Car-lift Noise Assessment

For

3 Greenaway Gardens, London

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Issue	Final
Revision	0

CONTENTS:

1 INTRODUCTION

1.01 CSG Acoustics has been appointed by My Construction & Carpentry Limited to undertake a noise assessment to support a planning application for 3 Greenaway Gardens, London, NW3 7DJ.

1.02 A Car-lift is proposed to be located towards the front of the site to facilitate underground parking. In light of this, and at the request of Camden Council, a noise assessment is required.

1.03 The assessment includes:

- The results of a noise survey conducted at the site over a typical daytime / night-time period;
- Plant noise limits based on the Local Authority's planning policy; and
- Assessment of the operation of plant items associated with the Car-lift in accordance with the Local Authority's guidelines.

1.04 This report is technical in nature, therefore to assist the reader explanations of the relevant terminology are presented in Appendix A.

2 EXISTING AND PROPOSED SITE

2.01 3 Greenaway Gardens, a three storey detached property, is located to the western kerbside of Greenaway Gardens in a predominantly residential area of West Hampstead.

2.02 Proposals are to update and reconfigure the ground, first and second floors and to construct new basement and lower basement levels.

2.03 The refurbishment proposals include the installation of a Car-lift, to be located at the front of the property, adjacent to Greenaway Gardens.

2.04 The site is bound by the following;

- North – 4 Greenaway Gardens, a similarly sized residential property to the site;
- East – Greenaway Gardens Road, a lightly trafficked residential access route, with similarly sized residential properties beyond;
- South – 2 Greenaway Gardens, a similarly sized residential property to the site; and
- West – The rear gardens of properties fronting Bracknell Gardens.

2.05 The Car-lift (Model Marte) is presented in Appendix B of this report, and is proposed to be located at the front of the site as per the architectural drawing below. The two closest noise sensitive locations are also presented below, 2 and 4 Greenaway Gardens, with 18 Greenaway Gardens being located to the north-east of the figure.

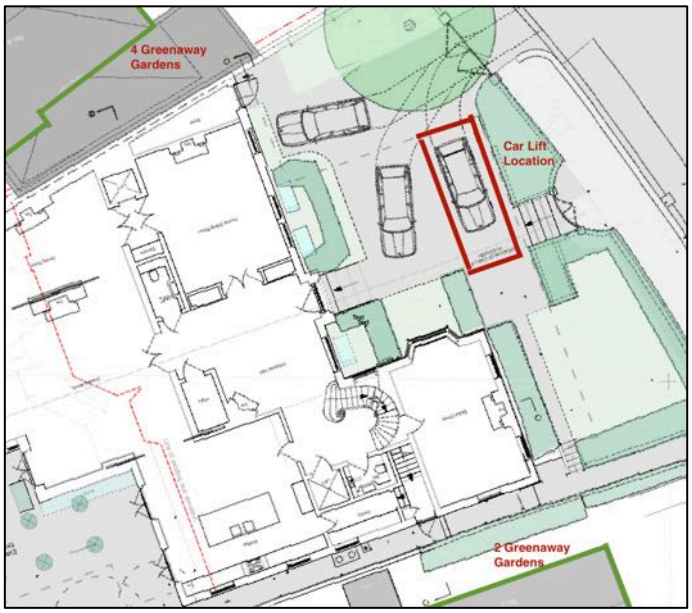


Figure 2.1: Location of Proposed Car-lift and Proximity to Closest Noise Sensitive Receptors

2.06 The only plant noise-generating component of the lift is due to the actuation of the electric motor that is used to move fluid to the hydraulic cylinders. The motor is engaged to lift the platform and also to drop the platform.

2.07 The motor is proposed to be located below the steel platform, underneath the workings of the lift, in the north-west corner of the lift pit.

2.08 The following additional detail has been provided by the lift manufacturer;

- Travel up time (motor on) – 75 seconds
- Travel down time (motor on) – 75 seconds
- Motor Sound Power Level – 65dB

3 GUIDANCE

3.01 This assessment has been undertaken in accordance with National and Local planning policy for Camden Borough Council and relevant British Standards.

3.02 A summary of the pertinent points of each document is presented below.

National Planning Policy

3.03 The National Planning Policy Framework (NPPF) and the Noise Policy Statement for England (NPSE) form the overarching noise policy for developments within England and the UK.

3.04 A summary of the four aims of the NPPF are presented below;

- avoid noise from giving rise to significant adverse impacts;
- mitigate noise and reduce to a minimum;
- recognise that development will often create some noise; and
- identify and protect areas of tranquillity.

