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Project:

MFG Levenshulme, Manchester

Title:

Noise Impact Assessment

quietly moving forward



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1 INTRODUCTION

- 1.01 Environmental Equipment Corporation Limited has been commissioned by MBH Design Studio Ltd to undertake an assessment of new noise sources proposed as part of a redevelopment of the MFG Levenshulme Service Station on Stockport Road in Greater Manchester. The proposals include the redevelopment of part of the existing forecourt and a small area of a current brownfield site adjacent to the main garage to include seven electric vehicle charging bays, their associated supporting infrastructure and two new jet wash bays for customer use.
- 1.02 This noise assessment has been conducted in accordance with current British Standard and World Health Organisation guidance for community noise and the results of a noise survey carried out over a weekend period. This document has been prepared during the ongoing COVID 19 epidemic in the UK and the survey was carried out during the final easing of restrictions at the end of the third lockdown.
- 1.03 This assessment includes the prediction of noise impacts at the worst affected noise sensitive receptors based on the proposed items of plant and their location.
- 1.04 Whilst every effort has been made to ensure that this report is easy to understand, it is necessarily technical in nature. To assist the reader, an explanation of the terminology used in this report is contained in Appendix A.

2 SITE

2.01 The MFG Levenshulme service station is located in a predominantly residential area of Greater Manchester.

2.02 The following Google Maps image has been annotated to identify the MFG Levenshulme site and the nearest noise sensitive residential properties. The measurement location used for the noise survey is also marked.



Figure 1: Site layout and nearest dwellings

2.03 The closest noise sensitive receptors to the site are the following:

- The two and three storey dwellings along Cringle Road to the north; and
- The three storey dwellings of 1162 Stockport Road to the west.

2.04 All other noise sensitive receptors are at a greater distance from the proposed location of the charging and jet wash bays, or are protected by more screening by the intervening structures, and as such will be subject to lower levels of noise.

2.05 This application proposes an extension of the existing forecourt into the adjacent brownfield site and will include the introduction of two new jet wash bays, seven dedicated electric vehicle charging bays. The electrical infrastructure required to support the charging bays consists of a new 1500kVA substation within a GRP Enclosure, a new LV Panel in a GRP enclosure. A large scale plan layout of the redeveloped site is presented in Appendix B. Figure 2 below overlays this plan onto a Google Maps image to put the layout in context.



Figure 2: Proposed new site layout and existing surroundings.

- 2.06 The only noise generating element associated with the charging bays will be the substation, the LV panel does not generate any noise. These elements will have some form of solid fencing or screening erected around them that will offer visual and acoustic screening to varying extents for each receptor.
- 2.07 The jet wash bays will be screened on three sides by 2.6m high barriers with a roof over the top of each bay to reduce noise and water spray to the surroundings.

3 GUIDANCE

- 3.01 A summary of the current National Planning Policy Framework including the Noise Policy Statement for England is presented in Appendix C of this document. We have reviewed the noise impact in line with current National Planning Policy guidance as this document is the basis upon which Local Council Plans are drawn up. The assessment methodology of 'BS4142:2014: 'Methods for rating and assessing industrial and commercial sound'' is the principle standard against which to assess potential impact in this context and that standard in turn requires that the assessment outcomes be judged and considered taking into account context and relevant guidance metrics.
- 3.02 Additional guidance has been taken from current British Standards and World Health Organisation Guidance. These documents provide useful reference for assessing acceptability against established absolute noise limits.

BS4142:2014 'Methods for rating and assessing industrial and commercial sound'

- 3.03 To assess the acceptability of the resultant noise levels we have consulted the relevant standards. BS 4142:2014 'Methods for rating and assessing industrial and commercial sound'. The scope of BS4142 includes that assessment of the following sources:
- Sound from industrial and manufacturing processes;
 - Sound from fixed installations which comprise mechanical and electrical plant and equipment;
 - Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
 - Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating
- 3.04 BS4142 gives guidance on assessing the likelihood of adverse impacts by calculating a 'rating level' of the new noise source and comparing its magnitude at noise sensitive locations to the existing or underlying background noise level. The background noise level is subtracted from the 'rating level' to assess the likelihood of complaints:
- The greater the difference the greater the likelihood of complaints.
 - A difference of around +10dB or more is an indication of a significant adverse impact, depending on the context.
 - A difference of +5dB is likely to be an indication of an adverse impact, depending on the context.
 - The lower the rating level is relative to the measured background noise level, the less likely it is that the specific sound source will have an adverse impact or significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low sound impact, depending on the context.

- 3.05 This assessment is carried out over a one hour period for the daytime and a fifteen minute period for the night-time. For the purposes of the standard it states that daytime and night-time are typically 07:00 to 23:00 hours and 23:00 to 07:00 hours respectively.
- 3.06 The 'rating level' of the noise source is obtained taking the following factors into consideration:
- The new plant noise (the specific noise) is measured or predicted in terms of L_{Aeq} .
 - An additional correction shall be included if the noise contains a distinguishable, discrete continuous note, if the noise contains distinct impulses or if the noise is irregular enough to attract attention. The value for any tonal noise can be an addition of up to 6dB and for impulsive noise of up to 9dB.
- 3.07 The background sound level should be established in terms of the L_{A90} noise index. The standard states that the background sound level should be measured over a period of sufficient length to obtain a representative value. The standard states that '*a representative level ought to account for the range of background sound levels and ought not to automatically to be assumed to be either the minimum or modal value.*'
- 3.08 BS 4142 goes onto state that:
- 'The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.'*
- 3.09 BS4142 requires uncertainties in the assessment to be considered and, where the uncertainty is likely to affect the outcome of the assessment, steps should be taken to reduce the uncertainty.

BS8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings'

- 3.10 BS8233:2014, 'Guidance on sound insulation and noise reduction for buildings', section 7 gives guidance on acoustic criteria and noise levels appropriate for various internal spaces that have different functions. Section 7.7 relates specifically to buildings having a residential purpose and offers guidance on appropriate internal ambient noise levels for dwellings (when unoccupied) with specific consideration:
- for bedrooms, the acoustic effect on sleep; and
 - for other rooms, the acoustic effect on resting, listening and communicating.
- 3.11 The guidance applies to external noise as it affects the internal acoustic environment from sources without a specific character.
- 3.12 Table 4 of section 7.7.2 recommends the following internal noise limits based on the presence of steady, external noise sources:

Table 4 Indoor ambient noise levels for dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	—
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	—
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

The guidance criteria are based upon research and existing guidelines provided by the World Health Organisation.

- 3.13 It is generally considered that the sound insulation provided by a partially open window will be 15dB, dependent on window type, extent of opening and source frequency content.
- 3.14 It can be seen that in the worst case, with a partially open window reduction of 15dB, indoor ambient noise targets for bedrooms will be met where the external ambient noise level is below 45dB(A). This is based upon steady noise of an anonymous nature and is consistent with the World Health Organisations LOAEL.

