragraphs 6.104 – 6.106 of the Plan.

Camden Planning Guidance [CPG] Amenity –March 2018

2.6 LBC has published a range of 'Camden Planning Guidance' (CPG)[3] documents that supports the policies set out in their Local Plan, confirming how these should be followed in practical terms. CPG Amenity relates to amenity and includes advice on how the impact on noise and vibration can be minimised via design, built fabric and by implementing features such as barriers. The CPG makes reference to Appendix 3 of the Local Plan as Starting point for developing Acoustic reports.

[3] London Borough of Camden, 2018. Camden Planning Guidance Amenity.

3.0 MEASURED NOISE SURVEY AND OBSERVATION

3.1 A manually observed noise survey was undertaken with 2 main objectives:

1.) Determine representative background and residual noise levels for the area as experienced by the close neighbouring residential property (Flaxman Court).

2.) Quantify the noise levels of individual service and delivery events associated with the Lab so that a full range of servicing scenarios can be assessed.

3.2 When selecting the appropriate time and date for the survey, the servicing logs for the Lab were studied to ensure a full range of activities could be captured and quantified to enable a robust assessment. The survey was undertaken on the 23rd October between 1pm and 3pm.

3.3 Due to covid-19 restrictions, it is likely that background noise in the area was lower than normal representative conditions as there are less people commuting to work and limited use of business in the area such as Mable Tavern . This should therefore be considered as a worst-case assessment.

3.4 The survey measurement point was chosen to be representative of noise experienced at the façade of Flaxman Court. So that measurements could be repeatable if needed, the survey was undertaken with the microphone of the sound level meter at a height of 1.5m above a survey marker as shown in **Figures 3.1** and **3.2**.

Figure 2: Photograph Showing Survey Marker EUS4082, above which the sound level meter was setup.

Figure 3.2: Location of Sound Level Meter

3.5 The acoustic environment in the vicinity of the site was largely influenced by road traffic. In addition to mechanical plant noise audible from the lab during

times of low background noise. At several points during the survey. amplified music was clearly audible from the London Contemporary Dance School.

Instrumentation and competence

3.6 The following instruments were used in the measured noise survey

- 1 x Cirrus Research CR:171C Sound Level Meter
- 1 x Cirrus Research CR:515 Calibrator

3.7 Personnel undertaking the survey are members of the Institute of Acoustics and have extensive experience of assessments of this nature. Instrumentation holds valid calibration certificates, which are available on request and the calibration was checked before and after the survey. There was no significant drift in calibration. Calibration certificates are available on request.

Weather Conditions

3.8 Weather conditions were noted during the survey. It is considered that the local weather conditions at the time of the survey were within the limits set out in the guidance and appropriate for measurements to be taken.

Measurements

3.9 A summary of the measurements is shown in **Table 3.1** further summaries of Measurement data is presented in **Appendix A**. Full measurement data in 125ms resolutions is available if required.

Position	Period	dB $L_{Aeq,T}$	dB $L_{A90,T}$
Flaxman Court Facade	13:00 -14:00	64	56-57
	14:00-15:00	62	56

Table 3.1 Measurement summary

Event and data logging

3.10 In addition to the sound level meter continuously measuring at high resoultion a separate tablet and software was used to identify each event associated with servicing the Lab. The sound level meter and the tablet were time sycnronised to the nearest second and all events were timestamped automatically by the software. This enabled arrucate analysis of all types of event associated with servicing the Lab inluding but not limited to: Motorbikes approaching entering the service ramp, motorbikes leaving the site via the service ramp, mortorbikes arriving and parking on Flaxman Terrace, motorbikes starting up on Flaxman Terrace and leaving Flaxman Terrace and noise associted with van deliveries on Flaxman Terrace. Miscellaneous events were also monitored and recorded such as noise from couriers conversing on Flaxman Terrace on their break periods and idling engines.

3.11 Detailed analyis of the survey results and activities log was then undertaken in order to undertake a series of assessments of potential servicing scenarios summarised within this report. A summary of the calculations is included at Appendix B.

Initial Findings

3.12 Once the noise all types of event could be robustly quantified, an initial assessment was undertaken with all Lab associated events including the miscellaneous events. The miscellaneous events included idling engines and loud conversations between couriers during their break periods.

3.13 The initial assessment indicated that with these miscellaneous events included there is potential for a significant noise impact for the residents at Flaxman Court. This conclusion is consistent with the nature of many of the complaints received to date. It is therefore proposed that mitigation will be implemented in order to protect the amenity of neighbouring residents.

4.0 ASSESSMENT

Baseline Data for the BS4142 Assessments:

Background Noise Level:

4.1 The background noise level for use in the assessment of day time hours was determined via statistical analysis of the measured noise data, in accordance with BS4142. The daytime background noise levels for use in the assessment is as follows: 56dB $L_{A90(1hour)}$

Residual Noise Level:

4.2 The residual noise level for use in the assessment of daytime hours was determined via statistical analysis of the measured noise data, in accordance with BS4142. The daytime residual noise levels for use in the assessment is as follows: **62dB** $L_{Aeq(1\ hour)}$

Acoustic Character Correction:

4.3 BS4142 provides specific guidance regarding an Acoustic Character Correction if sound from the operations will contain characteristics that could attract a listener's attention at noise sensitive receptors.

4.4 The operations will consist of vehicular movements accessing the site that will be of identical character to vehicles already traversing on local road networks. However, in order to be robust as attention is likely drawn specifically to service vehicles due to historic issues raised an acoustic character correction of **3dB** is applied to the assessment. This allow for the noise from movements once off the public highway as a worst case.

Correction for "Uncertainty"

4.5 In accordance with BS4142, all reasonable steps have been taken within this assessment to remove uncertainty from measurements, calculations and analysis. When quantifying sound levels of individual noise events, the variation for noise levels between types of motorcycle and type of movement have all been allowed for within statistical analysis. There is however a reasonable range between the highest and lowest sound levels within each type of event and, although fully allowed for within the calculations, there is still a minor degree of calculation uncertainty that should be allowed for. It is therefore proposed that a correction of **3dB** be applied to account for this uncertainty.

