CITY OF VINCENT

NOISE MANAGEMENT PLAN

ESSENTIAL SERVICES

Reference: 22027140-01d Noise Management Plan

Report: 22027140-01d Noise Management Plan

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CONTENTS

1. INTRODUCTION

The City of Vincent requested Lloyd George Acoustics to prepare a Noise Management Plan (NMP) for its Infrastructure Maintenance and Waste Services department, to minimise noise impact to sensitive receivers from out-of-hours essential services carried out by the City of Vincent within its boundaries. Refer Appendix A for the map showing the location of the works.

Such essential services include:

- residential waste collections
- road, public places and footpath cleaning

The NMP herewith has been prepared to satisfy regulation 14A of the Environmental Protection (Noise) Regulations 1997 (the Regulations) with guidance taken from the Department of Environment Regulation Draft Guideline DER2014/001628.

The NMP will be reviewed periodically to ensure best practice noise management techniques are continuing to be used.

Appendix D contains a description of some of the terminology used throughout this Noise Management Plan.

2. LEGISLATION

Environmental noise in Western Australia is governed by the Environmental Protection Act 1986, through the Environmental Protection (Noise) Regulations 1997 (the Noise Regulations).

Regulation 14A provides requirements for essential services and include the collection of waste, or the cleaning of roads, public places and foot paths. Such activities are defined as class 1 or class 2 works depending on the time of the day they are carried out, as follows:

"**Class 1 works** means specified works carried out between –

(a) 0700 hours and 1900 hours on any day that is not a Sunday or a public holiday

(b) 0900 hours and 1900 hours on a Sunday or public holiday

Class 2 works means specified works carried out otherwise than between the hours specified in the definition of class 1 works paragraphs (a) and (b);"

Class 1 works are exempt from having to comply with the Noise Regulations provided that, according to regulation 14A(2), the works are carried out in the quietest reasonable and practicable manner, and the equipment used is the quietest reasonably available.

Class 2 works can be exempt from having to comply with regulation 7, as prescribed in regulation 14A(3) as follows:

(3) Regulation 7 does not apply to noise emitted in the course of carrying out class 2 works if the works are carried out in accordance with a noise management plan, excluding any ancillary measure, for class 2 works approved in writing by the CEO

The requirements for a noise management plan for class 2 works are defined in regulation 14A(6) as follows:

(6) A noise management plan for class 2 works is to include, but is not limited to —

- **(a)** details of vehicle or equipment evaluation and purchase policies adopted to select, on a reasonable and practicable basis, the quietest vehicle or equipment available
- **(b)** measures to be adopted to minimise noise emissions resulting from carrying out the works;
- **(c)** justification for carrying out the works during the times of day to which the class relates
- **(d)** a description of the specified works to be carried out during the times of day to which the class relates
- **(e)** operator training programmes
- **(f)** community information on the manner in which the specified works will be carried out
- **(g)** a complaints response procedure

In addition, it is noted that regulation (11) prescribes that a noise management plan expires after a maximum of three years from the day on which it is approved by the CEO.

Finally, it must be noted that some type of noise emissions are exempt from compliance, and these are listed in regulation 3. Of particular significance to this NMP are the noise emissions from the propulsion and braking systems of motor vehicles operating on a road are exempt – refer to regulation 3(1)(a).

3. EQUIPMENT DETAILS

The measurements were carried out at the City of Vincent's depot in Osborne Park on 7 April 2022. The sound level meter used was Norsonic Type 132 (S/N:1322896);

- the equipment holds current laboratory certificates of calibration that is available upon request. The equipment was also field calibrated before and after and found to be within +/- 0.5 dB
- the microphone was fitted with a standard wind screen
- the microphone was at least 1.2 metres above ground level and at least 3.0 metres from reflecting facades (other than the ground plane)

3.1 Waste Collection

The equipment used for out-of-hours waste collection consists of waste trucks. Two of the mobile waste collection plant tested were rear loaders, with a third being a side loader.

Typical equipment types and noise levels are presented in Table 3.1. The complete measurement results are also shown in Appendix B with photos of tested plant in Appendix C.

Table 3.1 Typical Waste Collection Plant Noise Levels

Plant Description	Operational Mode	Registration Number	LAeq,1min Noise Levels Average of All Sides
Isuzu FVR 165 300 Rear Loader	Idle	1 GDT 043	64 @ 7 m
	Compacting		74 @ 7m
	Tipping		73 @ 7m
Isuzu FSR 850 Rear Loader	Idle	1EKS 994	63 @ 7 m
	Compacting		76 @ 7m
	Tipping		75 @ 7m
Volvo FE 320 Side Loader	Lifting and compacting	1 GES 938	71 @ 7 m
	Simulation of reversing, driving forward and tipping six times		70 – 86 @ 5 – 7m (moving)

The highest noise levels recorded were:

- 76 dB LAeq,1min at 7 metres from the rear loader Isuzu FSR 850 during compaction
- 86 dB LAeq,1min at 5 to 7 metres from the Volvo FE 320 side loader during simulated reversing, driving and tipping

It is understood that waste collection drivers are instructed not to reverse wherever practicable, but rather to carry on forward to the next possible turning point. The LAeq noise emissions from the waste trucks were observed to be dominated by the hydraulic power unit for the lifting mechanism and compactor, since the truck remains at idle during the loading and compaction cycle. However, maximum noise levels will depend on the type of waste in the bins and, to some degree, how the bins are handled during the loading and unloading cycle. The above measurements show that the LAeq noise levels are similar for both types of truck.

Background noise levels during the noise measurements were in the range of LAeq 50 to 55 dB and didn't influence the plant noise measurement results.

3.2 Cleaning Plant

The cleaning plant includes a variety of plant, from a truck mounted road sweeper, to small hand-held leaf blowers.

Typical equipment types and noise levels are presented in Table 3.2. The complete measurement results are also shown in Appendix B.

Table 3.2 Typical Waste Collection Plant Noise Levels

Plant Description	Operational Mode	Registration Number	LAeq,1min Noise Levels Average of All Sides
Hino 500 1628 Road Sweeper	Idle	1 EBC 003	64 at 7 m
	Hi Rev		69 at 7m
	Auxilarly engine on, brush and vacuum units both sides on		82 at 7m
Hyundai iLoad Van with Integrated Petrol Driven Pump and Power Washer	Idle	1 EYK 726	70 at 7m
	Power washer being operated at maximum PSI, pointing down from standing position		72 at 7m
GSV 190 Petrol Drive Push Vacuum	Idle, pointing down from standing position	MPW 20	78 at 3 m
	Maximum throttle, pointing down from standing position		85 at 3 m
STIHL BGA 200 Battery Drive Handheld Blower	Idle, pointing down from standing position	MPW 19	70 at 3 m
	Maximum throttle, pointing down from standing position		73 at 3 m
STIHL BR 700 Petrol Drive Backpack Blower	Idle, pointing down from standing position	MPW 12	77 at 3 m
	Maximum throttle, pointing down from standing position		92 at 3 m

From the measurements above it can be noted that the STIHL BR 700 blower on full throttle is 19 dB higher than the battery driven alternative BGA 200 model, which may be considered four times louder in terms of perceived response to sound. It is also noted from the detailed noise assessment results in Appendix B that the noise emissions vary for each position measured around the plant. Such directional properties can be used to minimise the noise impact to nearby sensitive receivers by orienting the noisiest side of the plant or equipment away from the receiver(s).

4. JUSTIFICATION FOR OUT-OF-HOURS WORK

The areas where waste collection and cleaning services are being carried out experience a significant increase in vehicular traffic volumes from 7am onwards. This is shown in Table 4.1, which summarises the traffic increase from 6 – 7am.