World Health Organisation 'Guidelines for Community Noise 1999'

- 3.15 In addition to the advice detailed above within BS8233 the WHO Guidelines for community noise, 1999 also provide the following guidance relating to noise during the night time.

'For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10 -15 times per night'

- 3.16 The guidelines refer to community noise which is also called environmental noise, residential noise or domestic noise, WHO states that this noise encompasses all sources except noise at the industrial workplace. Main sources of community noise include road, rail and air traffic, industries construction and public work and the neighbourhood. The main indoor sources of noise are ventilation systems, office machines, home appliances and neighbours. Typical neighbourhood noise comes from premises and installations related to the catering trade (restaurant, cafeterias, discotheques, etc.), from live or recorded music, sports events including motor sports, playgrounds, car parks and domestic animals such as barking dogs.

4 MEASUREMENTS

- 4.01 Environmental noise measurements were carried out over a weekday period, between 0730 hours on Friday 23rd July 2021 and concluded 0830 hours on Monday 26th July, 2021, to establish the existing noise levels at the site. The survey methodology and results are set out below.
- 4.02 Noise measurements have been carried out at the following position, as shown in Figure 1 and described as:
- Position 1: located at a height of approximately 1.7 metres above ground level on the east side of the site. The measurement was not located within 3.5 metres of any reflecting surfaces, other than the mounting surface.
- 4.03 This position is considered to be representative of the nearest windows on the front elevations of the dwellings along Cringle Road.
- 4.04 It is important to note that the survey was carried out during the third Government enforced lockdown regulations due to the COVID-19 epidemic but as restrictions had started to ease. This will potentially mean that the noise levels recorded will be lower than would normally be typical, even for quiet weekend periods. The survey results are therefore considered to provide the basis of a very much worst case assessment of noise impact, the conclusions likely overstating the impact.

5 EQUIPMENT

5.01 The equipment used for the survey was as follows:-

- 01dB Metravib Black Solo Integrating Sound Level Meter conforming to Class 1 BS EN 61672, Type 1 BS EN 60804 & BS EN 60651: 1994;
- 01dB Metravib MCE 212 Condenser Microphone, PRE 21 S Pre-amp and Connecting Leads;
- 01dB Outdoor Microphone Kit and a
- Tripod.

5.02 The equipment holds current UKAS or equivalent accreditation and serial numbers as follows:

Sound Level Meter 01dB Black Solo	Serial No.	61719
	Calibration Date	30 th July 2020
	Cal Certificate No.	U35361
½" MCE 212 Condenser Mic.	Serial No.	166397
	Calibration Date	30 th July 2020
	Cal Certificate No.	35360/U35361
Calibrator CAL 21	Serial No.	34634297
	Calibration Date	25 th March, 2021
	Cal. Certificate No.	U37495

N.B. Copies of calibration certificates are available upon request.

5.03 The equipment was calibrated both before and after the survey with no difference noted in the levels.

6 RESULTS

- 6.01 The weather during the survey was generally suitable for noise measurement for the weekend period with conditions being dry and calm throughout.
- 6.02 A list of the levels measured is included in Appendix D and represented graphically in Appendix E.
- 6.03 A summary of the time averaged ambient levels and measured background levels over the measurement periods are shown in Table 6.1. The L_{A90} levels presented are based on fifteen-minute measurements in the specified period.

Day	Period	Average $L_{Aeq,T}$ – dB	Range $L_{A90,15min}$ – dB	Representative $L_{A90,15min}$ – dB
Friday 23 rd July, 2021	Day time (0700-1900 hrs)	64.8	52-63	55
	Evening (1900-2300 hrs)	64.4	52-58	54
	Night-time (2300-0700 hrs)	59.7	37-52	40
Saturday 24 th July, 2021	Day time (0700-1900 hrs)	62.9	44-58	54
	Evening (1900-2300 hrs)	62.6	53-57	53
	Night-time (2300-0700 hrs)	60.3	39-53	42
Sunday 25 th July, 2021	Day time (0700-1900 hrs)	63.2	43-58	52
	Evening (1900-2300 hrs)	65.4	50-57	52
	Night-time (2300-0700 hrs)	59.1	32-53	34

Table 6.1: Free-Field Measured Ambient and Measured Background Noise Levels

7 PLANT ASSESSMENT

- 7.01 This application is for the redevelopment of the existing service station. The proposal include the introduction of seven new electric vehicle charging bays and two new jet wash bays. The electrical infrastructure required to support the operation of the charging bays consists of a new substation within a GRP Enclosure, a new LV Panel in a GRP enclosure.
- 7.02 With regards to substation, the exact details for the unit cannot currently be provided and we have therefore used library data we have for a range of substations. A typical source sound power level for a 1500kVA transformer is 56dB(A) ref $10^{-12}W$. For the purposes of this assessment and adopting precautionary principles to provide the most robust outcome, the transformer GRP housing is assumed to provide no attenuation. We understand that no noise is generated from the individual Alphitronic electric vehicle chargers.
- 7.03 With regards to the jet wash bays, EEC Ltd have previously undertaken in-situ measurements of the jet wash plant and operation, which has been used in these calculations. The measured data

is in line with the manufacturer's broad brush published data. Copies of the manufacturer's datasheets for the jet wash, air/water and vacuum stations are included in Appendix F.

Jet washes Istobal model 4CA2000 <70dBA at 1m (Published)

67 dBA* at 1.5m (measured average for a typical 11-minute wash cycle).

**67 dB was the recorded L_{Aeq} over the typical 11-minute wash cycle. Maximum L_{AF} emission values of up to 78 dB were recorded during the ultra-rinse with lance periods (approximately 1.5-2 minutes of the full cycle). Details of this are included in Appendix F.*

7.04 The propagation of noise from the proposed site due to the activities associated with the new installations has been modelled using CadnaA software produce by Datakustik. Calculations are undertaken using the General Method of Calculation from ISO9613-2:1996. Within the noise model, buildings and the immediate topography have been accounted for along with the screening attenuation of the proposed solid barriers to the sides of the jet wash bays (2.6m tall in all directions elevation except the opening on to the forecourt) and around the substation. There is a canopy proposed along the northern elevation above the charging stations that will also provide some additional screening from activity noise but this has not been included within the current model.

7.05 The following operating conditions have been modelled:

- **Peak daytime operation (0700-2200hrs Monday to Sunday)**
All of the facilities (Substation and 2 No. jet wash bays) are assumed to be operational continuously for the course of the BS4142, 1 hour reference time interval.
- **Night time operation (2200-0700hrs Monday to Sunday)**
No Jet wash operation but the electrical infrastructure (substation) serving the seven EV charging bays in use during the course of the BS4142, 15 minute reference time interval for night time.

7.06 The following illustrations show a graphical representation of the resulting noise model and calculated noise levels due to the operating conditions outlined above.