3.05 The NPPF does not provide any detail with regards to criteria or impacts relating to noise. However, the NPSE, which is referenced with regards to the NPPF, has similar aims and provides the following effect categorisations;

> *"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."*

3.06 It is not made clear in either document, the noise level at which the 'effect' is triggered.

3.07 As such, and with relation to this application, it is standard practice to rely on the guidance contained in British Standard (BS) 4142:2014 – *'Methods for rating and assessing industrial and commercial sound'* which provides a framework to predict noise related impacts associated with items of fixed plant.

3.08 BS4142 states:

> *"The likelihood of noise provoking complaints is assessed by subtracting the background noise level from the rating noise level.*

a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a 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 impact, depending on the context."

3.09 Relating the above back to the aims of the NPPF and 'effects' listed in the NPSE would imply the following;

- SOAEL : 10dB above the measured background noise level;
- LOAEL : 5dB above the measured background noise level; and
- NOEL : 10dB below the measured background noise level.

3.10 The above 'effect' levels form the basis of this assessment against the aims of the NPPF.

Local Planning Policy

3.11 Camden Borough Council's 'development plan' alongside the 'Mayor's London Plan' form the basis for planning decisions in the borough.

3.12 The Mayor's London Plan sets out an integrated economic, environmental, transport and social framework for the development of the capital over the next 20-25 years. The aims set out in the London Plan reflect those provided in both the NPPF and NPSE.

3.13 Camden's Local Development Framework consists of a number of documents, including the Core Strategy, Development Policies and Camden Planning Guidance.

3.14 The Core Strategy (2010-2025) sets out the key vision for the borough and lists DP28 Noise and Vibration as a Development Policy, which sets out detailed planning criteria that is used to determine applications for planning permission in the borough.

Development Policy 26 (DP26) references noise and vibration by stating;

"The Council will protect the quality of life of occupiers and neighbours by only granting permission for development that does not cause harm to amenity."

3.15 The pertinent text stated in Policy D28 relating to this application is reproduced below as an extract from Table E of that policy;

Noise description and location of measurement	Period	Time	Noise level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	5dB(A) <LA90
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise at 1 metre external to sensitive façade where LA90>60dB	Day, evening and night	0000-2400	55dBLAeq'

Table E: Noise levels from plant and machinery at which planning permission will not be granted

3.16 A noise sensitive development is stated in the policy as including housing, schools and hospitals as well as offices, workshops and open spaces.

3.17 As the proposed Car-lift exhibits none of the characteristics in the second and third rows of Table E, for the purposes of this assessment, the design target will be to ensure that the rating noise (L_{Ar}) level of the new plant is at least 5dB less than the existing background noise at the noise sensitive locations.

3.18 With regard to the aspirations of the NPPF and NPSE the limits adopted above would suggest that noise emissions would be considered to have a low impact, depending on the noise conditions and site context and would therefore be categorised as being between the NOEL and the LOAEL.

4 MEASUREMENTS

4.01 Environmental noise measurements have been carried out over a typical weekday and weekend period, between 14:45 hours on Thursday 11th May 2017 and concluded 12:15 on Monday 15th May, to establish the existing noise levels at the front of the site. The survey methodology and results are set out below.

4.02 Noise measurements have been carried out at the front garden of the site with the microphone located 4 meters above ground level, in a free-field location. This measurement location was chosen to represent background noise levels at the front of the site, in particular the front and side elevations of 2 and 4 Greenaway Gardens.

5 EQUIPMENT

5.01 The equipment used for the survey was as follows:

- 01dB Metravib Fusion 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 with Connecting Leads;
- 01dB Outdoor Microphone Kit;
- Cirrus Research CR511E Acoustic Calibrator;
- Tripod.