Proposed Mitigation

4.6 To ensure that the amenity of neighbouring residents is adequately protected whilst the Lab can be adequately serviced, a number of solutions are to be considered and implemented wherever feasible. This is to include policy implementation for couriers, both those directly employed by the Lab and those contracted which would minimise the non-essential noise on Flaxman Terrace.

4.7 These mitigation measures include:

- Not permitting couriers to take breaks on the street when parked on Flaxman Terrace. If couriers are using the comfort facilities within the building they will be directed to park in suitable public bays and not on the service area in Flaxman Terrace.
- Better utilisation of the full capacity of the ramp by using an automatic capacity and signally system to give motorbike couriers early warning as they approach the ramp.
- Consideration of alternative on street parking locations if the basement is full.
- No idling of vehicles (other than those with necessary refrigeration systems) is to be permitted.

4.8 The above measures once fully considered, would be enforced by building management as part of the Delivery and Servicing Management Plan.

Post Mitigation Assessments

4.9 With the mitigation measures in place the following assessments have been considered:

1.) A typical servicing hour such as one of the surveyed hours

2.) The busiest servicing hour from average daily logs

3.) An indicative assessment of night-time capacity for serving the site.

4.10 A log of recorded service activities is included at **Appendix C.**

Assessment of a typical servicing hour

4.11 A typical servicing hour consists of the following movements:

- 11 Lab motorbikes arriving on Flaxman Terrace and entering the service ramp to the basement.
- 11 Lab motorbikes coming up the ramp and leaving Flaxman Terrace
- 8 Lab motorbikes arriving and parking on Flaxman Terrace to drop off samples.
- 8 Lab motorbikes starting up on Flaxman Terrace and leaving Flaxman Terrace
- 3 Lab vans arriving and parking on Flaxman Terrace to drop off samples
- 3 Lab vans leaving Flaxman Terrace.

4.12 Total noise levels generated by the above events have been calculated and the appropriate acoustic character corrections are applied in accordance with BS4142. They are then compared with the background noise on Flaxman Terrace without the Lab service activities to give an indication of the significance of impact. The results are summarised in **Table 4.1**.

Flaxman Court	**Daytime**
Residual level dBL_{Aeq}	62 dBL_{Aeq}
Background level / $dBL_{A90,T}$	56 $dBL_{A90,T}$
Specific Level / $dBL_{Aeq,T}$	52 $dBL_{Aeq,60min}$
Acoustic Character Correction / dB	3dB
Uncertainty Correction	3dB
Rating Level / $dBL_{Aeq,T}$	58 $dBL_{Aeq,60min}$
Excess over background / dB	2dB
Initial Estimate	Low impact

Table 4.1 – Assessment of a typical servicing hour - likely significance

4.13 In this assessment scenario, an assessment of 2dB over background noise would be experienced which, when considered with the residual sound levels from other activities in the area is an indication of Low Impact.

Assessment of the busiest serving hour

4.14 From the log of typical servicing activities, the following movements would be experienced:

- 20 Lab motorbikes arriving on Flaxman Terrace and entering the service ramp to the basement.
- 20 Lab motorbikes coming up the ramp and leaving Flaxman Terrace
- 20 Lab motorbikes arriving and parking on Flaxman Terrace to drop off samples.
- 20 Lab motorbikes starting up on Flaxman Terrace and leaving Flaxman Terrace
- 4 Lab vans arranging and parking on Flaxman Terrace to drop off samples
- 4 Lab vans leaving Flaxman Terrace.

4.15 Total noise levels generated by the above events have been calculated and the appropriate penalty corrections are applied in accordance with BS4142. They

are then compared with the background noise on Flaxman Terrace without the Lab service activities to give an indication of the significance of the impact. The results are summarised in **Table 4.2**.

Flaxman Court	**Daytime**
Residual level dBL_{Aeq}	62 dBL_{Aeq}
Background level / $dBL_{A90,T}$	56 $dBL_{A90,T}$
Specific Level / $dBL_{Aeq,T}$	55 $dBL_{Aeq,60min}$
Acoustic Character Correction / dB	3dB
Uncertainty Correction	3dB
Rating Level / $dBL_{Aeq,T}$	61 $dBL_{Aeq,60min}$
Excess over background / dB	+5dB
Initial Estimate	Low impact

Table 4.1 –Assessment of the busiest servicing hour - likely significance

4.16 In this assessment scenario, an assessment of 5dB over background noise would be experienced which, when considered with the residual sound levels from other activities In the area is an indication of Low Impact.

4.17 It should be noted that the split of motorbike movements (Basement and On street) does have a degree of flexibility within this assessment outcome. For example, 30 bikes could use the basement with 10 parking on street within the assessment hour for a marginal improvement in noise.

4.18 The strategy for managing deliveries in the busiest time periods is to get as many of the up to 40 bikes per hour as is feasible using the basement as this gives rise to the lowest potential impact.

Assessment of the night time capacity (11pm to 7am)

4.19 There are occasional drop-offs during night time hours. The night time assessment period within BS4142 should be 15mins and not the 1 hour specified for day time assessments.

4.20 The follow up night time noise survey could not be undertaken due to current Covid-19 restrictions. Therefore, in order to determine a robust background noise level to use within this indicative assessment, historic noise surveys undertaken by within the Borough of Camden were used to determine a suitable relationship between day and night time hours. Only surveys covering full 24 hour periods and of 5+ days duration were considered within this analysis. In addition, a noise survey to support a planning application for the Premier Inn on Dukes Road was also considered. An initial estimate of night time background noise level is 51dB $L_{A90(15min)}$

4.21 It was evident from the lower night time background noise levels and the shorter assessment period that the number of movements would be more critical. It is also important that any bikes undertaking drop offs would have the lowest potential for disturbance if they were to exclusively use the basement due to noise maximum noise levels associated with motorcycles starting up. This would have further benefit of reducing the chance for conversing on Flaxman Terrace. The following activities are therefore considered the night time maximum capacity in any 15 min period without causing a significant impact.