7.07 The results of the noise modelling show that the nearest and most affected dwelling. The calculated noise levels are summarised below:

- 1162 Stockport Road 43 dB(A) daytime 16 dB(A) night time

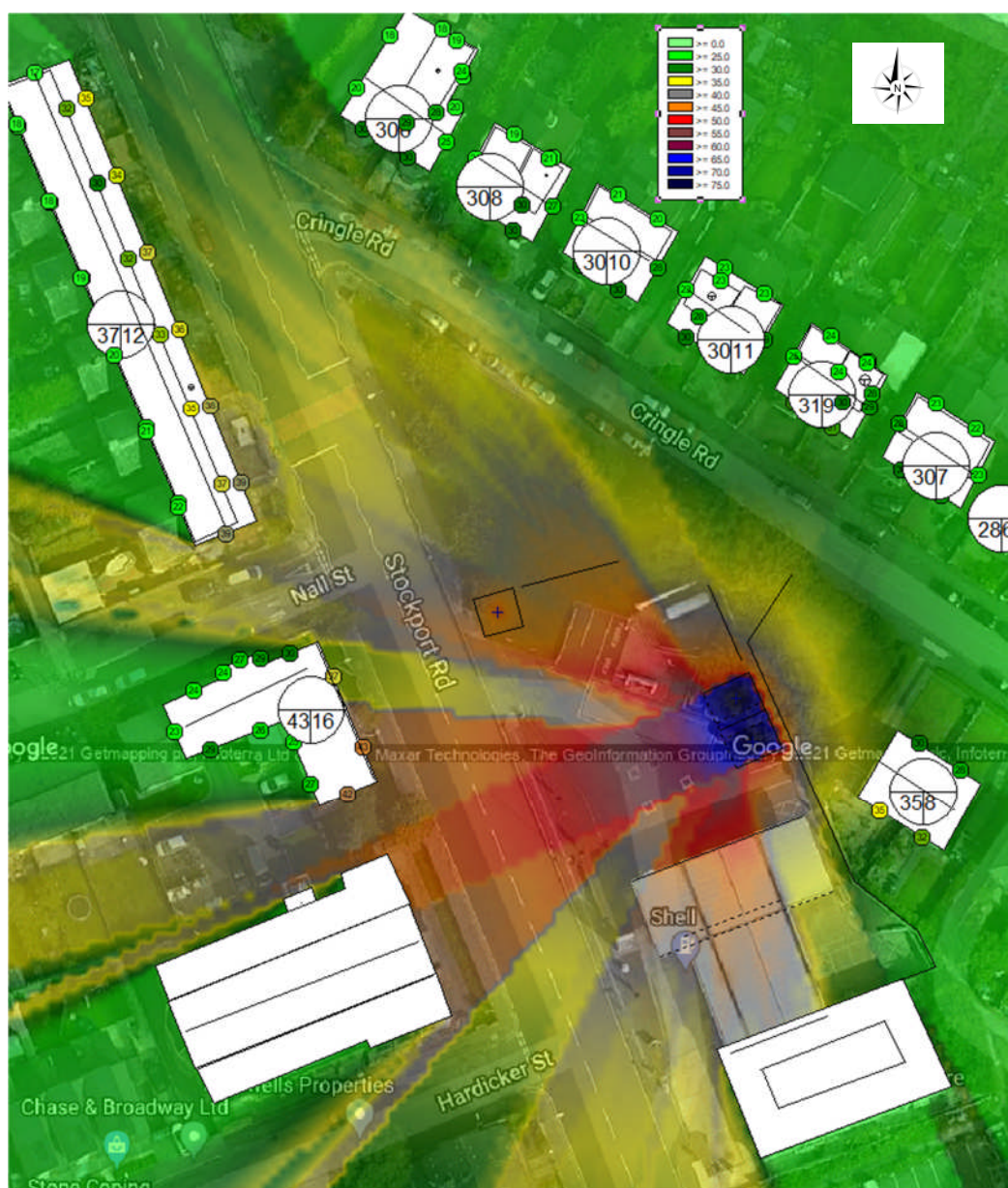
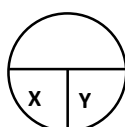


Figure 3: Specific Noise Levels as calculated:
(Substation + jet wash bays operating / Substation only)
 $- L_{Aeq,T}$



X – Daytime noise level – Substation 7 No. Jet wash bays
Y – Night time noise level – Substation only

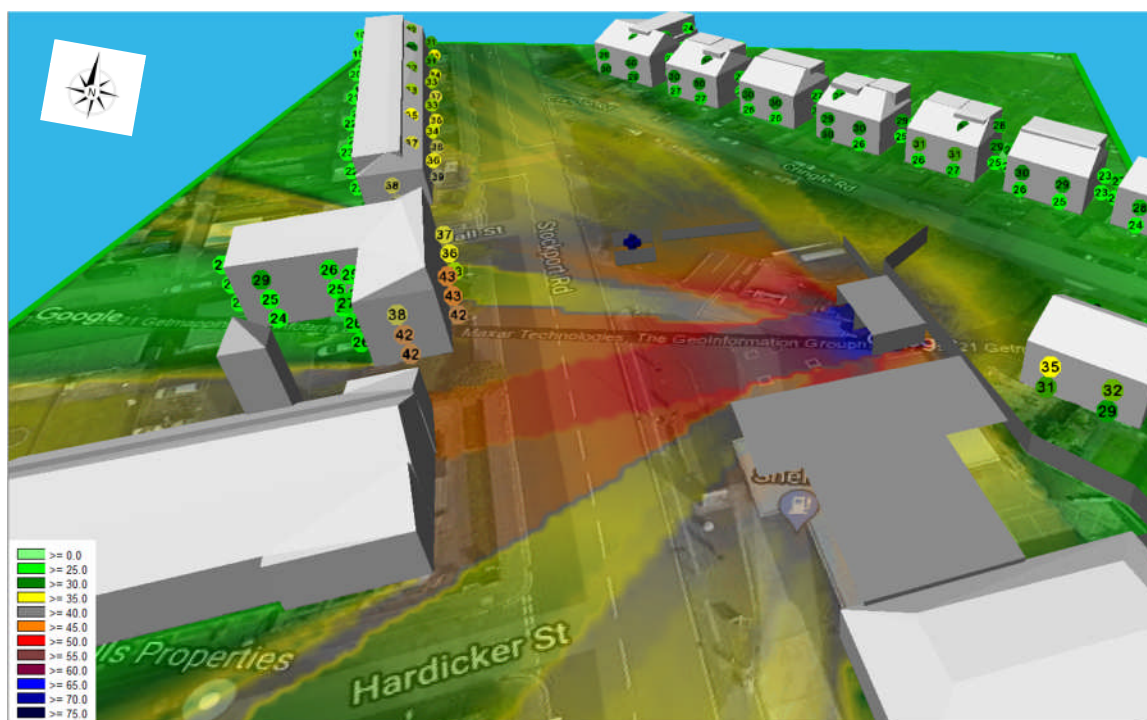


Figure 4: Isometric view of noise propagation all equipment in operation (typical worst case daytime)

8 BS4142 ASSESSMENT

8.01 The impact noise due to the operation of the new facilities has been assessed in accordance with BS4142 for the daytime and night time operating conditions described in Section 7.05.