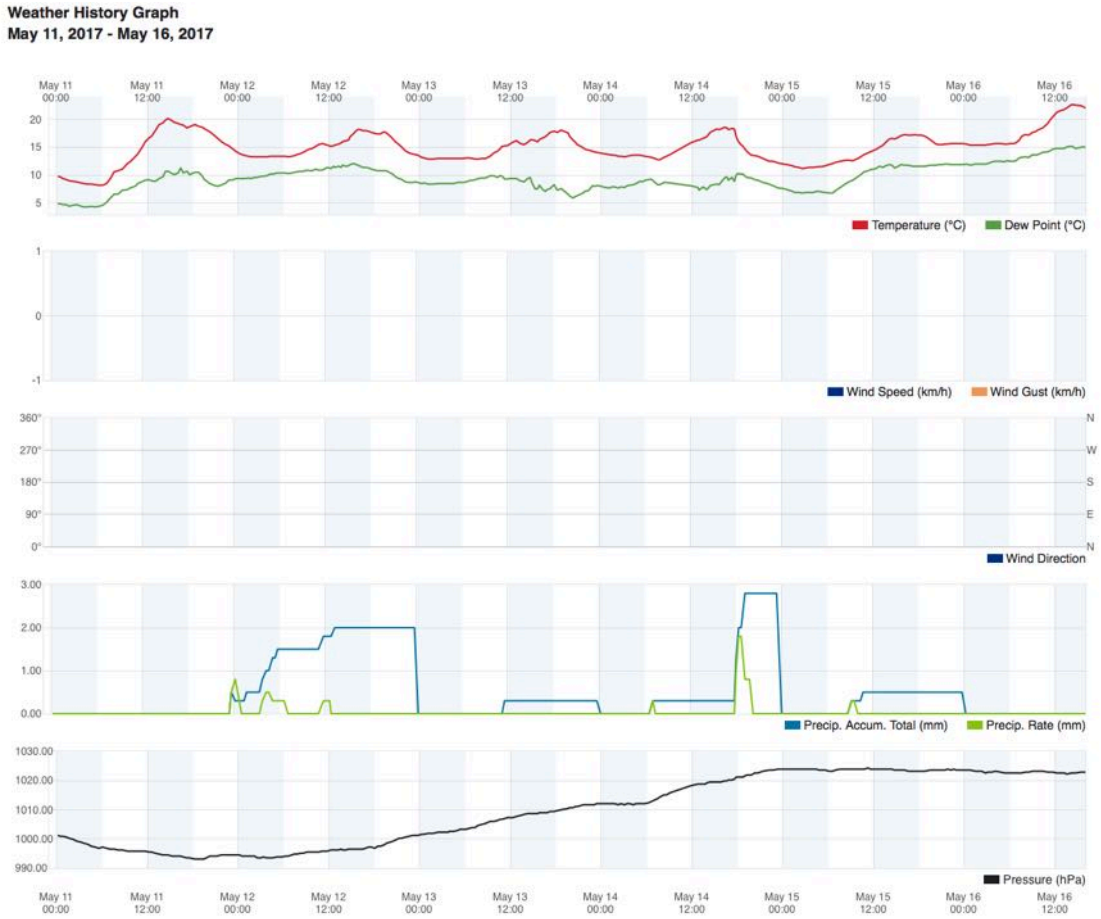
Position 1	Sound Level Meter 01dB Fusion	Serial No.	10816
		Calibration Date	4/5/2017
		Cal Certificate No.	03219/1
	½" 40 CE Condenser Mic.	Serial No.	217624
		Calibration Date	4/05/2017
		Cal Certificate No.	03219/1
Calibrator	Calibrator Model 511E	Serial No.	033927
		Calibration Date	4/05/17
		Cal Certificate No.	03146/1_R1

Table 5.1: Noise Survey Equipment

6 RESULTS

6.01 The noise survey was mostly unattended, with observations taken by the surveyor during the start and end of the measurements.

6.02 The weather during the survey period was considered suitable for noise measurements, it being dry with sporadic winds for the majority of the measurement period. Light rain occurred twice during the middle of the measurement period, but was not considered to adversely affect the readings. A graphical weather summary for the period is provided below. The data is taken from the closest weather station with the available data (ILONDON157).



6.03 Noise sources observed at the measurement location were not considered to be out of character for an inner city residential location. Sources noted included birdsong, road traffic, construction noise and aircraft flying overhead.

6.04 A summary of the lowest measured background levels are shown in Table 6.1, based on a 15-minute measurement period.

6.05 A list of the levels measured is represented graphically in Appendix C.

Position	Period	Lowest L_{A90} – dB
1 – Front Garden	Daytime (07:00–19:00 hrs)	35
	Evening (19:00–23:00 hrs)	37
	Night-time (23:00–07:00 hrs)	33

Table 6.1: Free-Field Measured Lowest Background Noise Levels

6.06 A histogram of the measured L_{A90} noise levels is presented below to show the distribution of background noise levels.