- 2 Lab motorbikes arriving on Flaxman Terrace and entering the service ramp to the basement.
- 2 Lab motorbikes coming up the ramp and leaving Flaxman Terrace
- No Lab motorbikes arriving and parking on Flaxman Terrace to drop off samples.
- No Lab motorbikes starting up on Flaxman Terrace and leaving Flaxman Terrace
- 1 Lab vans arranging and parking on Flaxman Terrace to drop off samples
- 1 Lab vans leaving Flaxman Terrace.

4.22 Total noise levels generated by the above events have been calculated and the appropriate acoustic character corrections are applied in accordance with

BS4142. They are then compared with the background noise on Flaxman Terrace without the Lab service activities to give an indication of the significance of the impact. The results of this indicative assessment are summarised in **Table 4.3**.

Flaxman Court	**Daytime**
Residual level dBL_{Aeq}	Unknown
Background level / $dBL_{A90,T}$	51 $dBL_{A90,T}$
Specific Level / $dBL_{Aeq,T}$	49 $dBL_{Aeq,60min}$
Acoustic Character Correction / dB	3dB
Uncertainty Correction	3dB
Rating Level / $dBL_{Aeq,T}$	55 $dBL_{Aeq,60min}$
Excess over background / dB	+4dB
Initial Estimate	Low impact

Table 4.1 – Assessment of worst case night time servicing hour - likely significance (Indicative)

4.23 In this indicative assessment scenario, an assessment of 4dB over background noise would be experienced which, when considered with the likely residual sound levels from other activities in the area is an indication of Low Impact.

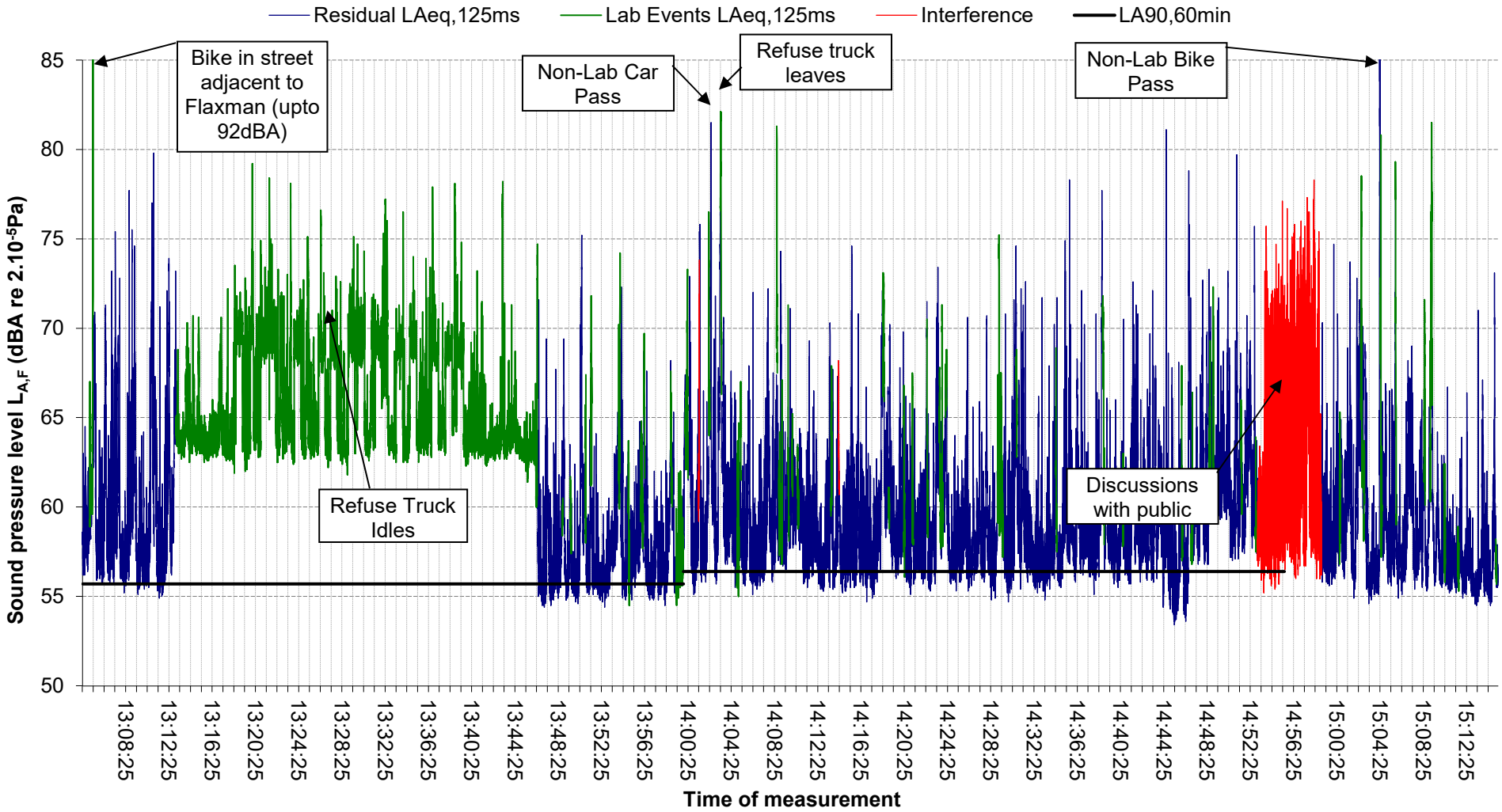
5.0 CONCLUSION

5.1 The Noise assessment has identified that there have been contributions to noise levels from motorcycles parking and remaining on Flaxman Terrace. The couriers have left their engine's idling and have had loud conversations whilst taking a break on Flaxman Terrace. Without these miscellaneous activities, noise associated with the deliveries to the building are acceptable. Mitigation measures therefore should focus on removing such activities as far as possible. The measures specified in this report can be implemented and will dramatically decrease the noise impact on neighbours from motorcycle engines and socialising between riders.