Table 4.1 Average Traffic Volumes

Average traffic volumes per hour (*)				
Road / Street Name	**Traffic Counter Detail (TrafficMap.com.au)**	**Traffic volumes at 6.00am**	**Traffic volumes at 7.00am**	**Traffic volume % increase**
Angove Street	East of Charles Street	203	473	133%
Beaufort Street	North of Bulwer Street	500	823	65%
Bulwer Steet	West of Beaufort Street	289	545	89%
Charles Street	South of Elizabeth Street	1104	1,734	57%
Fitzgerald Street	North of Raglan Road	1158	1723	49%
Fitzgerald Street	South of Vincent Street	809	1,423	76%
Scarborough Beach Road	West of Oxford Street	496	1118	25%
Vincent Street	East of Charles Street	1012	1,363	35%

(*) Data obtained by LGA from Main Roads Traffic Map Website Hourly Data

In addition, a number of businesses commence trading before 7am, including numerous cafes and restaurants with outdoor dining areas. The increase in pedestrian and vehicle traffic makes waste collection, road and pavement cleaning during the day impracticable and more dangerous, potentially hampering the flow of traffic causing significant delays, inconvenience and frustration for other road users. Also, parked vehicles including private contractors and delivery vans and trucks are often found to block access to bins, sections of roads and pavement, and this problem becomes more significant after 7am as more vehicles descend onto the area. The increase in pedestrian and vehicular traffic makes waste collection and pavement cleaning during daytime impracticable and more dangerous, and potentially hampering the flow of traffic causing significant delays, inconvenience and frustration for other road/path users.

As such, conducting the works out-of-hours would improve access to waste collections points resulting in

- shorter waste collection cycles and therefore noise exposure
- improve manual handling for City's personnel, therefore minimising risk of injury
- significantly reduce the number of pedestrian and vehicle interactions therefore promoting safety to the public and the City's workforce
- improve access on main roads i.e. no obstructing traffic

Waste collection and street cleaning services are structured to times that best suit the activity in individual areas, whilst minimising the impact on stakeholders, however a level of disruption is unavoidable.

5. WORKS DESCRIPTION AND CONTROLS

5.1 Waste Collection - (Internal and Contracted Collection Services)

The collection of waste is mostly kerb side collection and nearby sensitive receivers may therefore be impacted. Bins are wheeled to the rear or side of the truck and emptied. Compaction of waste generally occurs immediately to ensure the truck is ready for the next waste collection.

It is noted that the Volvo truck that carried out the simulated reversing was fitted with a standard tonal alarm. It is recommended that all trucks and other mobile plant are fitted with smart broadband reversing alarms i.e. the noise level of the alarm depends on background noise level and/or proximity to obstacle at rear of vehicle.

To minimise the impact from domestic rubbish collection at noise-sensitive receivers the following will be implemented:

- all new plant to be fitted with smart broadband reversing alarms i.e. the noise level of the alarm depends on background noise level and/or proximity to obstacle at rear of vehicle
- collections will need to take place on public holidays when the assigned noise levels are more sensitive. Staff will be educated to be aware of this and take special care to ensure that their tasks are carried out in the quietest possible method

5.2 Cleaning of Roads, Footpaths and Public Places

Roads, footpaths and public places are cleaned following a specific schedule and use a variety of equipment including road sweeper and manual blowers.

Road sweepers generally travel uninterrupted along their designated route to the next scheduled section. Footpath and road cleaning occurs daily, noting that some areas require extra cleaning due to deciduous trees or shrubs in those areas.

For large public places (e.g. Hyde Park area, NIB Stadium area, Britannia Reserve etc.) cleaning may require the use of several different plant at once in the area to maximise cleaning efficiency and minimise cleaning time.

To minimise the impact from the cleaning of roads, footpaths and public places at noise-sensitive receivers, wherever possible the following will be implemented:

- only the STIHL BGA 200 hand-held blower will be used near sensitive receivers at prior to 7am, as it is the blower with the lowest noise levels
- the City of Vincent will adopt a buy quiet policy for future equipment, with the intention to phase out petrol driven plant with quieter battery equivalent options, as cost effective versions become available
- cleaning activities are scheduled to minimise night-time works (excepting scheduled public events, annual precinct cleans as defined in Section 5.3 or unforeseen circumstances/ emergencies)
- all new plant to be fitted with smart broadband reversing alarms
- at night-time (prior to 7am), road sweepers will be operated in low vacuum mode if available
- cleaning activities scheduled on a Sunday will be alternated so as to provide at least one respite sunday in every four weeks
- areas where regular cleaning activities are required will be alternated so as to avoid activities occurring at a similar time on every occasion
- graffiti works will not be carried out in noise sensitive areas before 7am or 9am on Sundays/ public holidays

5.3 High Pressure Cleaning Overnight Works Between 10pm – 6am Monday to Saturday or on Sundays/Public Holidays

In addition to the above Street Cleaning operations, the City outsources high pressure pavement cleaning works in each of its main precincts, to improve amenity (as detailed below):

- these deep cleans are currently undertaken annually at each location and over one or two night shifts between the hours of 10pm to 6am
- residents in adjacent residential properties are notified of the impending works one to two weeks prior (by direct mail)
- contractors to the City of Vincent are required to provide all necessary supplementary documentation (i.e. NMP and schedule of works for approval prior to works commencing)

6. OPERATORS TRAINING

6.1 Waste Collection (Internal and Contracted Collection Services)

Operator training with regard to this plan is required for all operators of waste collection vehicles before commencing specified works under this plan. Operators will be trained accordingly to embrace Noise Minimisation Measures.

All new employees will undertake Driver Assessments to ensure they display defensive driving techniques in noise-minimising braking, accelerating and bin emptying techniques.

The relevant training is an induction on plant and includes:

- vehicle induction
- adequate licence for type of vehicle
- vehicle inspections and weekly checks
- safe operating procedures
- pre and post run vehicle inspections (to identify defective components contributing to potential excessive noise)
- defensive driving techniques (smooth braking and accelerating techniques)
- bin servicing techniques (as per safe operating procedures)
- waste collection routes
- noise minimisation measures will be communicated at toolbox meetings and documented on notice boards to constantly remind operators of their obligations whilst conducting collections during prescribed times

In relation to noise minimisation, further training will be provided by the City/contractor with a focus on noise mitigation and include as a minimum:

- identification of areas suitable to be compaction zones
- waste collection routes to minimise noise impacts
- reducing accelerating and braking noise
- engaging with residents and responding to complaints

6.2 Cleaning of Roads, Footpaths and Public Places

Operator training with regard to this plan is required for all operators of street cleaning vehicles before commencing specified works under this plan. The relevant training is a verification of competency Heavy Rigid Sanitation Vehicle with vehicle specific OEM (Original Equipment Manufacturer) training/certification.

In relation to noise minimisation, the City of Vincent will implement additional training which will focus on noise mitigation and include as a minimum:

- engaging with residents and responding to complaints
- plan various modes of operation and impact on noise emissions
- street cleaning routes to minimise noise impacts where practicable
- all operators are required to undergo annual refresher training
- inspecting equipment for excessive noise

7. PURCHASING FUTURE PLANT

When purchasing new plant, the City of Vincent's tender documentation specifies maximum acceptable levels of noise emissions. Noise emission data is obtained from suppliers, who provide a tender submission. Noise emission data is reviewed as part of the tender evaluation process, to ensure the plant with the lowest practicable noise levels is selected. When purchasing plant, the City also considers the Safe Work Australia - Managing Noise and Preventing Hearing Loss at Work - Code of Practice (July 2020). Based on the measurements, a sound power level of LwA 99-111 dB is estimated for the waste collection trucks, LwA 107 dB for the road sweeper, LwA 110 dB for the hand held petrol run plant and LwA 91 dB for the hand held battery run plant during simulated operation.