8.02 From inspection of the noise data recorded over the survey period, the following worst case representative background noise levels have been established and will be used in the assessment for the relevant periods. It is noteworthy that the surveyed noise levels on a Sunday are lower than those on any of the other days, particularly so at night. To provide a robust worst case noise impact assessment we have used the representative background noise levels recorded on the Sunday within our assessment.

- Daytime 0700-2300hrs 52 dB(A) L_{90}
- Night time 2300-0700hrs 34 dB(A) L_{90}

8.03 The following tables show the BS4142 assessment procedure for the activities and periods described above based upon the noise immissions modelled in CadnaA (Section 7 above). The assessments include commentary on context and reference to absolute noise standards found in BS8233:2014, 'Guidance on sound insulation and noise reduction for buildings' and WHO guidelines, summary details of which can be found in Appendix C.

8.04 The assessment refers only to worst-case site wide noise impact for the day and night time periods at the most affected property, 1162 Stockport Road. All other receptors are either further away or are subject to less noise than at 1162 Stockport Road.

1162 Stockport Road– Daytime

Results		Relevant Clause	Commentary
Assessment made during the daytime, so reference time interval is 1 hour		7.2	
Calculated Specific Noise	43 dB $L_{Aeq,1 \text{ hour}}$	7.3.6	Noise modelled using CadnaA, assumes continuous operation of all items during peak periods
Acoustic Character Correction	+ 3 dB	9.2	Switching on and off of the jet wash is expected to be just perceptible
Rating Sound Level	(43+3) dB = 46 dB	9.2	Overall 1 hour level
Background Noise Level	52 dB $L_{A90,1 \text{ hour}}$	8	Representative background during peak periods
Difference	(46-52) dB= -6 dB	11	
Assessment indicates the noise will be of very low impact		11	The site has operated as a commercial business previously and would have included noise of this type and magnitude.
Uncertainty of assessment	Not Significant	10	The noise model uses certified published source data and representative background noise levels are based extended survey including a weekend period.

Table 8.1: BS4142 Assessment for closest dwellings based on all jet wash and EV charging Bays Peak Daytime Activity

1162 Stockport Road – Night time

Results		Relevant Clause	Commentary
Assessment made during the night time, so reference time interval is 15 minutes		7.2	
Calculated Specific Noise	16 dB $L_{Aeq,15 \text{ mins}}$	7.3.6	Noise modelled using CadnaA, assumes continuous operation of all items during peak periods
Acoustic Character Correction	+ 3 dB	9.2	Possible tonal noise from substation
Rating Sound Level	(16+3) dB = 19 dB	9.2	Overall 15 minute level
Background Noise Level	32 dB $L_{A90,15 \text{ mins}}$	8	Quietest representative background during night time periods
Difference	(19-32) dB = -13 dB	11	
Assessment indicates the noise will be of negligible impact.		11	
Uncertainty of assessment	Not Significant	10	The noise model uses certified published source data and representative background noise levels are based extended survey including a weekend period.

Table 8.2: BS4142 Assessment for closest most affected dwelling based on the operation of the substation and power packs supporting the seven EV charging bays - Peak Night Time Activity

- 8.05 As indicated in the above BS4142 assessments, the impacts of the operational noise from the EV charging bays and jet wash bays are not expected to have any significant adverse impact, depending on context. In reality the usage of each element occurring simultaneously, as modelled, is very unlikely.
- 8.06 The context in this instance is that the impact will in practice be effectively mitigated by a number of contributing factors:
- the assessment is based on a worst case of items operating at their maximum capacity.
 - The existing ambient noise level is consistently over 60 dB L_{Aeq} which is significantly higher than the calculated noise levels from the operation of the plant and therefore can be expected to provide some useful masking noise.
 - The noise has been assessed against background noise levels that were recorded during the Government Lockdown when local traffic and activity was likely subdued. The measured background noise levels could therefore be expected to be lower than during more normal, non-lockdown periods.
- 8.07 Additional reviews of the operational noise levels are presented below in the context of established and accepted absolute design targets and metrics for noise in dwellings as described in BS8233:2014, 'Guidance on sound insulation and noise reduction for buildings'.
- 8.08 The following review considers levels of noise that will result within the properties accounting for the noise reductions that will occur as sound passes across the building facades.
- 8.09 The sound insulation of the façade is very much governed by the type of glazing and whether the windows are open or not. Both cases are considered here assuming minimum levels of 20dB sound insulation likely from basic closed thermal double glazed windows. A typical loss of 15dB could be expected for noise passing through a partially open window.
- 8.10 Table 8.3 presents the noise levels that could be expected within the dwellings against the relevant BS 8233 design criteria. We have presented the summary based on the most affected receptors.

Location	Period	Condition	Calculated $L_{Aeq,1hour}$ external	Minimum sound reduction loss	Resultant internal ambient noise level	BS8233 Design Criterion
1162 Stockport Road	Daytime	Windows Closed	43 dB	20 dB	<23dB(A) $L_{eq,15minutes}$	35dB(A) $L_{eq,16 hour}$
		Windows Open	43 dB	15dB	28dB(A) $L_{eq,15 minutes}$	35dB(A) $L_{eq,16 hour}$
	Night time	Windows Closed	16 dB	20 dB	0dB(A) $L_{eq,15minutes}$	30dB(A) $L_{eq,8 hour}$
		Windows Open	16 dB	15dB	1dB(A) $L_{eq,15 minutes}$	30dB(A) $L_{eq,8 hour}$

Table 8.8: Calculated Worst Case Internal Ambient Noise levels within closest dwellings

- 8.11 The assessment demonstrates that the guideline internal noise values would be achieved even with windows open during the night time. There is not expected to be any significant L_{Amax} levels associated with the plant operation associated with the EV Charging bays at night. During the daytime with the windows open the assessment would indicate the 16 hour desirable noise limit

could be exceeded, however as detailed in Table 6.1 the average ambient noise level currently experienced in the vicinity of the dwellings is over 62dB(A) L_{eq} which is 10dB higher than the worst case activity noise levels emanating from the proposed plant during the daytime. Therefore to achieve the desirable levels stated within BS8233 against the existing noise climate the resident would already have to have their windows closed.