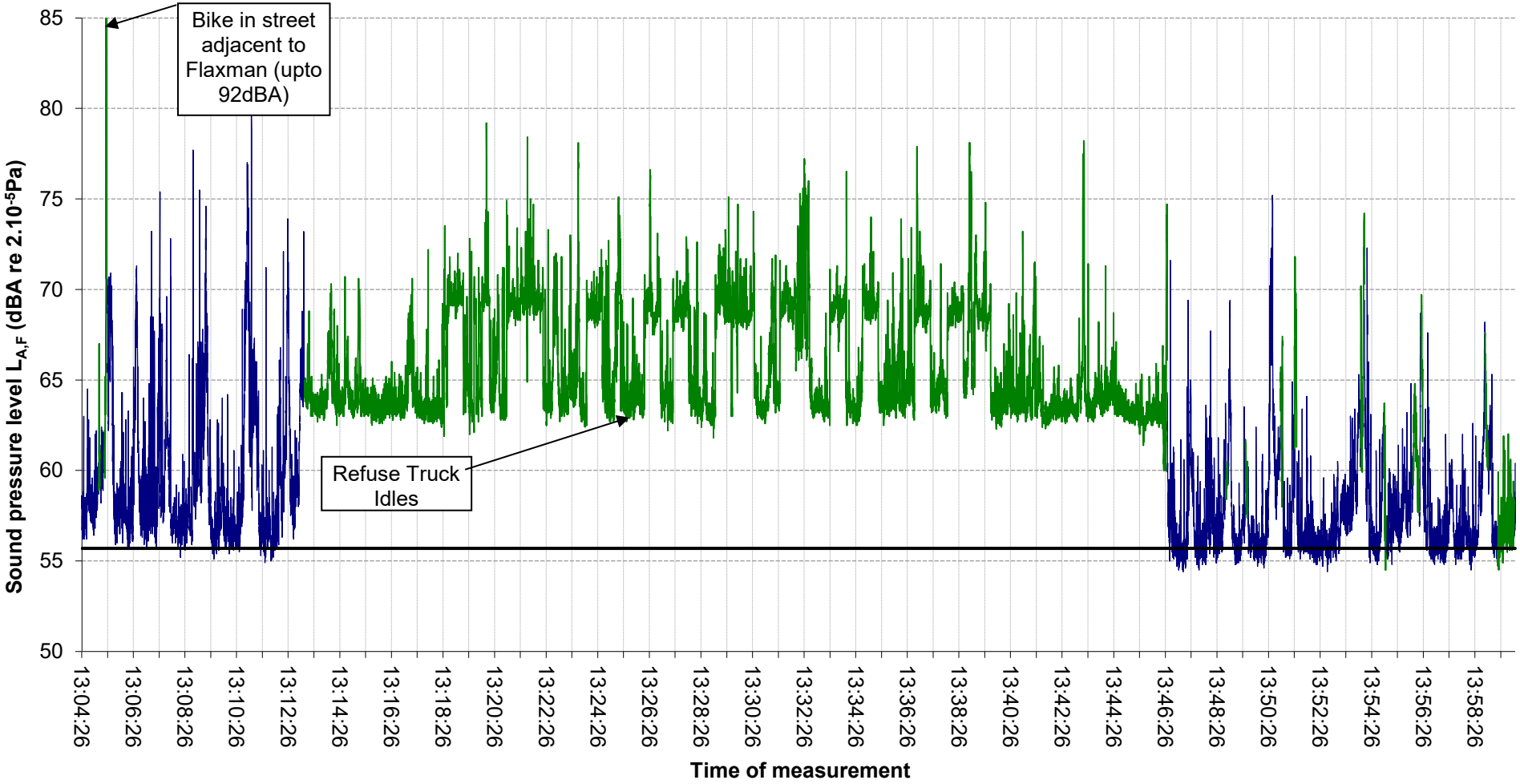
5.2 When these mitigation measures are implemented, a suitable level of servicing, deliveries and drop offs can be maintained with minimal impact noise impact on neighbours.

Appendix A
Measurement Data

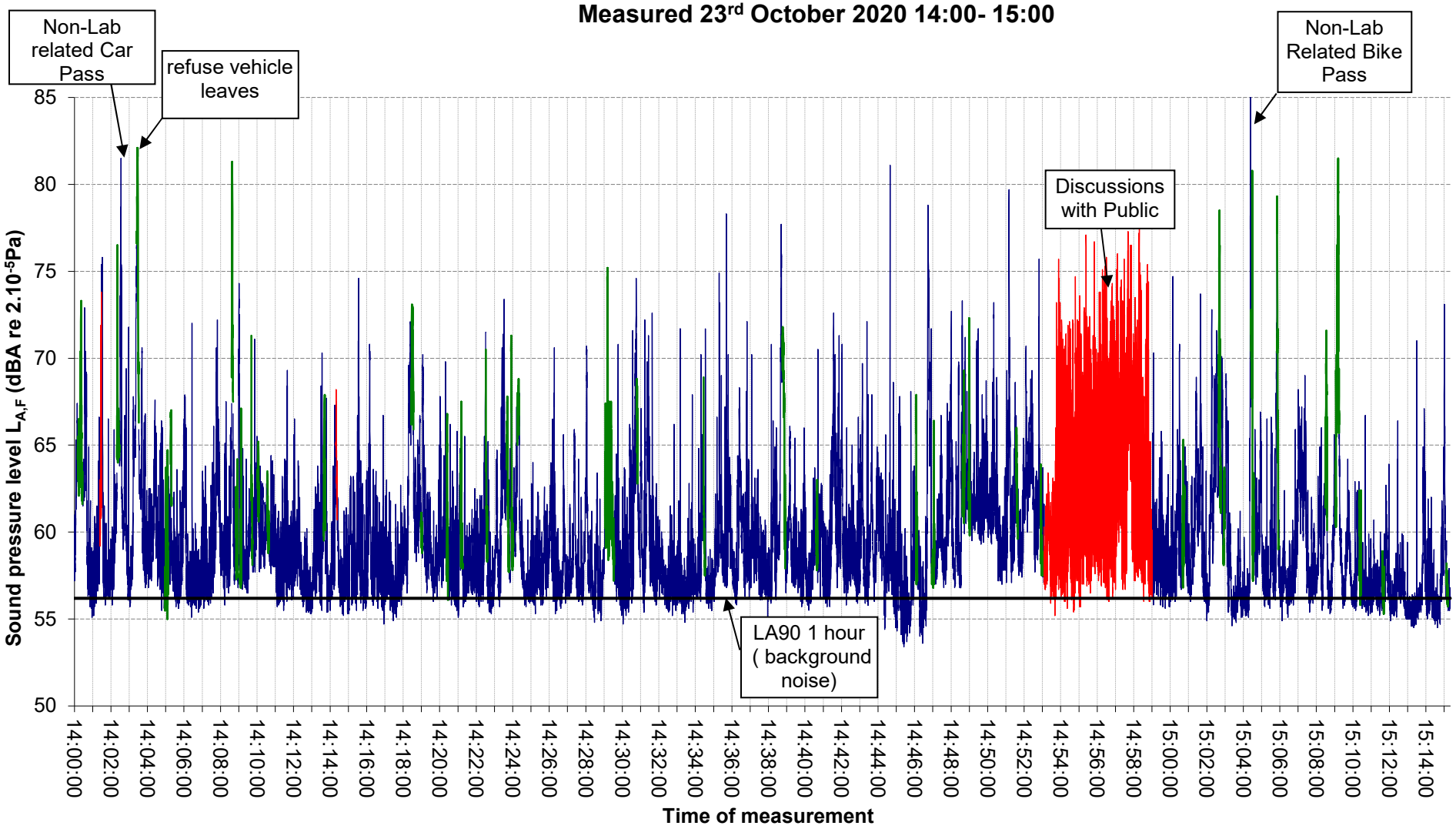
Graph 1 - Existing ambient sound level in At Facade of Flaxman Building
Measured 23rd October 2020