8. COMMUNITY INFORMATION

Community information regarding the works carried out under this plan will be accessible on the City's website, or via direct letter drop to affected residents of specified scheduled work. The information provided will include:

- where the Noise Management Plan (NMP) can be accessed
- a schedule of the works
- a brief description of the works
- how to lodge comments or complaints about the works
- the duration of the current NMP approval, the date of the next review and how to make a submission

9. COMPLAINTS RESPONSE

All noise complaints regarding out-of-hours essential services (i.e. class 2 works) within the City of Vincent boundaries carried out under this plan will be recorded and investigated by the waste service or delegate.

The relevant complaint response person is trained/experienced in the principles of excellent customer service. The complaint will be recorded and managed in accordance with the City's Customer Service Charter. Within 48 hours of a complaint, the City's Environmental Health Department will also be notified of the complaint.

APPENDIX A

City of Vincent Work Areas

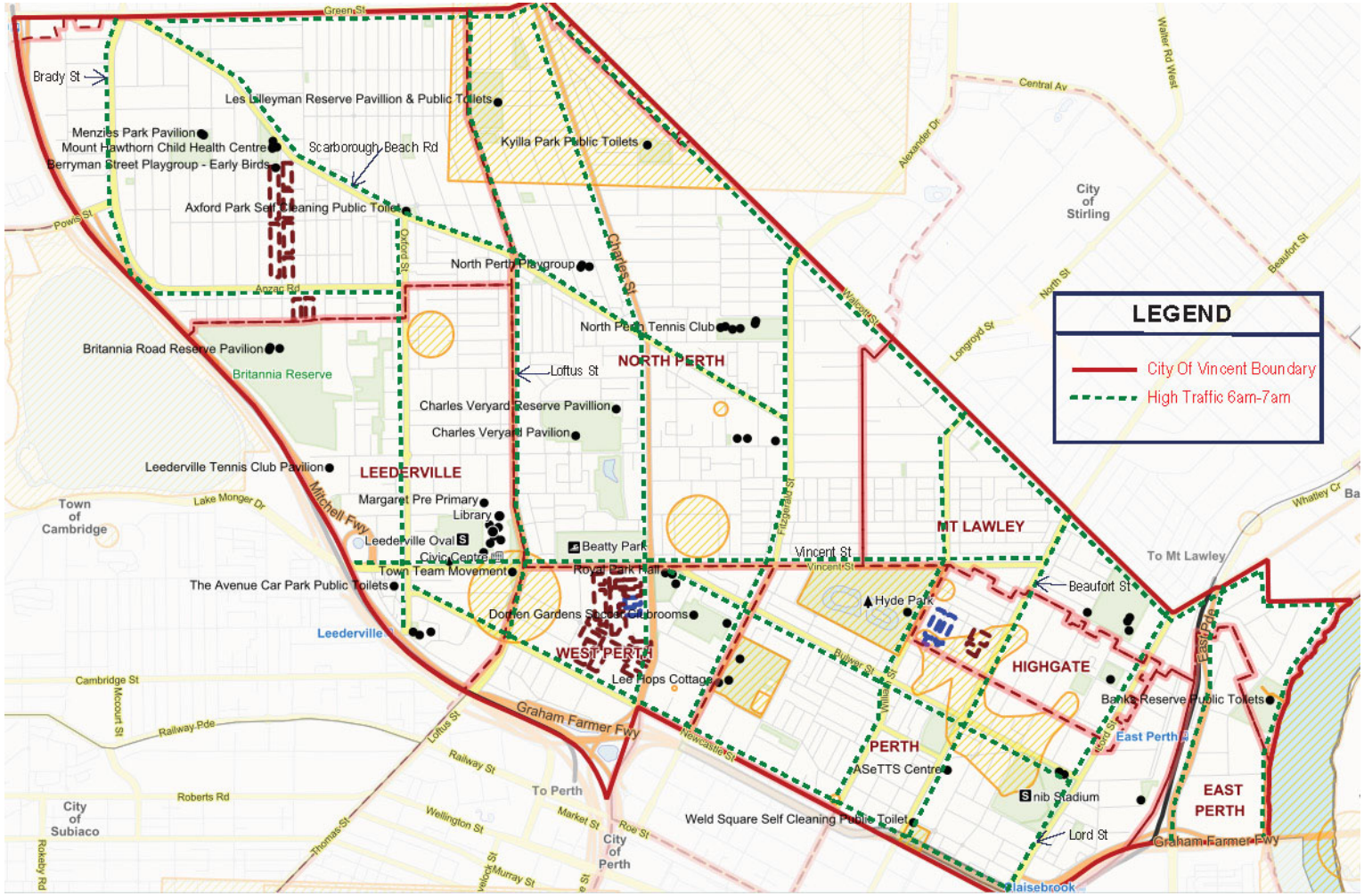

Figure A-1 City of Vincent Works Area

APPENDIX B

Equipment Noise Levels

Plant	ONE-THIRD OCTAVE BAND CENTRE FREQUENCY (H_Z)																				Overall dB(A)
	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	
Road Sweeper - Hino 500 Euro 5 1628 (registration 1EBC003) at 7 metres – at idle																						
Front Left, $L_{Aeq,1min}$	67.2	68.1	66.8	62.6	60.3	55.2	54.1	54.1	55.5	57.0	58.3	57.5	58.5	58.6	55.9	55.6	52.5	50.3	48.5	48.2	45.0	66.0
Front Right, $L_{Aeq,1min}$	73.5	68.6	68.1	61.6	61.6	58.7	58.5	56.9	58.1	57.0	55.8	56.2	56.4	57.7	55.9	56.6	53.6	51.3	49.3	48.7	45.0	65.7
Rear Right, $L_{Aeq,1min}$	70.6	66.1	65.6	60.6	60.8	56.1	53.5	53.0	53.7	53.1	53.0	54.2	54.5	54.8	51.8	49.7	48.1	45.2	44.2	42.7	40.3	62.0
Rear Left, $L_{Aeq,1min}$	65.1	62.9	64.7	68.0	59.3	54.7	52.8	50.5	53.3	52.6	52.3	52.8	53.8	54.0	50.8	49.0	47.5	44.1	42.9	41.7	39.2	61.3
Average, $L_{Aeq,1min}$	**70.2**	**66.9**	**66.5**	**64.3**	**60.6**	**56.5**	**55.4**	**54.2**	**55.6**	**55.4**	**55.5**	**55.5**	**56.2**	**56.7**	**54.2**	**53.9**	**51.2**	**48.8**	**47.0**	**46.4**	**43.1**	**64.2**
Road Sweeper - Hino 500 Euro 5 1628 (registration 1EBC003) at 7 metres – at hi revs.																						
Front Left, $L_{Aeq,1min}$	69.9	68.7	70.3	63.8	65.5	64.5	61.4	62.4	63.9	66.6	65.8	61.7	61.2	60.6	59.4	57.9	55.2	52.4	50.2	49.2	46.4	70.2
Front Right, $L_{Aeq,1min}$	71.8	71.6	65.5	62.3	61.9	59.8	63.8	62.9	61.7	65.1	62.3	59.9	59.4	59.4	57.5	56.9	54.1	51.0	48.8	48.0	44.9	68.5
Rear Right, $L_{Aeq,1min}$	70.8	71.0	65.4	64.3	65.4	63.2	63.6	63.1	64.2	63.5	60.7	60.0	57.9	57.3	57.8	56.6	53.6	48.7	46.4	44.4	41.8	67.8
Rear Left, $L_{Aeq,1min}$	67.4	69.8	71.9	64.8	65.7	66.0	63.6	62.8	64.6	65.7	65.5	61.4	59.6	58.5	59.3	57.8	53.7	50.1	48.1	46.4	44.2	69.6
Average, $L_{Aeq,1min}$	**70.3**	**70.4**	**69.2**	**63.9**	**64.9**	**63.9**	**63.2**	**62.8**	**63.7**	**65.4**	**64.1**	**60.8**	**59.7**	**59.1**	**58.6**	**57.3**	**54.2**	**50.8**	**48.6**	**47.4**	**44.6**	**69.1**