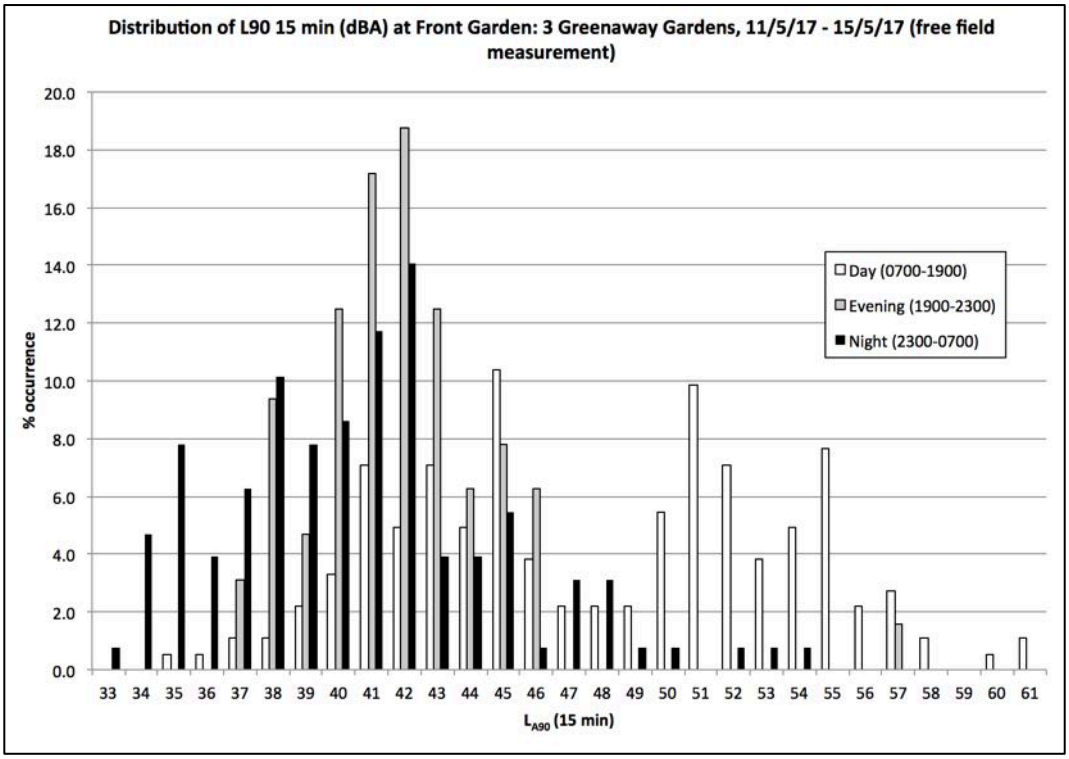


Figure 6.1: Position 1 – Histogram of Noise Levels With Respect to Time Period

6.07 BS 4142 (2014) suggests that the risk of uncertainty in gathered data should be considered.

6.08 Figure 6.1 supports the reliability of the data. The lowest noise levels measured within each time period are an accurate representation of the lowest levels experienced at the sound meter due to the normal distribution of results and low percentage occurrence of the lowest levels.

6.09 There is some variation in the daytime distribution of levels This is likely to be from construction noise. However the lower half of the results demonstrate a typical normal distribution, and as such the lowest daytime level can be stated with confidence.

7 CAR-LIFT ASSESSMENT

7.01 This report is to support a planning application for a Car-lift to be located to the front of 3 Greenaway Gardens.

7.02 Based on the standard requirements of Camden Council and the lowest measured background noise level in each time period, Table 7.1 sets out the recommended noise limits, based on achieving 5dB below the measured background noise level 1m external to the nearest/worst affected noise receptors.

Measurement Position	Period	Proposed Noise Limit L_{Ar}
1	Day	30
	Evening	32
	Night	28

Table 7.1: Suggested Plant Noise Emission Limits Based on Measured L_{A90}, Free-field dB

7.03 Note that the limits suggested above are rating levels and as such any design should take into account the acoustic characteristics of the plant. In this instance the Car-lift motor displays none of the characteristics whereby the acoustic correction should be applied.

7.04 It should be noted that should any other items of plant be installed as part of the development, the cumulative noise from all items should not exceed the limits stated in Table 7.1.

7.05 To facilitate noise predictions at the closest, worst affected noise sensitive receptors a proprietary noise model of the Car-lift and surrounding architecture has been constructed.

7.06 In this instance a noise model has been used to demonstrate compliance, as there are a number of propagation pathways and reflections that will contribute to the overall noise level.

7.07 The model assumes the following;

- ISO9613 prediction methodology
- Second order acoustic reflections
- All ground is 50% absorbing
- All buildings are modelled as structured facades

7.08 The following acoustic and architectural assumptions have been made;

- The Car-lift pit is 4m in depth;
- The motor of the Car-lift is located in the bottom, north- western corner of the pit;
- The pit walls are reflective (structured elevations);
- The receiver locations are 1m from the assessment facades in accordance with the requirements of the Local Authority;
- The sound power level of the motor (65dB) has been extrapolated into an octave band level based on a standard spectrum of a similarly sized motor; and
- As a worst case, and due to likely penetrations surrounding the platform, the sound insulation of the lift platform has been assumed to provide 5dB reduction.

7.09 It should be noted that the parking of a car in the basement space will require one up and one down motion of the car lift. During a 15-minute period, which is a reasonably suggested assessment period, this would only happen once. Therefore, it would be normal to apply a correction to the sound power level to account for the motor action extrapolated over a 15-minute period.