9 CONCLUSIONS

- 9.01 MBH Design Studio Ltd has appointed Environmental Equipment Corporation Limited to undertake a noise assessment for the new fit out of the MFG Levenshulme site in Manchester.
- 9.02 The assessment has been carried out in accordance with national planning guidance and current British Standard guidance and is based on an environmental noise survey conducted at the site over a weekend period during the third Government enforced lockdown.
- 9.03 A noise assessment has been undertaken to evaluate the potential worst case noise impact of the proposed operations and equipment.
- 9.04 The assessment has shown that during the respective daytime and night time operation of all services will be of low impact at all the nearest receptors.
- 9.05 During the night time it is assumed that the jet wash bays will be closed with the potential that only the EV charging bays will be kept open
- 9.06 On the basis of this assessment it is considered that noise does not pose a material constraint to planning permission for the redevelopment of the site being granted.

APPENDIX A

GLOSSARY OF TECHNICAL TERMS

ACOUSTIC TERMINOLOGY

Absorption Classes	The sound absorption of a material is rated from Class A to Class E, where Class A materials provide the highest level of sound absorption.
Ambient Noise Levels	Noise levels measured in the absence of noise requiring control, frequently measured to determine the situation prior to the additional of a new noise source.
dB	Decibel. The logarithmic unit of sound level.
dBA	A-weighted decibel. The A-weighting approximates the response of the human ear.
$D_{nT,w}$	Weighted standardized level difference. A single number quantity of the sound level difference between two rooms. $D_{nT,w}$ is typically used to measure the on-site sound insulation performance of a building element such as a wall, floor or ceiling. Measured in accordance with BS EN ISO 16283-1 and weighted in accordance with BS EN ISO 717-1.
$D_{n,e,w}$	The weighted element-normalized level difference. A single number rating of the sound reduction provided by a sound passing through an individual element. $D_{n,e,w}$ is typically used to define the sound insulation provided by ventilators. Measured in accordance with BS EN ISO 10140-2:2010 and rated in accordance with BS EN ISO 717-1.
Flanking	Transmission of sound energy through paths adjacent to the building element being considered. For example, sound may be transmitted around a wall by travelling up into the ceiling space and then down into the adjacent room.
Frequency	Sound can occur over a range of frequencies extending from the very low, such as the rumble of thunder, up to the very high such as the crash of cymbals. Sound is generally described over the frequency range from 63Hz to 4kHz, roughly equal to the range of frequencies on a piano.
Impact Sound	Sound produced by an object impacting directly on a building structure, such as footfall noise or chairs scrapping on a floor.
$L_{Aeq,t}$	The equivalent continuous sound level measured in dBA. This is commonly referred to as the average noise level. 't' is the interval time for the measurement. Typically 't' of 16hrs and 8hrs is used for day and night time ambient noise respectively or 't' is defined by the period of interest in BS4142 assessments.
$L_{A90,t}$	The noise level exceeded for 90% of the measurement period, measured in dBA. This is commonly referred to as the background noise level.
$L'_{nT,w}$	Weighted, standardized impact sound pressure level. A single number rating of the impact sound insulation of a floor/ceiling when impacted on by a standard "tapper" machine. The lower the $L'_{nT,w}$, the better the acoustic performance. Measured in accordance with BS EN ISO 140-7 and rated in accordance with BS EN ISO 717-2.
NR	Noise Rating. A single number rating which is based on the sound level in the octave bands 31.5Hz – 8kHz inclusive, generally used to assess noise from mechanical services in buildings.
Octave Band	Frequencies are often grouped together into octaves for analysis. Octave bands are labelled by their centre frequency which are: 63Hz, 125Hz, 250Hz, 500Hz, 1kHz, 2kHz and 4kHz.
Reverberation Time (T_{mf})	Reverberation time is used for assessing the acoustic qualities of a space. It is defined as the time it takes for an impulse to decay by 60dB. T_{mf} is the arithmetic average of the reverberation time in the mid frequency bands (500Hz, 1kHz and 2kHz).
R_w	Weighted sound reduction index. A single number rating of the sound insulation performance of a specific building element. R_w is measured in a laboratory. R_w is commonly used by manufacturers to describe the sound insulation performance of building elements such as plasterboard and concrete. Measured in accordance with BS EN ISO 10140-2:2010 and rated in accordance with BS EN ISO 717-1.
Sound Absorption	When sound hits a surface, some of the sound energy is absorbed by the surface material. Sound absorption refers to the ability of a material to absorb sound, rated from 0, complete reflection, to 1, complete absorption.
Sound Insulation	When sound hits a surface, some of the sound energy travels through the material. 'Sound insulation' refers to the ability of a material to prevent the travel of sound.
Structure-borne transmission	Transmission of sound energy as vibrations via the structure of a building.

APPENDIX B

**SITE PLAN
&
MEASUREMENT LOCATION**

APPENDIX C
PLANNING POLICY
AND GUIDANCE

National Planning Policy Framework and the Noise Policy Statement for England

The Department for Communities and Local Government published the National Planning Policy Framework (NPPF) on 27th March 2012 (as amended on 19th June 2019) and upon its publication, the majority of planning policy statements and guidance notes were withdrawn, including Planning Policy Guidance 24 Planning and Noise, which previously presented the government's overarching planning policy on noise.

Paragraph 170 in Section 15 of the NPPF (2019), entitled Conserving and enhancing the natural environment, states that:

"Planning policies and decisions should contribute to and enhance the natural and local environment by:

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability..."

Paragraph 180 in Section 15 also states that:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason..."

The Department for Environment Food and Rural Affairs published the Noise Policy Statement for England (NPSE) in March 2010. The explanatory note of NPSE defines the following terms used in the NPPF:

"NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

2.21 Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur."

The NPSE does not define any of the above effect levels numerically.

The NPSE presents the Noise Policy Aims as:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy and sustainable development:

avoid significant adverse impacts on health and quality of life;
mitigate and minimise adverse impacts on health and quality of life; and
where possible, contribute to the improvement of health and quality of life."

It can be seen that the first two bullet points are similar to Section 11 of the NPPF, with a third aim that seeks to improve health and quality of life. The NPSE later expands on the Noise Policy Aims, stating:

2.23 The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development (paragraph 1.8).

2.24 The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur.

2.25 This aim (the third aim), seeks where possible, positively to improve health and quality of life through the pro-active management of noise while also taking into account the guiding principles of sustainable development (paragraph 1.8), recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim."

It is clear that noise described in the NPSE as SOAEL that would lead to significant adverse effects should be avoided, although there is no definition as to what constitutes a significant adverse effect. Similarly, noise should be mitigated where it is high enough to lead to adverse effects, termed the LOAEL, but not so high that it leads to significant adverse effects.

British Standard 4142

To assess the acceptability of the resultant noise levels we have consulted the relevant standards. BS 4142:2014 'Methods for rating and assessing industrial and commercial sound' has been used to assess the likelihood any adverse impacts based on the resultant noise level from the new plant item, including any corrections for the character of the noise against the existing background noise level.