Graph 2 - Existing ambient sound level in At Facade of Flaxman Building
Measured 23rd October 2020 13:00-14:00



Graph 3 - Existing ambient sound level in At Facade of Flaxman Building
Measured 23rd October 2020 14:00- 15:00



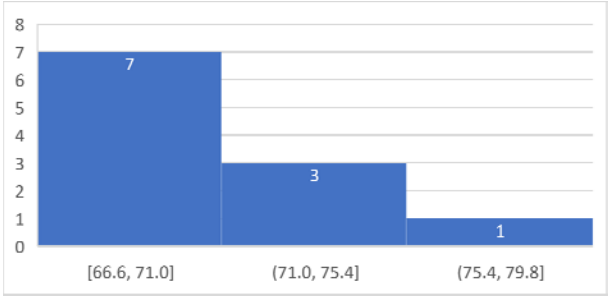
Appendix B
Calculations

Clear Measurement Samples for Analysis (14:00 - 13:00)

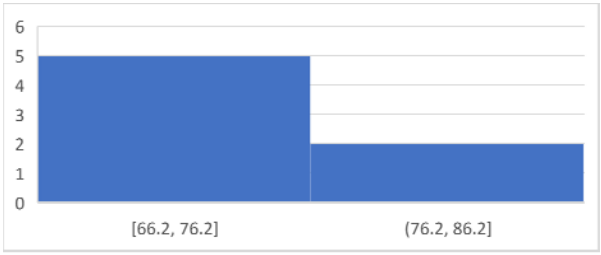
Timestamp	_id	Type	LAEQS (125ms)	Seconds (T)	LAeqT	SEL
14:00:15.87	76	Bike In Ramp	63 62 63 62 62 63 63 63 64 63 63 64 63 64 66 65 64 64 63 63 63 64 65 64 63 64 63 64 64 64 65 67 65 65 65 64 64 66 68 65	5	64.1	71.1
14:00:16.94	77	Bike In Ramp	63 62 63 62 62 63 63 63 64 63 63 64 63 64 66 65 64 64 63 63 63 64 65 64 63 64 63 64 64 64 65 67 65 65 65 64 64 66 68 65	5	64.1	71.1
14:09:04.62	93	Bike In Ramp	58 57 57 57 58 57 60 59 61 60 60 60 59 58 59 60 60 58 57 58 58 60 59 60 60 57 61 67 66 64 62 59 58	4	60.4	66.6
14:09:43.77	94	Bike In Ramp	71 66 64 64 63 63 63 62 62 62 63 63 62 61 61 61 61 62 62 62 61 59 59 59 59 60 59 59 60 58 58	4	62.6	68.5
14:10:04.38	95	Bike In Ramp	64 63 64 64 63 64 64 63 62 62 63 63 63 63 63 61 61 65 64 63 63 62 62 63 61 62 63 62 61	4	62.7	68.3
14:20:23.82	107	Bike In Ramp	59 57 57 58 60 61 62 64 65 65 66 67 64 63 63 62 61 61 61 61 61 62 60 60 61 60 61 60 61 58 59 57 57 56 56	4	61.6	68.0
14:30:47.88	122	Bike In Ramp	67 67 67 68 67 68 68 68 69 68 67 68 68 68 66 65 65 65 65 65 63 63 64 66 65 66 67	4	66.6	72.0
14:34:27.43	124	Bike In Ramp	69 67 64 62 63 62 62 62 62 62 62 62 61 61 61 61 61 60 59 59 59 60 60 60 59 59 59 60 60 59 59 59 59 58 58 58 58	5	61.5	68.2
14:38:46.71	128	Bike In Ramp	69 70 71 71 71 71 72 72 72 70 70 71 71 71 71 71 71 70 71 70 71 71 71 71 71 70 71	3	70.9	76.2
14:46:57.59	138	Bike In Ramp	58 58 58 58 57 58 58 57 58 58 59 58 58 57 58 58 58 59 58 58 57 57 58 58 58 59 58 58 59 58 57 57 57 57 58 58 57 57 58 58 57 58 57 57 58 58 57 58 57 57 57 57 57 58 58 57 58 57 65 66 66 64 61 59 61 59 58 58 58 59 59 59 59	9	58.7	68.0
14:52:54.16	149	Bike In Ramp	58 59 58 59 59 59 58 59 59 59 62 64 62 60 60 61 59 59 59 59 59 60 59 58 59 58 58 59 59 58 58 58 59 60 58 58 58 58 58 58 58 58 58 59 59 58 58 58 58 58 58 58	7	59	67.1
13:05:06.08	12	Bike In Street	59 59 59 60 62 67 66 65 61 61 61 61 60 60 60 59 59 60 60 61 61 61 61	3	61.6	66.2
14:00:11.83	75	Bike In Street	64 64 66 65 64 65 64 64 64 64 64 64 64 64 64 64 64 63 63 64 63 64 63 63 62 63 64 67 64 65 64 64	4	64	70.0
14:02:21.22	80	Bike In Street	67 67 64 65 65 64 74 77 76 75 73 74 69 67 66 67 66 65 66 66 65 64 64 64 65 65 65 65 65 65 65 64 66 67 66 66 65 67 65 65 65 65 65 65 65 65 65 65 65 65 64 64 65 64 65 65 65	8	67.8	76.6
14:08:50.50	92	Bike In Street	60 61 62 60 62 63 61 61 62 60 61 60 58 58 57 58 58 58 58 59 60 62 61 60 60 60 60 60 60 58 59 58 58 58 62 62 61 61 62 64 63 60 59 57 59 58	6	60.3	67.9
14:46:05.96	136	Bike In Street	66 67 68 67 66 64 62 60 58 58 57 57 59 60 62 62 62 62 60 59 58 58 59 58 59 59 59 60 61 59 59 58 57 57 58	4	61.7	68.1
15:02:39.03	158	Bike In Street	65 66 65 68 69 69 69 69 70 70 69 70 71 72 74 76 75 77 77 78 78 79 78 77 76 76 77 75 73 72 70 70 69 68 69 71 70 70 69 69 68 68 66 67 65 64 64 64 63 63 62 61 64 62 61 64 62 61 64	7	72.1	80.8
15:02:53.76	159	Bike In Street	59 59 59 58 58 58 59 58 58 58 58 59 58 59 60 59 59 59 60 60 61 61 62 63 62 63 62 64 63 63 63 63 63 64 64 63 63 61 60 61	5	61	68.0
14:00:20.98	78	Bike Out Ramp	65 67 69 70 70 70 70 69 67 66 66 67 68 70 72 73 72 73 73 71 70 69 68 66 67 67 67 66 65 66 66 64 63 63 64 63 63 64 63 63 63 63 62 63 63 63 62 63 64 63 62	6	67.7	75.7
14:05:16.81	86	Bike Out Ramp	67 67 66 66 65 64 65 66 66 65 66 67 66 67 67 66 67 64 65 62 62 62 62	3	65.4	70.0
14:10:34.17	97	Bike Out Ramp	64 63 63 63 63 63 62 62 62 61 62 62 60 60 60 60 61 60 59 60 59 59 60 60 59 59 60 59 60 61 60 59 60 61 60 59 60 59 59 61 59 59 59 59	6	60.6	68.0