7.10 The correction to the Sound Power level would be the following;

- 10*log(75s (up motion time)+75s (down motion time)/900s (15 minutes))

7.11 The above would equate to a reduction in the Sound Power level of 8dB. In this instance, and to assess a worst-case, this correction has not been applied to the original Sound Power level.

7.12 The calculation below is a replication of the direct noise path from the motor to the worst effected noise sensitive receptor (upper floor of 2 Greenaway Gardens). The below has been used to corroborate the results demonstrated in the noise model.

Item	Figure	Notes
(A) Motor SWL (Linear)	65dB	As provided by the manufacturer
(B) A-weighted correction	-7dB	Based on typical motor spectrum
(C)Lift Platform correction	-5dB	Based on no line of sight
(D)Distance correction	-38dB	10*log(1/(4*pi()*22^2)
(E)Barrier correction	-8dB	Due to pit architecture
Total Noise Level (A+B+C+D+E)	7dBA	Direct Noise Level (dBA)

Table 7.2: Demonstration Of Noise Calculation to Confirm Noise Model Predictions

7.13 Note that the above calculated noise level of 7dBA at the worst effected location accounts for the direct noise only. The model calculation includes various reflective pathways to calculate the overall noise level, which in this instance is 10.5dBA.

7.14 Predictions have been undertaken at the closest surrounding dwellings, at all floor levels. The worst effected, being the upper floors of 2 and 18 Greenaway Gardens.

7.15 Figure 7.1 presents the predicted worst-case noise level at upper floors of 2 Greenaway Gardens (South) and 18 Greenaway Gardens (East). Note that the thin white lines denote reflections of buildings and the level attributed to the areas of equal sound level are presented in the key.

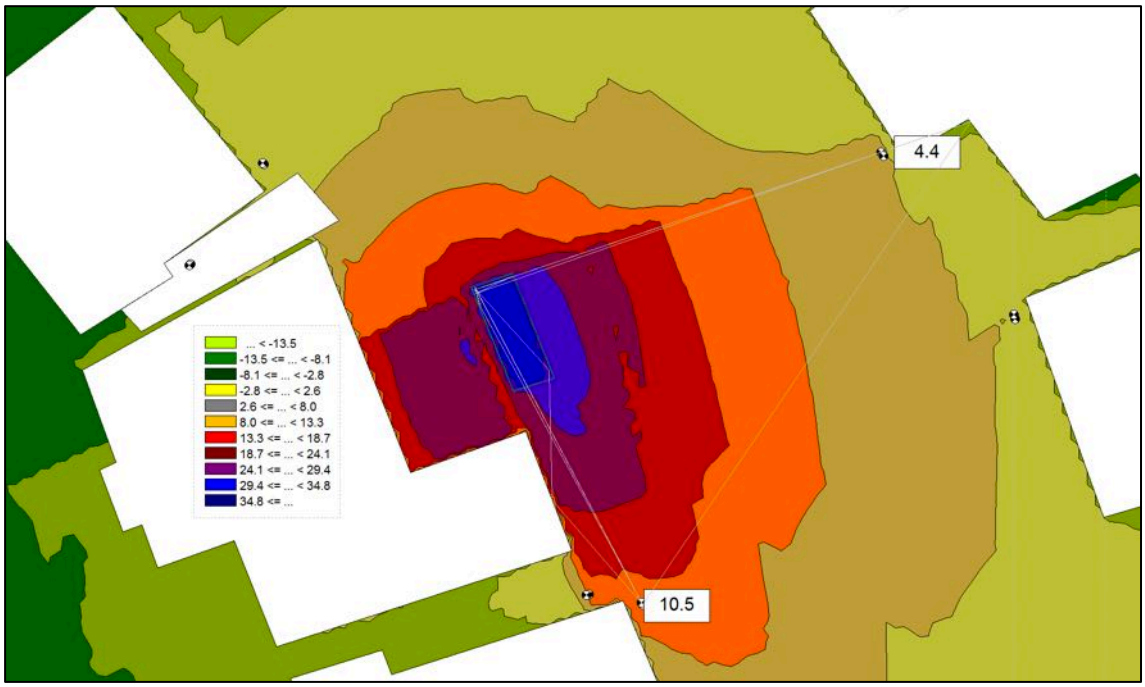


Figure 7.1: Propagation of Noise Level and Reflected Pathways

7.16 It can be seen from the above that the predicted highest noise level due to the operation of the Car-lift motor is the front window of the upper floor of 2 Greenaway Gardens.

7.17 Figure 7.2 presents a 3D view looking towards the site with the Car-lift pit located centrally; with 2 Greenaway Gardens to the left and 4 Greenaway Gardens to the right.