Plant	ONE-THIRD OCTAVE BAND CENTRE FREQUENCY (H_Z)																				Overall dB(A)
	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	
Road Sweeper - Hino 500 Euro 5 1628 (registration 1EBC003) at 7 metres – Auxiliary on, sweeper brushes and vacuums operating																						
Front Left, $L_{Aeq,1min}$	80.9	79.4	76.3	70.1	72.4	75.1	71.8	75.9	80.5	81.1	77.3	73.8	75.4	72.5	72.0	72.1	72.5	71.1	69.8	68.4	66.9	84.5
Front Right, $L_{Aeq,1min}$	85.4	78.0	73.5	70.9	68.9	71.6	78.9	77.3	80.5	82.1	72.8	72.3	71.5	69.5	67.9	68.4	67.8	66.1	65.7	65.7	64.5	82.8
Mid Right, $L_{Aeq,1min}$	87.7	76.8	76.2	73.2	73.3	77.6	77.5	76.7	74.2	75.6	73.9	74.6	74.0	69.4	68.3	70.7	69.0	69.1	69.1	69.8	69.6	83.1
Rear Right, $L_{Aeq,1min}$	85.9	75.8	73.5	74.3	72.0	75.4	75.4	76.7	82.3	82.5	73.4	72.6	71.8	69.3	68.2	68.9	69.5	68.2	67.2	66.7	65.4	83.6
Rear Left, $L_{Aeq,1min}$	82.5	77.3	74.8	74.3	72.2	75.1	74.2	76.7	82.8	83.0	74.1	73.6	71.9	67.2	66.1	67.0	65.7	65.8	66.0	66.2	65.2	83.3
Mid Left, $L_{Aeq,1min}$	76.1	78.2	78.0	74..2	71.9	79.6	83.7	77.6	83.1	82.6	77.0	76.0	74.8	70.5	69.3	72.4	72.3	71.8	69.6	70.1	69.6	85.7
Average, $L_{Aeq,1min}$	**84.4**	**77.7**	**75.7**	**73.1**	**72.0**	**76.4**	**78.7**	**76.8**	**81.3**	**81.7**	**75.1**	**74.0**	**73.5**	**70.0**	**69.0**	**70.4**	**70.1**	**69.3**	**68.2**	**68.2**	**67.4**	**84.0**

Plant	ONE-THIRD OCTAVE BAND CENTRE FREQUENCY (H_Z)																				Overall dB(A)
	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	
Petrol Powered GSV 190 Overhead Cam Vacuum (#MPW 20) at 3 metres – at idle																					
Front Left, $L_{Aeq,1min}$	59.1	59.8	58.1	58.4	55.7	54.1	54.3	46.9	48.3	51.7	51.7	52.3	53.8	52.3	68.4	59.3	55.5	56.7	54.7	51.4	53.5	70.7
Front Right, $L_{Aeq,1min}$	59.2	63.1	61.7	58.2	54.3	54.6	52.3	48.8	54.5	59.1	54.9	53.7	53.1	52.9	68.3	58.4	52.3	54.9	51.2	49.4	50.7	70.3
Rear Right, $L_{Aeq,1min}$	58.1	63.0	64.3	55.5	54.8	56.6	54.6	52.4	54.6	58.8	54.9	52.2	51.9	50.8	59.8	53.2	47.7	53.4	47.9	46.0	46.8	64.6
Rear Left, $L_{Aeq,1min}$	58.4	60.6	59.4	54.9	54.6	53.4	53.0	48.8	48.6	51.9	52.0	51.7	51.4	50.9	69.3	59.3	55.4	57.8	54.8	52.3	53.0	71.3
Average, $L_{Aeq,1min}$	**71.4**	**73.6**	**78.6**	**76.6**	**77.6**	**81.0**	**73.5**	**66.4**	**78.6**	**74.3**	**70.6**	**62.7**	**62.9**	**61.0**	**63.1**	**63.2**	**61.5**	**61.7**	**62.9**	**61.3**	**62.3**	**78.1**
Petrol Powered GSV 190 Overhead Cam Vacuum (#MPW 20) at 3 metres – Full throttle																					
Front Left, $L_{Aeq,1min}$	76.8	70.7	79.9	73.8	76.3	79.7	75.4	77.4	75.3	80.2	89.2	72.7	75.4	68.2	71.4	67.8	67.2	65.2	65.3	63.2	64.6	87.2
Front Right, $L_{Aeq,1min}$	76.5	67.6	70.0	73.6	76.2	78.4	78.3	90.1	74.8	76.1	80.1	71.8	75.2	67.9	67.8	67.3	67.2	63.5	63.2	61.6	60.0	84.4
Rear Right, $L_{Aeq,1min}$	77.5	66.6	70.5	73.3	75.2	76.3	79.7	93.2	76.3	77.3	85.6	73.1	74.1	70.6	70.0	68.4	66.3	62.9	61.4	59.5	56.8	87.3
Average, $L_{Aeq,1min}$	**77.0**	**67.4**	**74.7**	**72.3**	**74.7**	**77.1**	**76.9**	**89.0**	**74.3**	**77.0**	**85.1**	**71.3**	**73.7**	**67.8**	**68.7**	**66.6**	**65.7**	**62.7**	**62.3**	**60.4**	**60.4**	**85.2**

Plant	ONE-THIRD OCTAVE BAND CENTRE FREQUENCY (H_Z)																				Overall dB(A)
	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	
Battery Powered STIHL BGA200 Blower (#MPW 19) at 3 metres – at idle																						
Front Left, $L_{Aeq,1min}$	59.1	59.8	58.1	58.4	55.7	54.1	54.3	46.9	48.3	51.7	51.7	52.3	53.8	52.3	68.4	59.3	55.5	56.7	54.7	51.4	53.5	70.7
Front Right, $L_{Aeq,1min}$	59.2	63.1	61.7	58.2	54.3	54.6	52.3	48.8	54.5	59.1	54.9	53.7	53.1	52.9	68.3	58.4	52.3	54.9	51.2	49.4	50.7	70.3
Rear Right, $L_{Aeq,1min}$	58.1	63.0	64.3	55.5	54.8	56.6	54.6	52.4	54.6	58.8	54.9	52.2	51.9	50.8	59.8	53.2	47.7	53.4	47.9	46.0	46.8	64.6
Rear Left, $L_{Aeq,1min}$	58.4	60.6	59.4	54.9	54.6	53.4	53.0	48.8	48.6	51.9	52.0	51.7	51.4	50.9	69.3	59.3	55.4	57.8	54.8	52.3	53.0	71.3
Average, $L_{Aeq,1min}$	**58.7**	**61.9**	**61.5**	**57.0**	**54.9**	**54.8**	**53.6**	**49.7**	**52.5**	**56.7**	**53.6**	**52.5**	**52.7**	**51.8**	**67.6**	**58.1**	**53.7**	**56.0**	**53.0**	**50.4**	**51.7**	**69.9**
Battery Powered STIHL BGA200 Blower (#MPW 19) at 3 metres – at medium throttle																						
Front Left, $L_{Aeq,1min}$	62.9	60.8	58.6	59.8	60.3	55.3	55.1	54.8	55.5	56.8	54.9	55.1	55.5	55.0	55.0	58.8	62.2	57.7	61.0	58.0	55.9	70.6
Front Right, $L_{Aeq,1min}$	60.0	61.1	59.1	55.2	55.0	55.3	53.5	55.6	59.5	63.1	61.0	57.1	56.0	55.8	56.8	58.7	59.2	54.6	60.0	57.1	53.9	69.4
Rear Right, $L_{Aeq,1min}$	59.9	61.2	57.6	55.9	55.1	56.5	53.1	54.6	61.0	63.1	57.3	55.2	56.6	55.5	53.6	52.5	53.9	50.5	55.4	53.0	50.1	66.4
Rear Left, $L_{Aeq,1min}$	64.9	63.4	60.2	57.9	55.0	55.4	54.3	54.0	61.0	60.0	56.7	56.9	57.1	56.1	57.1	59.9	63.3	59.5	64.3	61.5	57.7	72.3
Average, $L_{Aeq,1min}$	**62.4**	**61.8**	**59.0**	**57.6**	**57.0**	**55.7**	**54.1**	**54.8**	**59.7**	**61.4**	**58.1**	**56.2**	**56.3**	**55.6**	**55.8**	**58.2**	**60.9**	**56.7**	**61.2**	**58.4**	**55.2**	**70.2**