BS4142 gives guidance on assessing the likelihood of adverse impacts by calculating a 'rating level' of the new noise source and comparing its magnitude at noise sensitive locations to the existing or underlying background noise level. The background noise level is subtracted from the 'rating level' to assess the likelihood of complaints:

- The greater the difference the greater the likelihood of complaints.
- A difference of around +10dB or more is an indication of a significant adverse impact, depending on the context.
- A difference of +5dB is likely to be an indication of an adverse impact, depending on the context.
- The lower the rating level is relative to the measured background noise level, the less likely it is that the specific sound source will have an adverse impact or significant adverse impact. Where the rating level does not exceed the background

sound level, this is an indication of the specific sound source having a low sound impact, depending on the context.

This assessment is carried out over a one hour period for the daytime and a fifteen minute period for the night-time. For the purposes of the standard it states that daytime and night-time are typically 07:00 to 23:00 hours and 23:00 to 07:00 hours respectively.

The 'rating level' of the noise source is obtained taking the following factors into consideration:

- The new plant noise (the specific noise) is measured or predicted in terms of L_{Aeq} .
- An additional correction shall be included if the noise contains a distinguishable, discrete continuous note, if the noise contains distinct impulses or if the noise is irregular enough to attract attention. The value for any tonal noise can be an addition of up to 6dB and for impulsive noise of up to 9dB.

BS 4142 goes onto state that:

'The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.'

BS4142 has been referenced in setting noise limits for any fixed plant proposed as part of the proposed development.

APPENDIX D
SURVEY RESULTS
(TABULAR)

APPENDIX E
SURVEY RESULTS
(GRAPHICAL)

EC 18541 - MFG Levenshulme

MBH Design Studio Ltd

Tabulated Noise data

Sheet 1 of 4

Time	L _{Aeq}	L _{AMax}	L _{A90}
07:30	63.6	79.0	54.2
07:45	63.3	81.3	53.4
08:00	62.4	80.4	52.3
08:15	62.7	69.8	55.3
08:30	62.4	70.0	55.5
08:45	63.1	74.9	54.7
09:00	62.8	73.7	54.9
09:15	62.0	72.0	55.1
09:30	62.5	74.1	54.6
09:45	65.4	87.4	55.1
10:00	62.9	82.2	55.3
10:15	63.0	81.7	54.2
10:30	62.4	70.9	57.0
10:45	65.5	86.3	55.4
11:00	61.5	72.2	56.2
11:15	59.8	71.5	54.1
11:30	59.9	70.9	53.5
11:45	62.8	83.0	55.6
12:00	63.2	77.7	54.2
12:15	66.1	76.4	63.0
12:30	65.2	76.9	63.1
12:45	64.7	75.0	58.2
13:00	61.2	72.4	55.2
13:15	62.0	73.6	55.2
13:30	62.5	78.0	56.8
13:45	62.2	80.6	56.5
14:00	62.2	75.1	57.1
14:15	62.3	74.4	57.0
14:30	62.8	73.0	57.9
14:45	63.7	82.2	57.0
15:00	62.5	71.0	55.6
15:15	65.9	90.4	57.4
15:30	67.6	95.2	56.9
15:45	62.8	73.3	56.7
16:00	66.2	89.8	56.8
16:15	62.9	77.8	56.8
16:30	62.9	77.1	57.0
16:45	64.0	83.2	57.4
17:00	64.2	87.6	56.1
17:15	62.5	70.9	56.4
17:30	64.2	84.4	56.8
17:45	62.6	70.8	58.3
18:00	62.8	78.7	57.4
18:15	63.2	73.8	57.5
18:30	75.9	106.6	58.2
18:45	63.8	82.8	57.6
19:00	66.1	96.8	56.4
19:15	63.2	76.4	57.7

Time	L _{Aeq}	L _{AMax}	L _{A90}
19:30	63.3	77.1	54.9
19:45	65.8	90.3	56.4
20:00	70.4	94.0	55.3
20:15	62.4	71.3	54.8
20:30	63.3	81.6	56.2
20:45	62.1	70.3	55.5
21:00	62.9	88.4	55.8
21:15	61.9	80.6	56.6
21:30	63.1	84.4	56.4
21:45	62.2	80.5	54.9
22:00	61.6	71.1	54.4
22:15	62.5	84.7	54.2
22:30	64.9	89.9	52.4
22:45	63.7	84.7	51.5
23:00	61.2	79.9	51.5
23:15	62.0	75.7	50.9
23:30	61.1	72.5	50.3
23:45	61.0	74.9	47.3
00:00	60.9	70.3	50.7
00:15	60.3	70.5	47.4
00:30	60.7	73.2	50.3
00:45	59.4	75.2	46.9
01:00	59.4	72.0	47.9
01:15	60.2	70.9	48.3
01:30	58.9	70.9	44.1
01:45	59.7	77.7	46.5
02:00	59.1	69.5	45.2
02:15	58.6	69.4	43.5
02:30	57.7	69.1	41.9
02:45	58.9	76.8	41.2
03:00	58.1	77.1	40.7
03:15	57.7	70.9	40.8
03:30	59.0	76.4	43.0
03:45	57.8	70.8	37.1
04:00	59.2	71.7	41.7
04:15	59.4	74.8	43.0
04:30	58.4	69.4	38.4
04:45	58.7	76.5	43.4
05:00	59.7	73.7	43.4
05:15	59.0	69.2	42.3
05:30	58.2	72.0	39.4
05:45	60.6	77.4	39.0
06:00	60.2	78.0	43.3
06:15	59.8	73.2	42.4
06:30	61.1	75.3	48.5
06:45	60.6	72.9	47.9
07:00	60.3	72.4	44.1
07:15	60.8	76.5	45.9

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Tabulated Noise data

Sheet 2 of 4

Time	L _{Aeq}	L _{AMax}	L _{A90}
07:30	60.2	71.4	47.0
07:45	61.1	71.9	48.6
08:00	62.0	74.0	50.3
08:15	61.4	77.4	48.7
08:30	61.8	72.2	52.1
08:45	61.8	68.7	54.0
09:00	61.1	69.7	48.7
09:15	61.7	79.2	51.2
09:30	64.4	87.5	54.3
09:45	61.9	70.8	53.2
10:00	62.6	73.5	54.6
10:15	62.2	72.3	51.5
10:30	64.6	86.5	56.5
10:45	66.1	93.0	56.7
11:00	62.3	70.0	55.6
11:15	62.1	76.8	53.7
11:30	63.0	81.1	57.2
11:45	62.6	77.4	55.9
12:00	63.2	81.8	54.8
12:15	62.2	73.8	54.2
12:30	62.5	76.4	55.9
12:45	63.7	84.6	54.5
13:00	63.1	73.8	58.3
13:15	63.5	80.0	56.9
13:30	62.8	76.1	57.0
13:45	62.5	70.6	56.4
14:00	62.6	77.5	56.4
14:15	63.7	86.1	56.7
14:30	62.0	71.1	56.6
14:45	62.8	73.8	56.9
15:00	62.6	78.2	57.1
15:15	62.2	75.2	56.7
15:30	66.4	92.6	56.0
15:45	62.6	72.6	56.4
16:00	62.8	81.6	55.6
16:15	62.6	81.6	56.7
16:30	63.4	80.7	56.8
16:45	62.8	73.1	55.8
17:00	63.4	78.6	56.4
17:15	62.8	80.7	57.0
17:30	65.5	89.0	55.7
17:45	64.2	83.4	55.7
18:00	63.1	74.1	56.2
18:15	63.3	80.1	55.2
18:30	62.8	72.6	56.3
18:45	63.2	73.6	56.7
19:00	64.6	80.6	56.1
19:15	63.5	81.9	57.3