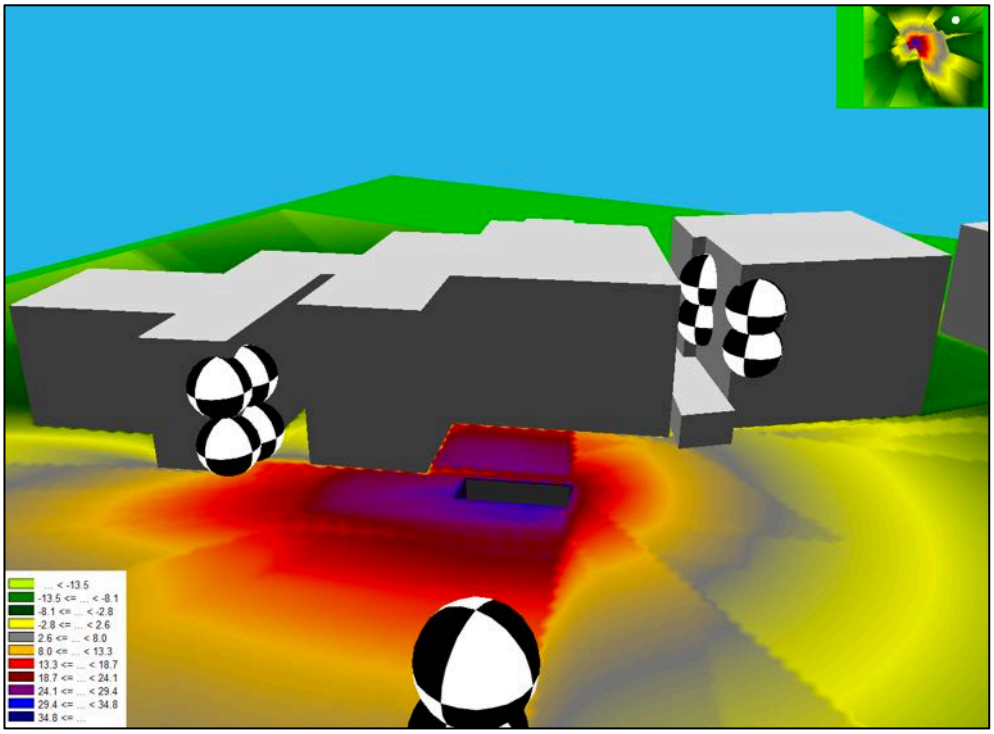


Figure 7.2: 3D View showing Car-lift Pit and Neighbouring Receptors

7.18 Table 7.2 presents a summary of the worst-case predicted noise levels at the relevant assessment location and compares the noise level with the required local authority criteria.

Location	Period	Predicted Noise Level	Criteria	Exceedance of Criteria
2 Greenaway Gardens	Day	11dBA	30dBA	-19dB
	Evening	11dBA	32dBA	-21dB
	Night	11dBA	28dBA	-17dB
18 Greenaway Gardens	Day	4dBA	30dBA	-26dB
	Evening	4dBA	32dBA	-28dB
	Night	4dBA	28dBA	-24dB

Table 7.2: Assessment of Predicted Noise Levels Based on Proposed Noise Limit, Free-field dB(A)

7.19 It can be seen from Table 7.2 that predicted noise levels based on the operation of the Car-lift motor are far below the planning noise criteria required by Camden Council. The predicted noise levels will therefore be considerably below

the measured background noise levels and would have a low impact on the noise climate surrounding the site.

7.20 With respect to the NPPF, achieving the noise limits would be classified as being below the NOEL.

8 CONCLUSION

8.01 CSG Acoustics has been appointed by My Construction & Carpentry Limited to undertake a noise assessment to support a planning application for plant associated with the proposed Car-lift to be located at the front of 3 Greenaway Gardens, London, NW3 7DJ.

8.02 The assessment has been carried out in accordance with national planning guidance and the requirements of Camden Council, and is based on an environmental noise survey conducted at the front of the site over a mid-week and weekend period.

8.03 Plant noise limits have been set based on the methodology contained in BS4142, the results of a background noise survey and the requirements of DP28 of the Borough's Development Policies.

8.04 Assuming proposed operation of the Car-lift meets the levels stated in Table 7.1 the requirements of DP28 (5dB below the measured background noise level) will be met at all assessment locations.

8.05 Worst-case noise levels are predicted to be 11dBA at the closest worst affected noise sensitive receptor, 2 Greenaway Gardens. 11dBA is a minimum of 17dB below the lowest criteria required by Camden Council.

8.06 With regards to BS4142, predicted noise levels show that the noise levels due to the motor would be well below the measured background noise levels and therefore would be considered to have a low impact on the noise climate surrounding the site.

8.07 Assessing the site in accordance with the principles of the National Planning Policy Framework has shown that predicted noise levels would be at the NOEL, the No Observed Effect Level.