14:18:27.65	104	Bike Out Ramp	67 68 68 68 69 67 67 67 66 67 66 68 67 67 68 66 67 69 72 73 73 73 73 70 71 71 70 71 70 71 70 71 73 72 73 73 73 72 72 73 72 72 73 71 71 72 72 71 71 69 70 69 68 68 68 67 68 68 66	7	70.3	79.0
14:21:09.82	108	Bike Out Ramp	62 65 63 61 60 59 58 58 58 59 64 65 67 68 67 66 67 67 66 64 63 62 61 59 59 59 58 59 59 58 59 59 58 58 58 58 58 59 61 60 59 58 58 58 58 58 58 58	6	62.1	69.9
14:24:15.20	114	Bike Out Ramp	65 66 65 67 68 67 67 67 67 67 67 67 67 68 67 67 67 67 66 66 66 66 66 66 66 68 68 68 67 67 67 68 67 67 68 68 69 67 67 68 67 66 66	6	67	74.4
14:29:04.43	117	Bike Out Ramp	62 61 63 63 63 62 62 65 62 60 67 63 61 62 62 63 61 59 59 59 61 63 63 62 62 62 64 66 63 60 61 61 61 62 62 63 64 63 64 64 65 66 67 66 66 63 61 61 60 60 60 61 61 61 61 61 62 66 70	7	63.1	71.8
14:29:11.28	118	Bike Out Ramp	74 75 74 75 74 74 74 74 69 67 65 64 62 62 62 61 60 60 61 60 60 60 60 60 60 59 58 59 59 59 59 60 59 59 60 59 59 59 59 59 61 62 62 61 62 67 68 66 67 65 64 64 63 63 63 61 61 61 61 61 61 61 61 61 61 60 60 61 61 61 60 60 61 61 61 60 60 60 60 60 60 61 64 62 63 63 62 63 63 62 64 65 65 66 66 67 68 67 65 64 64 64 64 65 65 66 66	13	65.9	77.1
14:29:25.09	119	Bike Out Ramp	62 62 62 63 62 62 62 62 62 62 62 62 63 62 63 60 60 60 60 59 59 60 62 61 60 60 61 59 59 59 59 59 59 59 59 59	5	61	67.7
14:51:34.79	146	Bike Out Ramp	66 64 66 64 65 63 64 63 63 63 62 63 64 63 62 63 64 63 62 64 62 61 61 61 62 61 61 61 61 61 60 60 60 60 61 61 60 60	5	62.5	69.3
15:00:41.57	152	Bike Out Ramp	58 62 59 57 57 57 59 58 60 58 58 61 65 61 59 62 60 59 58 61 58 60 59 60 61 59 60 60 61 61 61 60 61 61 61 61 62 62 62 62 61 63 62 62 63	6	60.6	68.1
14:08:37.53	91	Bike Out Street	69 70 71 71 71 73 75 75 76 77 78 79 81 81 81 79 78 78 77 75 72 71 71 71 72 72 71 70 70 70 69 70 68 69 68 68	5	75.3	81.8
14:13:39.28	98	Bike Out Street	60 61 60 61 62 63 64 65 65 64 64 64 64 65 65 65 67 66 66 66 66 66 67 67 67 68 68 67 66 63 61 64 64 64 63 63 62 63 62 62 62 61 61 61 60	6	64.4	71.9
14:15:09.33	102	Bike Out Street	61 63 60 61 60 59 58 58 58 57 57 57 60 58 57 56 58 58 57 56 56 56 57 58 57 57 58 57 57 58 58 59 58 58 57 59 58 57 57 57	5	58.2	65.3
14:18:59.21	105	Bike Out Street	60 60 61 60 61 60 61 60 60 59 61 60 60 60 60 59 60 60 60 60 60 60 61 60 59 60 61 60 60 59 59	4	60	65.9
14:23:57.58	113	Bike Out Street	70 71 71 70 70 68 68 69 70 68 67 71 68 66 62 62 61 61 61 61 61 61 61 61 60 60 61 60 60 59 59 59 59 60 59 58 59 59 58 59 59 60 59 59 59 58 59 59 61 60 60 60 59 60	7	64.7	73.0
14:48:38.85	142	Bike Out Street	62 61 64 63 63 62 62 62 63 66 63 62 63 62 62 61 62 62 62 62 62 62 62 62 62 62 64 64 65 62 62 62 61 61 61 62 61 63 61 69 65 63 66 66 63 61	6	63	70.6
14:48:58.52	143	Bike Out Street	64 62 62 62 63 61 61 61 61 63 67 69 70 72 66 71 63 65 65 62 62 61 62 60 60 61 60 61 62 62 62 62 62 61 61 61 62	5	64.5	71.2
15:04:31.20	162	Bike Out Street	60 60 59 60 59 57 59 59 57 58 58 58 60 58 59 61 63 63 63 63 63 63 63 63 63 62 62 61 61 61 61 62 61 60 60 60 59	5	60.9	67.6
13:05:19.66	13	Vi Van In	60 60 61 61 61 62 60 61 60 61 62 62 62 62 62 64 63 65 64 65 64 63 63 64 64 66 64 66 68 70 71 71 72 92 82 75 72 71	5	77	83.8
14:29:29.69	120	Vi Van In	59 59 60 59 61 60 59 61 60 59 59 58 58 59 58 58 59 60 58 58 58 58 57 59 58 59 58 59	3	59	64.3
14:40:37.67	131	Vi Van In	59 61 60 60 60 60 59 59 59 59 59 59 60 59 59 58 59 58 62 59 59 59 60 58 60 62 63 60 59 58 59 58 59	4	59.6	65.9
14:22:33.13	109	VL Van Leave	71 70 67 66 65 64 64 64 64 65 64 64 63 62 62 62 61 62 60 60 60 59 60 59 59 59 59 61 59 59 59 59 58 61 60 61 62 59 59	5	63.1	70.0
14:23:40.68	112	VL Van Leave	64 64 64 64 64 65 64 65 65 65 65 66 65 65 66 66 66 66 67 68 67 67 68 67 67 67 67 66 67 65 64 63 63 62 62 60 62 63 62 63 63 61 61 62 62 61 60 60 60 59 58 58 60 58 58 58 58 58 59 58 58 59 59	8	63.9	72.9
14:38:49.44	129	VL Van Leave	70 69 69 69 68 68 69 68 68 68 67 67 68 67 67 68 68 67 68 68 68 67 66 64 61 61 61 61 61 61 61 60 61 60 60 61 61 60 59 63 63 60 59 60 59 58 58	6	65.6	73.3