Plant	ONE-THIRD OCTAVE BAND CENTRE FREQUENCY (H_Z)																				Overall dB(A)
	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	
Battery Powered STIHL BGA200 Blower (#MPW 19) at 3 metres – at full throttle																						
Front Left, $L_{Aeq,1min}$	62.4	63.5	64.1	60.0	57.8	57.8	54.9	52.4	60.0	59.9	56.9	58.6	58.1	57.6	57.3	59.2	60.7	61.9	61.7	63.9	61.4	72.7
Front Right, $L_{Aeq,1min}$	63.4	67.1	69.2	69.5	64.2	61.5	61.0	57.9	66.1	66.4	61.9	60.5	60.3	59.3	60.5	59.9	59.4	59.3	58.8	71.0	61.6	74.8
Rear Right, $L_{Aeq,1min}$	61.3	64.0	66.3	62.3	56.5	57.3	57.0	55.3	62.8	65.2	61.3	57.8	59.1	58.5	57.5	54.8	55.2	54.6	54.6	64.4	57.7	70.5
Rear Left, $L_{Aeq,1min}$	61.1	62.8	64.7	61.5	53.7	53.9	51.5	51.2	57.6	60.7	56.8	58.4	59.6	57.0	58.3	60.1	61.8	63.2	63.3	67.8	64.1	74.4
Average, $L_{Aeq,1min}$	**62.2**	**64.7**	**66.6**	**65.1**	**59.9**	**58.4**	**57.4**	**55.0**	**62.8**	**63.9**	**59.9**	**58.9**	**59.3**	**58.2**	**58.6**	**58.9**	**59.9**	**60.8**	**60.7**	**67.7**	**61.8**	**73.4**

Plant	ONE-THIRD OCTAVE BAND CENTRE FREQUENCY (H_Z)																				Overall dB(A)
	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	
Petrol Powered STIHL BR 700 Blower (#MPW 12) at 3 metres – at idle																						
Front Right, LAeq,1min	66.5	67.6	64.5	62.0	60.9	61.3	64.6	61.7	66.7	66.8	65.8	68.3	64.3	63.6	64.4	64.2	63.4	60.5	61.1	56.8	51.9	74.4
Rear Right, LAeq,1min	66.8	67.4	66.6	62.3	62.8	65.6	65.6	63.6	72.8	70.6	63.8	65.3	62.9	64.6	66.9	68.3	70.2	70.2	72.1	67.4	61.9	79.6
Rear Left, LAeq,1min	63.3	69.2	66.4	64.0	62.1	64.3	66.2	63.1	71.2	71.6	64.9	62.4	62.8	62.9	64.8	67.1	68.3	66.5	65.2	64.3	60.0	77.0
Front Left, LAeq,1min	63.1	63.8	65.7	63.5	64.5	64.2	65.8	61.9	70.2	72.4	68.8	64.7	64.2	63.3	64.1	63.8	64.4	60.9	58.3	57.2	54.1	75.2
Average, LAeq,1min	**65.3**	**67.4**	**65.9**	**63.0**	**62.8**	**64.1**	**65.6**	**62.6**	**70.7**	**70.8**	**66.3**	**65.7**	**63.6**	**63.6**	**65.2**	**66.3**	**67.4**	**66.4**	**67.3**	**63.6**	**58.7**	**77.0**
Petrol Powered STIHL BR 700 Blower (#MPW 12) at 3 metres – at full power																						
Front Right, LAeq,1min	67.8	77.0	61.9	71.4	84.2	78.5	80.6	77.9	80.1	84.5	86.8	84.2	84.1	78.8	79.1	81.3	78.0	75.3	74.1	72.0	67.5	91.2
Rear Right, LAeq,1min	68.6	78.0	62.2	74.0	86.7	77.1	78.7	76.7	76.3	82.0	84.5	83.9	81.4	76.0	77.0	79.2	76.6	76.5	76.0	72.5	68.9	89.7
Rear Left, LAeq,1min	67.6	77.7	62.9	77.8	90.4	81.1	82.2	74.3	80.8	87.0	81.9	83.0	81.9	79.3	78.9	80.9	82.7	82.1	85.5	83.8	78.7	93.7
Front Left, LAeq,1min	65.3	74.0	60.8	70.7	82.8	74.5	76.0	68.5	77.8	87.9	82.8	86.7	81.7	78.2	78.1	80.8	80.0	79.6	79.3	80.9	74.2	92.2
Average, LAeq,1min	**67.5**	**76.9**	**62.0**	**74.4**	**87.0**	**78.4**	**79.9**	**75.5**	**79.1**	**85.9**	**84.4**	**84.7**	**82.4**	**78.2**	**78.4**	**80.6**	**79.9**	**79.2**	**81.0**	**80.0**	**74.5**	**91.9**

Plant	ONE-THIRD OCTAVE BAND CENTRE FREQUENCY (H_Z)																				Overall dB(A)
	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	
Isuzu FVR 165 300 Rear Loader(registration 1GDT043) at 7 metres – at idle																						
Front Left, $L_{Aeq,1min}$	70.7	61.7	61.8	59.5	59.4	57.7	57.0	54.7	58.4	61.9	58.5	59.0	61.3	59.3	57.0	57.5	59.4	56.1	54.6	51.4	48.9	68.6
Front Right, $L_{Aeq,1min}$	73.4	66.7	62.2	59.0	59.7	56.6	54.6	52.3	55.1	60.3	56.8	56.2	59.9	58.8	55.7	55.8	58.7	55.3	53.7	50.6	47.9	67.4
Rear Right, $L_{Aeq,1min}$	74.8	64.8	60.6	59.4	57.5	56.0	55.1	53.4	54.5	58.4	56.3	56.5	58.6	56.3	53.2	53.7	55.0	50.6	49.7	47.1	44.3	65.2
Rear Left, $L_{Aeq,1min}$	67.2	63.7	62.5	59.4	59.9	58.7	54.4	54.8	55.3	60.8	58.8	56.1	58.9	59.0	55.6	54.9	56.3	53.1	52.3	49.5	46.8	66.8
Average, $L_{Aeq,1min}$	**72.4**	**64.6**	**61.8**	**59.3**	**59.2**	**57.4**	**55.4**	**53.9**	**56.1**	**60.5**	**57.7**	**57.1**	**59.8**	**58.5**	**55.6**	**55.7**	**57.7**	**54.3**	**52.9**	**49.9**	**47.3**	**67.2**
Isuzu FVR 165 300 Rear Loader(registration 1GDT043) at 7 metres – Compacting																						
Front Left, $L_{Aeq,1min}$	68.7	68.0	63.6	69.3	67.4	68.2	68.3	64.1	71.1	71.5	66.3	67.7	67.9	64.9	63.5	65.9	61.5	60.7	58.8	57.0	53.4	75.6
Front Right, $L_{Aeq,1min}$	78.3	75.2	64.5	66.1	67.1	70.7	65.9	63.4	70.0	67.8	63.2	64.3	67.0	61.4	61.5	62.9	60.3	60.8	57.9	56.7	53.5	73.7
Rear Right, $L_{Aeq,1min}$	76.3	74.1	62.0	62.6	59.8	62.6	60.1	56.0	62.9	63.9	61.6	61.7	63.8	60.5	60.9	60.8	58.7	58.4	58.3	55.4	52.0	71.1
Rear Left, $L_{Aeq,1min}$	72.8	72.7	64.9	64.3	65.2	63.5	61.1	58.0	66.0	67.1	59.8	61.3	63.7	61.2	61.6	63.3	60.9	59.4	58.0	56.0	52.9	72.2
Average, $L_{Aeq,1min}$	**75.3**	**73.2**	**63.9**	**66.3**	**65.7**	**67.5**	**65.1**	**61.6**	**68.6**	**68.4**	**63.4**	**64.6**	**66.0**	**62.4**	**62.0**	**63.6**	**60.5**	**59.9**	**58.3**	**56.3**	**53.0**	**73.5**