8.08 In light of the above, noise is not considered to be a constraint to the operation of the Car-lift.

APPENDIX A

GLOSSARY OF TECHNICAL TERMS

TECHNICAL TERMS AND UNITS

Decibel (dB) – The unit used to describe sound. A logarithmic scale is used to describe sound pressure levels and sound power levels. The logarithms used are to base 10; hence, an increase of 10dB in sound pressure level corresponds to a doubling in perceived loudness of the sound.

Sound Power Level (SWL) – This is a product of the source alone and is independent of its surroundings. It is a measure of the amount of sound power output measured in decibels.

Sound Pressure Level (SPL) – This is a function of the source and its surroundings and is a measure of the sound pressure at a point in space. The sound pressure measured or reported can be influenced by room/mounting conditions and the distance that the measurement is taken.

Octave Bands – The human ear is sensitive to sound over a range of approximately 20 Hz to 20 KHz and is generally more sensitive to medium and high frequencies than to low frequencies. In order to define the frequency content of a noise, the spectrum is divided into frequency bands and the sound pressure level is measured in each band. The most commonly used frequency bands are octave bands, in which the mid frequency of each band is twice that of the band below it.

"A" Weighting – A number of frequency weightings have been developed to imitate the ear's varying sensitivity to sound of different frequencies. The most commonly used weighting is the "A" weighting. The "A" weighted SPL can be measured directly or derived from octave or one-third octave band SPLs. The result is a single figure index which gives some idea of the subjective loudness of the sound, but which contains no information as to its frequency content.

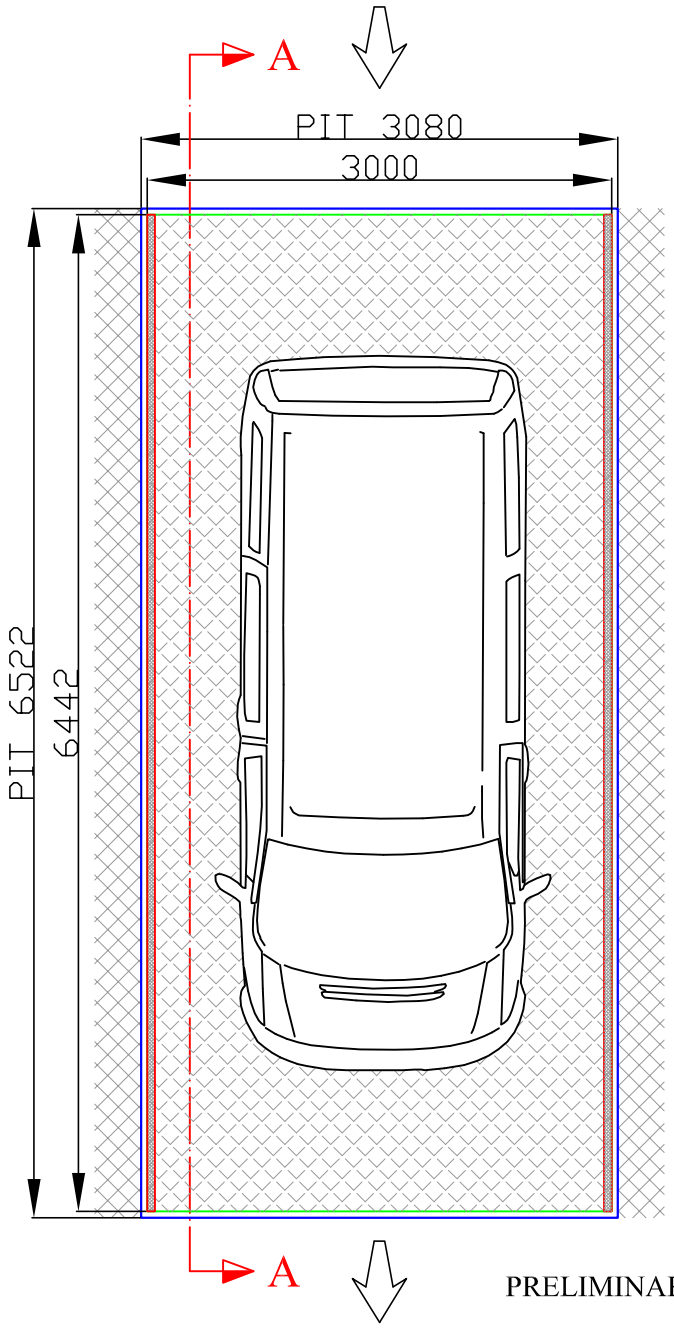
Intermittency and Time-Weighting – The degree of annoyance caused by a noise also depends on its duration and intermittency of a noise. Intermittent, impulsive or repetitive noises tend to be more annoying than continuous noises. Various time-weightings have been derived to measure sounds of differing intermittences and these can be measured directly on modern equipment. The most common time-weightings in use are as follows:-