Statistical Analysis of SEL

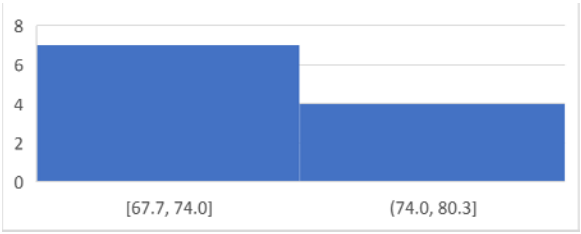
Bike in ramp			
MIN	MAX	Arith Av	Log Av
66.6	76.2	69.5	70.6



Bike in Street			
MIN	MAX	Arith Av	Log Av
66.2	80.8	71.1	74.5

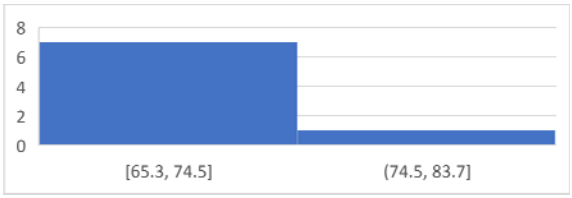


Bike Out Ramp			
MIN	MAX	Arith Av	Log Av
67.7	79.0	71.9	73.7



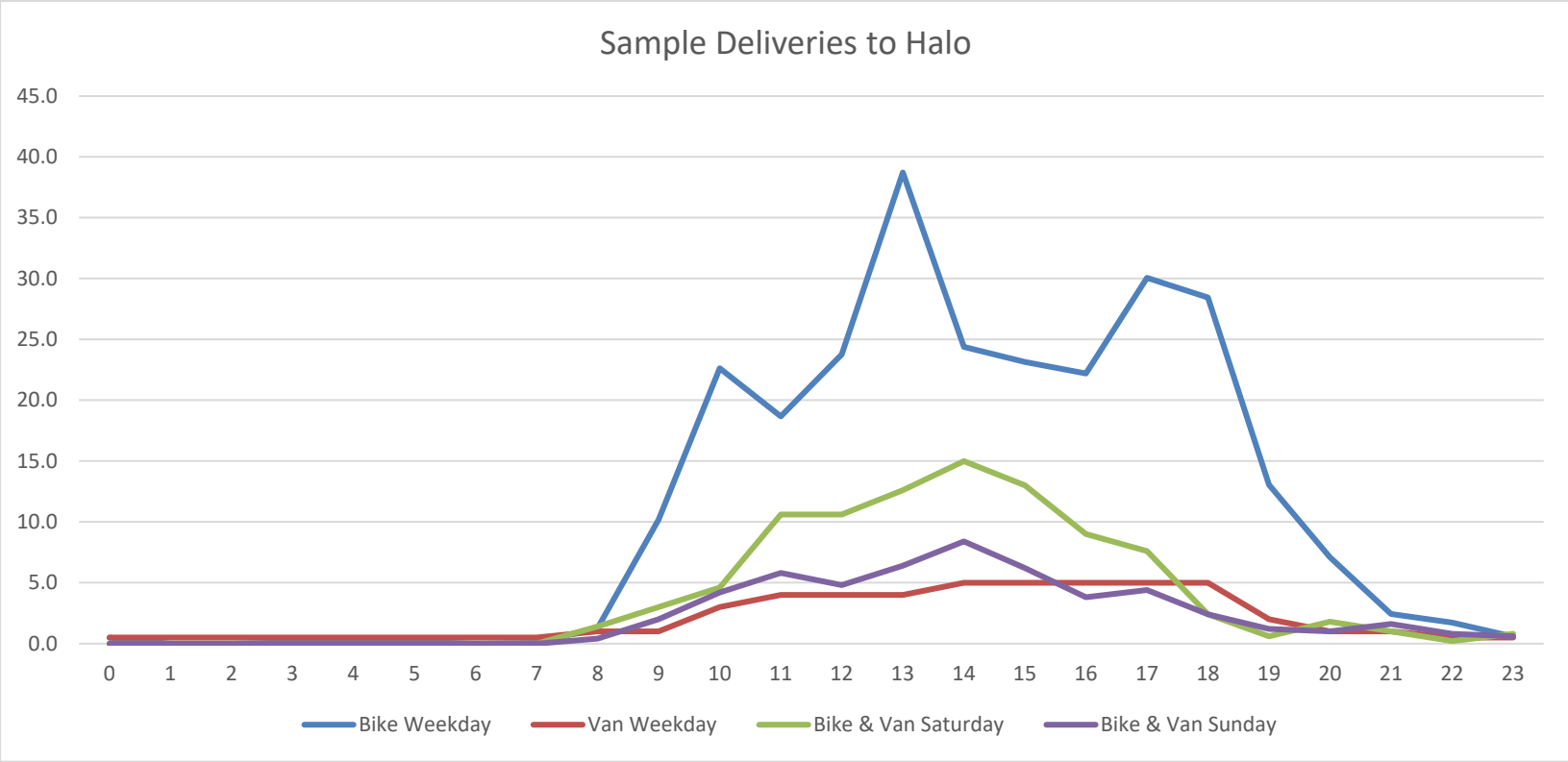
Bike Out Street			
MIN	MAX	Arith Av	Log Av
65.3	81.8	70.9	74.5
Van In			
MIN	MAX	Arith Av	Log Av
64.3	83.8	72.1	77.3
Van out			
MIN	MAX	Arith Av	Log Av
64.3	83.8	72.7	77.3

Typical
65



Appendix C
Activity Log

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Bike Weekday	0.5	0.0	0.0	0.1	0.0	0.1	0.0	0.0	1.3	10.2	22.6	18.7	23.8	38.7	24.4	23.1	22.2	30.0	28.4	13.0	7.1	2.4	1.7	0.6
Van Weekday	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.0	1.0	3.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	5.0	2.0	1.0	1.0	0.5	0.5
Bike & Van Saturday	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	3.0	4.6	10.6	10.6	12.6	15.0	13.0	9.0	7.6	2.4	0.6	1.8	1.0	0.2	0.8
Bike & Van Sunday	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	2.0	4.2	5.8	4.8	6.4	8.4	6.2	3.8	4.4	2.4	1.2	1.0	1.6	0.8	0.6



Appendix D
Acoustic Terminology

ACOUSTIC TERMINOLOGY

The effects of noise on human beings may be expressed in terms of physiological damage and annoyance. It is, however, only the annoyance impacts that need to be considered in detail when addressing environmental noise impacts. Annoyance also includes the immediate effects of activity interference, for example sleep disturbance and speech interference.

The practice has become to measure sound levels in decibels (dB). The decibel scale is logarithmic rather than linear and it is useful to bear in mind that a noise level change of 3dB would be equivalent to doubling the energy level (for example doubling the volume of traffic) and that an increase of 10 dB is perceived, subjectively, as a doubling of loudness. The human ear responds differently to sounds of different frequency. The ear perceives high frequency sound of a given sound pressure level more loudly than a low frequency sound at the same level. The A-weighted sound level, dB(A), takes this response into consideration and is commonly used for measurement of environmental noise in UK. It thus indicates the subjective human response to sound.