Plant	ONE-THIRD OCTAVE BAND CENTRE FREQUENCY (H_Z)																				Overall dB(A)
	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	
Isuzu FVR 165 300 Rear Loader(registration 1GDT043) at 7 metres – Lifting/Tipping																						
Front Left, $L_{Aeq,1min}$	68.9	68.0	64.2	65.9	66.7	69.8	68.6	63.3	69.2	69.8	67.3	66.0	68.9	62.9	60.7	62.5	59.7	59.5	58.4	55.1	52.2	74.5
Front Right, $L_{Aeq,1min}$	79.6	74.7	65.5	66.1	66.1	71.5	67.7	62.6	70.4	68.7	63.4	64.4	66.8	60.7	59.5	61.6	59.1	59.6	58.7	55.3	52.6	73.4
Rear Right, $L_{Aeq,1min}$	81.4	76.8	62.5	65.8	67.9	68.9	64.0	58.9	64.3	65.3	64.2	61.1	65.3	59.5	58.4	59.2	56.7	55.6	54.7	51.2	48.1	70.9
Rear Left, $L_{Aeq,1min}$	76.7	71.6	63.9	68.0	65.4	68.9	66.1	60.9	68.1	68.6	64.1	62.7	66.3	57.9	58.8	60.5	55.9	56.6	55.4	51.5	48.3	72.1
Average, $L_{Aeq,1min}$	**78.5**	**73.9**	**64.2**	**66.6**	**66.6**	**69.9**	**66.9**	**61.7**	**68.5**	**68.4**	**65.0**	**63.9**	**67.0**	**60.9**	**59.4**	**61.1**	**58.1**	**58.2**	**57.1**	**53.7**	**50.8**	**72.9**

Plant	ONE-THIRD OCTAVE BAND CENTRE FREQUENCY (H_Z)																				Overall dB(A)
	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	
Hyundai iLoad Graffiti Removal Van (registration 1EYK726) – Pump On – at 7m																					
Rear Right, $L_{Aeq,1min}$	68.1	68.8	68.4	69.8	68.1	61.9	59.8	54.5	52.8	54.6	58.7	56.2	52.0	52.1	51.6	51.6	51.7	49.8	48.5	48.2	45.9	64.0
Rear Left, $L_{Aeq,1min}$	78.6	70.8	70.9	71.2	70.3	63.6	64.3	60.1	60.7	61.2	58.1	56.3	56.6	58.9	58.5	58.7	61.3	60.3	59.9	60.3	58.0	71.1
Front Left, $L_{Aeq,1min}$	70.4	71.4	73.6	71.0	70.5	65.0	65.7	61.5	65.2	61.1	58.6	56.7	56.6	58.1	60.8	61.7	61.5	64.3	63.1	64.3	64.1	74.2
Front Right, $L_{Aeq,1min}$	70.2	67.9	70.8	72.2	65.9	58.7	61.7	55.4	54.3	55.0	54.1	52.4	51.7	50.6	50.0	48.5	49.0	47.6	46.7	46.8	44.2	62.7
Average, $L_{Aeq,1min}$	**74.0**	**70.0**	**71.3**	**71.1**	**69.1**	**62.9**	**63.4**	**58.8**	**60.9**	**59.0**	**57.7**	**55.7**	**54.8**	**56.3**	**57.3**	**57.8**	**58.7**	**59.9**	**58.9**	**59.9**	**59.1**	**70.4**
Hyundai iLoad Graffiti Removal Van (registration 1EYK726) – Power Washer Operational – at 7m																					
Front Left, $L_{Aeq,1min}$	63.0	62.6	69.6	74.6	67.0	60.6	61.4	58.5	57.2	56.6	56.3	55.2	57.2	58.7	59.1	56.9	58.1	58.7	58.1	58.2	58.0	59.4
Front Right, $L_{Aeq,1min}$	64.0	65.9	71.4	76.1	69.6	64.4	63.2	58.9	56.7	60.7	60.1	58.0	59.2	57.9	56.7	56.1	55.3	55.0	53.8	53.7	52.5	52.0
Rear Right, $L_{Aeq,1min}$	69.9	71.5	72.9	75.3	69.0	63.9	65.5	60.7	61.9	63.0	59.3	58.1	58.0	60.0	58.5	59.6	61.0	61.6	59.8	61.2	60.1	59.5
Rear Left, $L_{Aeq,1min}$	65.5	72.4	74.8	65.6	66.2	61.5	62.2	60.3	61.6	61.4	60.0	64.6	59.1	58.2	60.3	62.0	61.7	63.8	62.2	63.9	64.6	64.5
Average, $L_{Aeq,1min}$	**66.5**	**69.7**	**72.6**	**74.3**	**68.2**	**62.9**	**63.4**	**59.7**	**60.0**	**61.0**	**59.2**	**60.5**	**58.5**	**58.8**	**58.8**	**59.3**	**59.7**	**60.9**	**59.4**	**60.7**	**60.7**	**71.8**

Plant	ONE-THIRD OCTAVE BAND CENTRE FREQUENCY (H_Z)																				Overall dB(A)
	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	
Isuzu FSA 850 Rear Loader (registration (1EKS994) at 7 metres – Idle																						
Front Left, $L_{Aeq,1min}$	62.3	64.3	62.8	58.0	58.7	55.2	53.3	51.3	51.1	55.1	55.1	53.3	54.5	54.4	53.0	50.8	50.1	49.1	47.8	48.1	51.5	63.2
Front Right, $L_{Aeq,1min}$	61.9	61.9	63.9	59.0	58.2	57.2	54.9	54.5	54.1	54.8	54.4	53.2	55.9	55.5	53.9	51.9	51.1	49.8	46.6	44.8	41.8	63.3
Rear Right, $L_{Aeq,1min}$	64.8	63.6	70.5	59.4	57.2	57.0	54.1	53.4	53.0	56.1	54.8	54.1	55.9	54.9	53.6	51.0	49.3	47.5	46.0	44.3	47.7	63.3
Rear Left, $L_{Aeq,1min}$	65.1	66.1	60.2	61.9	59.5	55.7	54.1	52.2	51.9	55.8	54.3	53.6	54.7	53.7	54.9	49.1	47.0	46.5	44.4	42.4	38.5	62.2
Average, $L_{Aeq,1min}$	**63.8**	**64.2**	**66.2**	**59.8**	**58.5**	**56.4**	**54.1**	**53.0**	**52.7**	**55.5**	**54.7**	**53.6**	**55.3**	**54.7**	**53.9**	**50.8**	**49.6**	**48.4**	**46.4**	**45.4**	**47.4**	**63.0**
Isuzu FSA 850 Rear Loader (registration (1EKS994) at 7 metres – Compacting																						
Front Left, $L_{Aeq,1min}$	70.3	76.1	67.6	67.0	69.1	72.4	71.5	64.8	65.7	68.8	68.9	69.8	66.4	65.5	66.8	62.8	63.8	65.5	62.5	59.4	55.2	76.3
Front Right, $L_{Aeq,1min}$	66.7	73.5	68.1	64.8	69.4	68.6	71.4	63.8	67.2	69.1	65.8	67.1	65.4	63.3	64.5	61.7	63.2	63.6	61.0	58.7	55.3	74.8
Rear Right, $L_{Aeq,1min}$	72.7	80.8	67.9	65.2	68.9	69.9	70.4	61.1	67.2	68.8	66.1	69.6	65.2	62.9	65.5	59.9	61.6	61.3	59.8	56.7	53.3	74.6
Rear Left, $L_{Aeq,1min}$	68.1	75.1	68.3	64.2	71.9	72.1	64.6	64.9	67.7	68.9	67.5	73.6	67.1	65.8	67.0	61.9	62.5	64.5	62.2	60.1	55.3	76.9
Average, $L_{Aeq,1min}$	**70.1**	**77.3**	**68.0**	**65.4**	**70.0**	**71.0**	**70.2**	**63.9**	**67.0**	**68.9**	**67.3**	**70.7**	**66.1**	**64.6**	**66.1**	**61.7**	**62.9**	**64.0**	**61.5**	**58.9**	**54.9**	**75.8**