Time	L _{Aeq}	L _{AMax}	L _{A90}
19:30	63.4	77.7	56.3
19:45	63.0	73.8	55.3
20:00	62.7	72.4	54.7
20:15	63.0	74.6	56.8
20:30	62.5	79.7	55.8
20:45	62.8	72.0	56.2
21:00	63.3	84.0	54.8
21:15	61.9	75.8	53.6
21:30	61.9	75.7	54.1
21:45	61.3	73.6	53.6
22:00	61.6	73.0	53.1
22:15	61.4	71.7	52.8
22:30	62.4	80.7	53.3
22:45	61.4	75.5	53.0
23:00	62.0	71.5	52.9
23:15	61.9	72.7	50.7
23:30	61.4	71.5	50.7
23:45	61.4	75.6	49.8
00:00	61.1	72.9	49.9
00:15	61.0	75.6	51.1
00:30	62.7	94.4	48.7
00:45	61.2	74.9	50.2
01:00	60.7	72.1	47.4
01:15	61.0	79.5	44.8
01:30	59.7	69.6	45.9
01:45	61.6	72.0	52.0
02:00	60.3	76.6	48.0
02:15	60.6	79.1	46.3
02:30	60.7	70.0	45.7
02:45	59.3	71.9	43.8
03:00	58.0	79.0	43.0
03:15	59.5	71.6	43.7
03:30	59.3	71.8	44.9
03:45	59.2	71.8	42.6
04:00	59.0	73.4	42.7
04:15	59.5	71.7	41.8
04:30	59.9	77.0	43.3
04:45	59.7	79.1	39.1
05:00	57.8	70.5	41.4
05:15	58.2	70.6	39.2
05:30	58.4	70.3	42.9
05:45	58.7	69.9	42.6
06:00	59.1	70.8	46.7
06:15	59.5	72.3	41.7
06:30	60.7	76.4	47.4
06:45	60.9	72.8	47.4
07:00	60.3	71.0	46.0
07:15	58.9	69.4	43.2

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Tabulated Noise data

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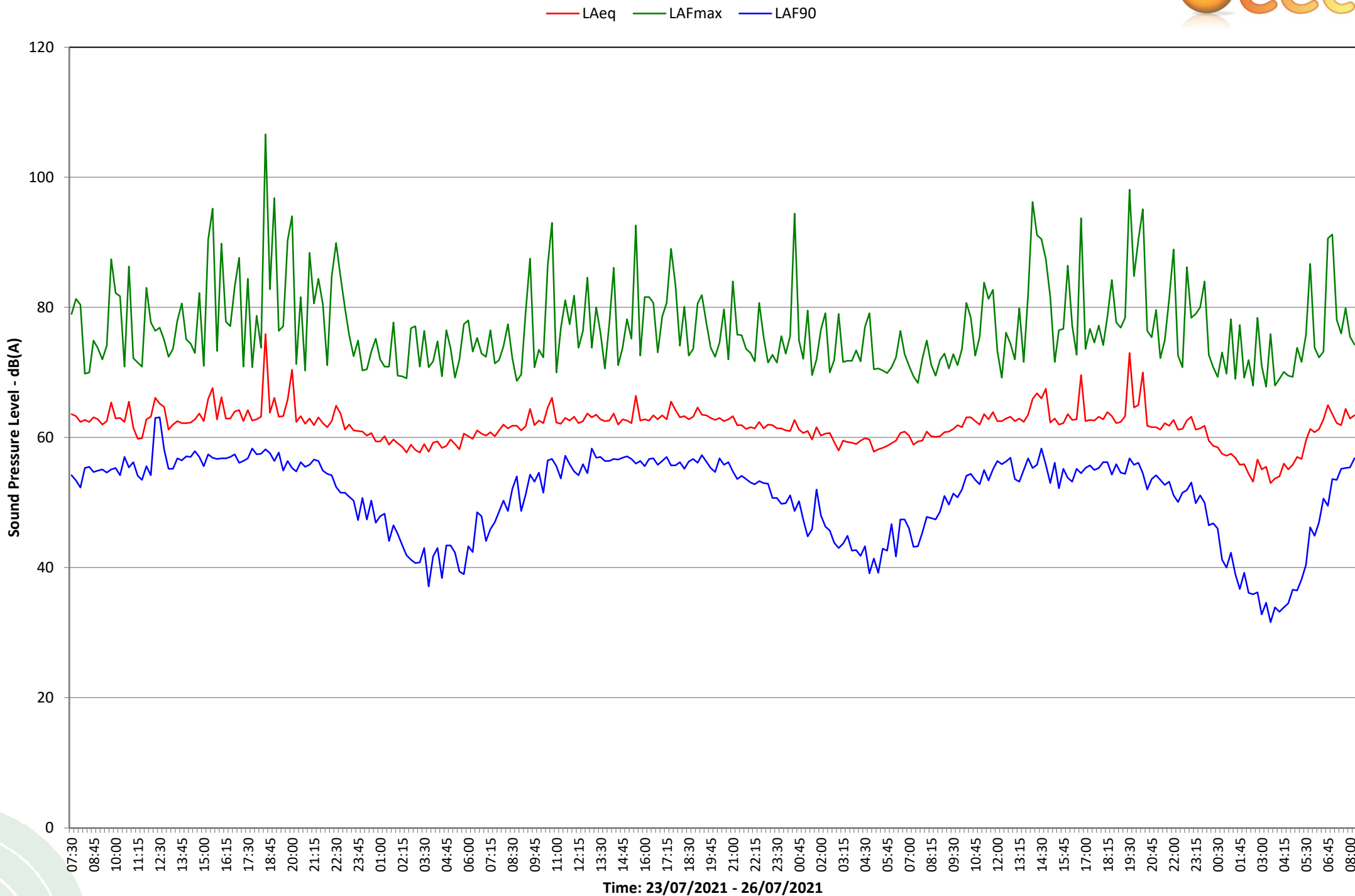
Time	L _{Aeq}	L _{AMax}	L _{A90}
07:30	59.4	68.4	43.3
07:45	59.5	72.1	45.4
08:00	60.9	74.9	47.8
08:15	60.2	71.2	47.6
08:30	60.1	69.5	47.4
08:45	60.2	71.9	48.6
09:00	60.8	72.9	51.0
09:15	60.9	70.6	49.7
09:30	61.3	72.8	51.4
09:45	61.9	71.1	50.8
10:00	61.6	73.6	52.0
10:15	63.1	80.7	54.1
10:30	63.1	78.4	54.4
10:45	62.5	72.6	53.5
11:00	62.0	75.5	52.8
11:15	63.6	83.8	55.0
11:30	62.8	81.3	53.4
11:45	63.9	82.7	55.1
12:00	62.5	73.3	56.4
12:15	62.5	69.2	55.9
12:30	62.9	76.1	56.3
12:45	63.2	74.4	56.9
13:00	62.5	72.0	53.6
13:15	62.9	79.9	53.2
13:30	62.4	71.6	55.0
13:45	63.5	82.1	56.8
14:00	65.9	96.2	55.3
14:15	66.8	91.1	55.8
14:30	66.0	90.5	58.3
14:45	67.5	87.4	55.8
15:00	62.3	81.6	53.0
15:15	62.9	71.6	56.1
15:30	62.0	76.5	52.2
15:45	62.2	76.7	55.2
16:00	63.6	86.4	53.8
16:15	62.7	77.2	53.2
16:30	62.8	72.7	55.2
16:45	69.6	93.7	54.5
17:00	62.5	73.6	55.3
17:15	62.7	76.7	55.7
17:30	62.6	74.6	55.0
17:45	63.2	77.2	55.3
18:00	62.8	74.2	56.2
18:15	63.9	78.6	56.2
18:30	63.3	84.2	54.3
18:45	62.2	77.7	55.9
19:00	62.4	76.9	54.6
19:15	63.3	78.4	54.4