Environmental noise levels vary continuously from second to second, it is clearly impractical to specify the sound level continuously and thus time averaging is required. In practice human response has been related to various units which include allowance for the fluctuating nature of sound with time. For the purpose of this report these include:

LAeq,T : the equivalent A-weighted continuous sound level.

This unit relates to the equivalent level of continuous sound for a specific time period T, for example 16 hours for daytime noise. It contains all the sound energy of the varying sound levels over the same time period and expresses it as a continuous sound level over that period. The unit is used for assessing traffic and industrial noise for planning purposes and in particular for PPG24.

LA10,T : the A-weighted level of sound exceeded for 10% of the time period T.

This unit is used for traffic noise measurement and is the preferred unit for prediction of traffic noise in the publication, 'Calculation of Road Traffic Noise'.

LA90,T : the A-weighted level of sound exceeded for 90% of the time period T.

This unit is commonly used to represent the background noise and is used in assessing the effects of industrial noise in UK.

LAmax : the maximum A-weighted level of sound over a period of measurement.

LAr,T : the rating level.

The specific Noise plus any adjustments for the characteristic features of the noise. Used for comparison between background levels with the noise source off.

SEL : the Sound Exposure Level.

Sound exposure level abbreviated as SEL and LAE, is the total noise energy produced from a single noise event condensed into a 1 second time period.

Rw : weighted sound reduction index.

A laboratory-measured value as defined in ISO717 Part 1.

DnTw :

The equivalent of Rw, but measured onsite as oppose to in a laboratory