Plant	ONE-THIRD OCTAVE BAND CENTRE FREQUENCY (H_Z)																				Overall dB(A)
	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	
Isuzu FSA 850 Rear Loader (registration (1EKS994) at 7 metres – Lifting																					
Front Left, $L_{Aeq,1min}$	65.4	73.7	63.6	66.5	68.2	69.8	70.8	66.1	64.4	69.9	68.3	69.0	65.9	63.4	66.0	62.6	61.5	63.8	60.5	57.8	53.9	75.3
Front Right, $L_{Aeq,1min}$	66.2	72.2	65.8	66.5	69.2	69.6	72.8	64.4	63.7	68.3	66.4	63.9	65.1	62.5	66.1	62.0	61.8	63.0	59.9	57.6	54.2	74.3
Rear Right, $L_{Aeq,1min}$	66.3	78.5	64.9	65.1	68.3	68.4	76.0	61.6	64.7	69.5	66.2	67.6	64.9	61.7	69.3	62.7	60.9	63.6	60.5	58.6	54.5	75.7
Rear Left, $L_{Aeq,1min}$	64.8	69.6	65.8	64.4	68.8	69.4	65.2	65.2	64.7	68.5	66.8	67.7	67.0	64.1	67.8	63.9	61.2	63.3	61.6	58.7	56.1	75.5
Average, $L_{Aeq,1min}$	**65.7**	**74.8**	**65.1**	**65.4**	**68.6**	**69.3**	**72.7**	**64.6**	**64.4**	**69.1**	**67.0**	**67.4**	**65.8**	**63.0**	**67.5**	**62.9**	**61.4**	**63.4**	**60.7**	**58.2**	**54.8**	**75.2**

Plant	ONE-THIRD OCTAVE BAND CENTRE FREQUENCY (H_Z)																					Overall dB(A)
	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	
Isuzu FE 320 Side Loader (registration 1GES938) at 7 metres – Lifting & Compacting																						
Front Left, $L_{Aeq,1min}$	69.6	65.5	67.3	61.6	62.6	64.8	57.4	67.7	71.3	66.8	61.3	65.4	64.2	63.0	63.0	59.6	57.5	58.3	54.9	53.3	51.9	72.8
Front Right, $L_{Aeq,1min}$	69.4	64.7	62.4	61.3	62.1	65.0	61.5	62.9	66.0	63.0	59.9	63.0	63.6	62.1	61.6	58.5	57.3	56.2	54.4	52.3	52.0	70.8
Rear Right, $L_{Aeq,1min}$	70.6	64.9	67.7	62.9	60.3	59.8	57.7	63.7	64.8	62.0	58.3	62.9	60.6	58.6	59.3	57.2	53.1	53.6	49.9	48.8	47.7	68.8
Average, $L_{Aeq,1min}$	**69.9**	**65.0**	**66.4**	**62.0**	**61.8**	**63.8**	**59.3**	**65.3**	**68.3**	**64.5**	**60.0**	**63.9**	**63.1**	**61.6**	**61.6**	**58.5**	**56.4**	**56.4**	**53.6**	**51.9**	**50.9**	**71.1**
Isuzu FE 320 Rear Loader (registration 1GES938) at 7 metres – Simulation of Normal Driving/Tipping Operation @ approximately 7m																						
Left Side, $L_{Aeq,1min}$	68.1	68.3	70.2	65.5	62.2	62.0	60.6	65.4	66.5	61.7	59.6	63.3	60.9	59.3	59.6	56.3	55.0	54.5	51.9	49.4	47.9	69.5
Isuzu FE 320 Rear Loader (registration 1GES938) at 7 metres – Simulation of Reversing Operation With Tonal Reverse Siren@ approximately 7m																						
Left Side, L	75.9	77.3	65.7	68.6	70.1	69.8	64.1	60.8	61.8	64.4	71.8	66.7	63.1	80.1	82.8	61.7	64.3	64.5	61.9	58.3	60.7	85.9

APPENDIX C

Plant Photos

DETAIL	ID	PHOTO
Hino FG 1628 Road Sweeper	1 EBC 003	
Hyundai iLoad Graffiti Removal Van	1 EYK 726	
GSV 190 Vacuum	MPW 20	
STIHL BGA 200 Battery Operated Blower	MPW 19	

DETAIL	ID	PHOTO
STIHL BR 700 Petrol Driven Blower	MPW 12	
Isuzu FVR 165 Rear Loader	1 GDT 043	
Isuzu FSR 850 Rear Loader	1 EKS 994	
Volvo FE 320 Side Loaderr	1 GES 938	

APPENDIX D

Terminogoly

THE FOLLOWING IS AN EXPLANATION OF THE TERMINOLOGY USED THROUGHOUT THIS REPORT	
Decibel (dB)	The decibel is the unit that describes the sound pressure and sound power levels of a noise source. It is a logarithmic scale referenced to the threshold of hearing.
A-Weighting	An A-weighted noise level has been filtered in such a way as to represent the way in which the human ear perceives sound. This weighting reflects the fact that the human ear is not as sensitive to lower frequencies as it is to higher frequencies. An A-weighted sound level is described as L_A dB.
Sound Power Level (L_w)	Under normal conditions, a given sound source will radiate the same amount of energy, irrespective of its surroundings, being the sound power level. This is similar to a 1kW electric heater always radiating 1kW of heat. The sound power level of a noise source cannot be directly measured using a sound level meter but is calculated based on measured sound pressure levels at known distances. Noise modelling incorporates source sound power levels as part of the input data.
Sound Pressure Level (L_p)	The sound pressure level of a noise source is dependent upon its surroundings, being influenced by distance, ground absorption, topography, meteorological conditions etc and is what the human ear actually hears. Using the electric heater analogy above, the heat will vary depending upon where the heater is located, just as the sound pressure level will vary depending on the surroundings. Noise modelling predicts the sound pressure level from the sound power levels taking into account ground absorption, barrier effects, distance etc.
L_{ASlow}	This is the noise level in decibels, obtained using the A frequency weighting and the S (Slow) time weighting as specified in IEC 61672-1:2002. Unless assessing modulation, all measurements use the slow time weighting characteristic.
L_{AFast}	This is the noise level in decibels, obtained using the A frequency weighting and the F (Fast) time weighting as specified in IEC 61672-1:2002. This is used when assessing the presence of modulation only.
L_{APeak}	This is the greatest absolute instantaneous sound pressure in decibels using the A frequency weighting as specified in IEC 61672-1:2002.