Time	L _{Aeq}	L _{AMax}	L _{A90}
19:30	73.0	98.1	56.8
19:45	64.6	84.8	55.8
20:00	65.0	90.4	56.1
20:15	70.0	95.1	54.5
20:30	61.8	76.4	52.0
20:45	61.6	75.4	53.6
21:00	61.6	79.6	54.2
21:15	61.2	72.2	53.5
21:30	62.2	74.9	52.7
21:45	61.8	81.3	53.2
22:00	62.7	88.9	51.1
22:15	61.2	72.6	50.1
22:30	61.3	70.8	51.5
22:45	62.6	86.2	51.9
23:00	63.2	78.4	53.1
23:15	61.2	79.0	49.9
23:30	61.4	80.0	51.1
23:45	61.8	84.0	50.0
00:00	59.5	72.7	46.5
00:15	58.7	70.8	46.8
00:30	58.5	69.3	46.0
00:45	57.5	73.1	41.2
01:00	57.2	69.8	40.0
01:15	57.5	78.2	42.3
01:30	56.9	69.0	39.0
01:45	55.8	77.3	36.7
02:00	55.9	69.2	39.2
02:15	54.4	71.9	36.1
02:30	53.2	68.0	35.9
02:45	56.6	78.4	36.2
03:00	55.1	71.0	32.8
03:15	55.5	67.8	34.6
03:30	53.0	75.9	31.6
03:45	53.7	68.0	33.9
04:00	54.0	69.0	33.2
04:15	56.0	70.1	33.9
04:30	55.1	69.5	34.5
04:45	55.8	69.3	36.6
05:00	57.0	73.8	36.5
05:15	56.7	71.6	38.2
05:30	59.5	75.8	40.4
05:45	61.3	86.7	46.2
06:00	60.8	73.8	44.9
06:15	61.3	72.3	47.0
06:30	62.8	73.2	50.6
06:45	65.0	90.6	49.5
07:00	63.6	91.2	53.6
07:15	62.2	78.1	53.5

APPENDIX F

PUBLISHED PLANT NOISE DATA

Noise Level Time History at MFG Levenshulme





GENERAL DESCRIPTION 4CA20

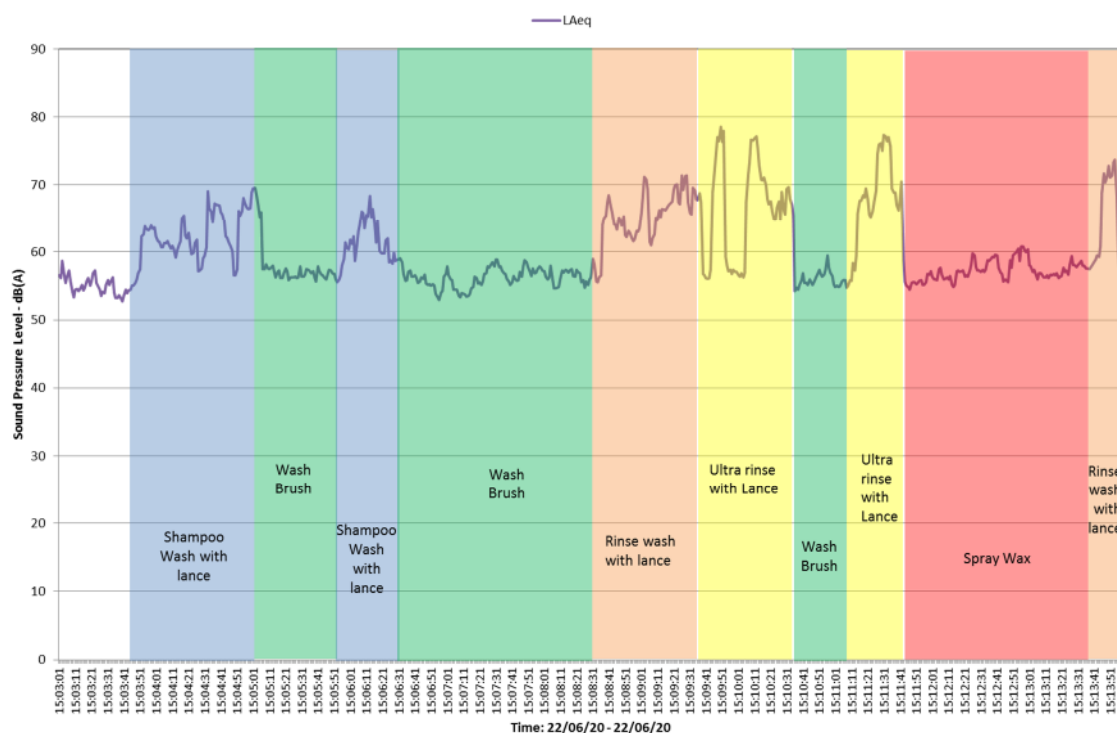
12

TECHNICAL SPECIFICATIONS

NOISE CONTROL

The level of sound pressure with equivalent weighing is less than 70 dB.

Noise Level Time History at Jet Wash Noise



EEC Ltd in-situ measurements of typical jet wash cycle, at a distance of approximately 1.5m.