THE FOLLOWING IS AN EXPLANATION OF THE TERMINOLOGY USED THROUGHOUT THIS REPORT	
L_{Amax}	An L_{Amax} level is the maximum A-weighted noise level during a particular measurement.
L_{A1}	An L_{A1} level is the A-weighted noise level which is exceeded for one percent of the measurement period and is considered to represent the average of the maximum noise levels measured.
L_{A10}	An L_{A10} level is the A-weighted noise level which is exceeded for 10 percent of the measurement period and is considered to represent the "intrusive" noise level.
L_{Aeq}	The equivalent steady state A-weighted sound level ("equal energy") in decibels which, in a specified time period, contains the same acoustic energy as the time-varying level during the same period. It is considered to represent the "average" noise level.
L_{A90}	An L_{A90} level is the A-weighted noise level which is exceeded for 90 percent of the measurement period and is considered to represent the "background" noise level.
One-Third-Octave Band	Means a band of frequencies spanning one-third of an octave and having a centre frequency between 25 Hz and 20 000 Hz inclusive.
L_{Amax} assigned level	Means an assigned level which, measured as a $L_{A\ Slow}$ value, is not to be exceeded at any time.
L_{A1} assigned level	Means an assigned level which, measured as a $L_{A\ Slow}$ value, is not to be exceeded for more than 1% of the representative assessment period.
L_{A10} assigned level	Means an assigned level which, measured as a $L_{A\ Slow}$ value, is not to be exceeded for more than 10% of the representative assessment period..
Tonal Noise	A tonal noise source can be described as a source that has a distinctive noise emission in one or more frequencies. An example would be whining or droning. The quantitative definition of tonality is: the presence in the noise emission of tonal characteristics where the difference between (a) the A-weighted sound pressure level in any one-third octave band (b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands, is greater than 3 dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as $L_{A\ Slow}$ levels. This is relatively common in most noise sources.

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Modulating Noise	A modulating source is regular, cyclic and audible and is present for at least 10% of the measurement period. The quantitative definition of modulation is: a variation in the emission of noise that (a) is more than 3 dB $L_{A\ Fast}$ or is more than 3 dB $L_{A\ Fast}$ in any one-third octave band (b) is present for at least 10% of the representative.
Impulsive Noise	An impulsive noise source has a short-term banging, clunking or explosive sound. The quantitative definition of impulsiveness is: a variation in the emission of a noise where the difference between $L_{A\ peak}$ and $L_{A\ Max\ slow}$ is more than 15 dB when determined for a single representative event.
Major Road	Is a road with an estimated average daily traffic count of more than 15,000 vehicles.
Secondary/ Minor Road	Is a road with an estimated average daily traffic count of between 6,000 and 15,000 vehicles.
Influencing Factor (IF)	$= \frac{1}{10}(\%TypeA_{100} + \%TypeA_{450}) + \frac{1}{20}(\%TypeB_{100} + \%TypeB_{450})$ Where: $\%TypeA_{100}$ = the percentage of industrial land within a 100m radius of the premises receiving the noise $\%TypeA_{450}$ = the percentage of industrial land within a 450m radius of the premises receiving the noise $\%TypeB_{100}$ = the percentage of commercial land within a100m radius of the premises receiving the noise $\%TypeB_{450}$ = the percentage of commercial land within a 450m radius of the premises receiving the noise + Traffic Factor (maximum of 6 dB) = 2 for each secondary road within 100m = 2 for each major road within 450m = 6 for each major road within 100m
Representative Assessment Period	Means a period of time not less than 15 minutes, and not exceeding four hours, determined by an inspector or authorised person to be appropriate for the assessment of a noise emission, having regard to the type and nature of the noise emission.
Background Noise	Background noise or residual noise is the noise level from sources other than the source of concern. When measuring environmental noise, residual sound is often a problem. One reason is that regulations often require that the noise from different types of sources be dealt with separately. This separation, e.g. of traffic noise from industrial noise, is often difficult to accomplish in practice. Another reason is that the measurements are normally carried out outdoors. Wind-induced noise, directly on the microphone and indirectly on trees, buildings, etc., may also affect the result. The character of these noise sources can make it difficult or even impossible to carry out any corrections.
Ambient Noise	Means the level of noise from all sources, including background noise from near and far and the source of interest.


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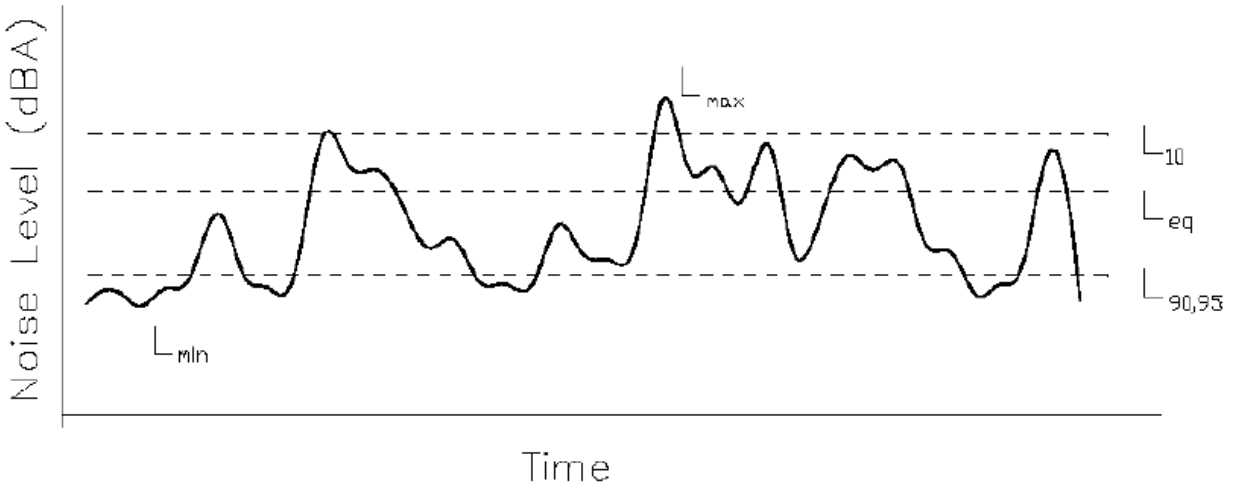
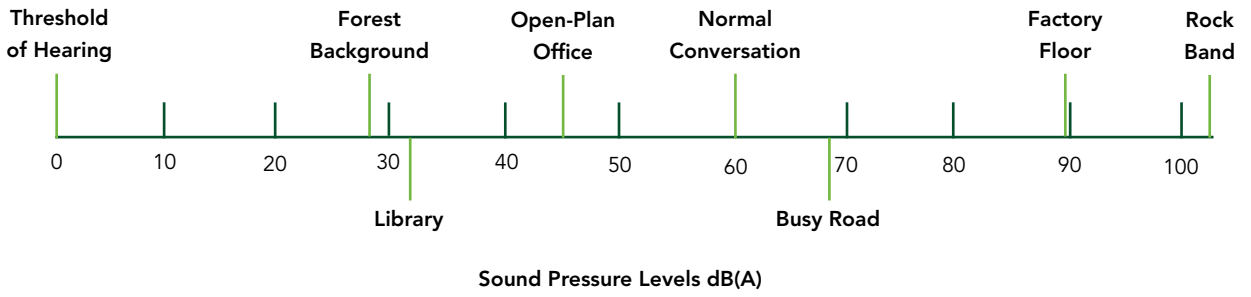
THE FOLLOWING IS AN EXPLANATION OF THE TERMINOLOGY USED THROUGHOUT THIS REPORT	
Specific Noise	Relates to the component of the ambient noise that is of interest. This can be referred to as the noise of concern or the noise of interest.
Chart of Noise Level Descriptors	
Typical Noise Levels	

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