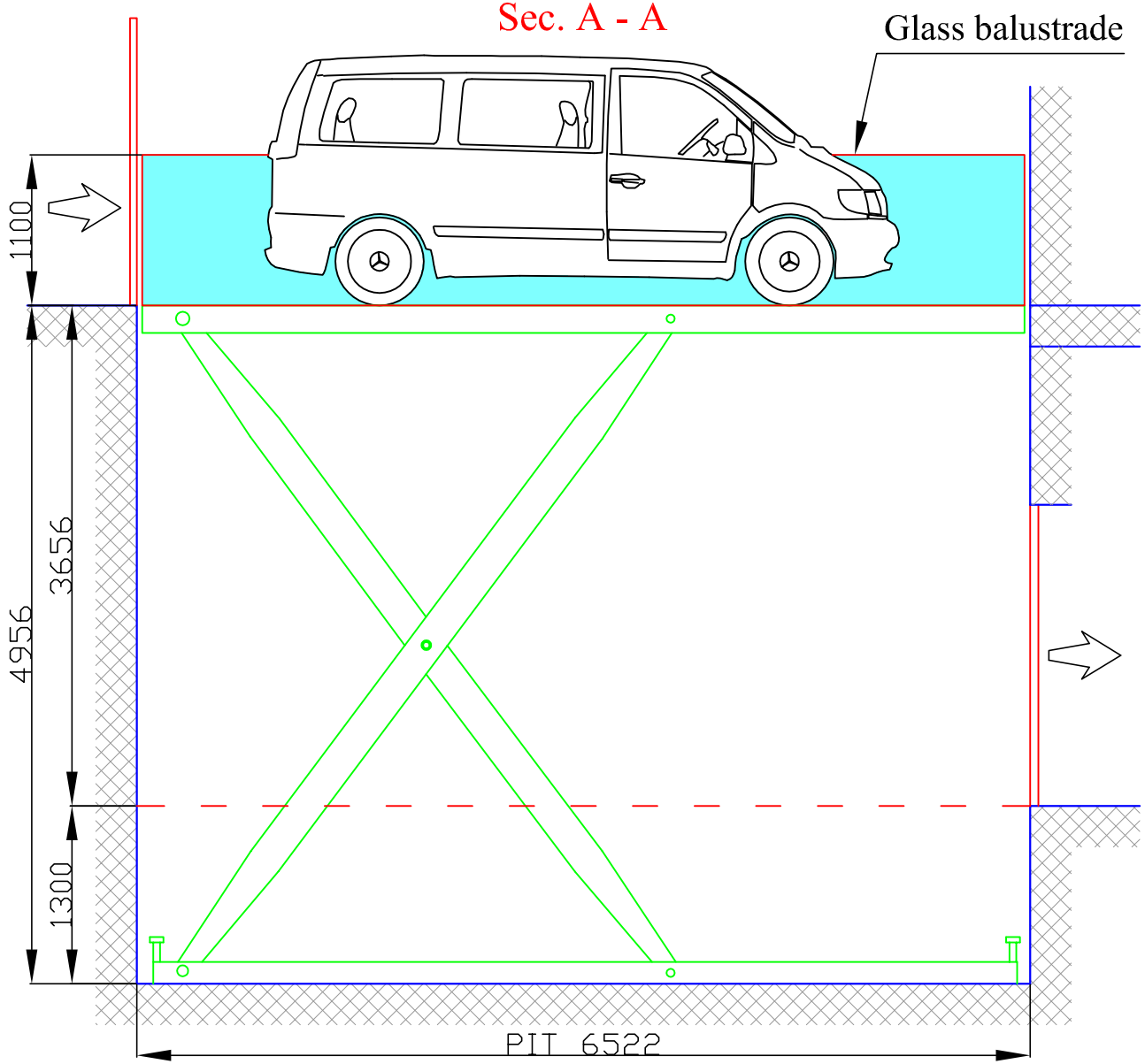
L_{90} This is the sound pressure level exceeded for 90% of the measurement period. It is widely used to measure background noise levels.

L_{eq} The equivalent continuous noise level is often used to measure intermittent noise. It is defined as the notional steady noise level that would contain the same acoustic energy as the varying noise. Because the averaging process used is logarithmic, the L_{eq} level tends to be dominated by the higher noise levels measured.

APPENDIX B

CAR-LIFT DRAWING





PRELIMINARY DRAWING: DIMENSIONS ARE SUBJECT TO ADJUSTMENTS.

PROTECTION TO BE DEFINED.

ECOSPACE
SOLUZIONI DIMENSIONALI

Off. ____/2017

Disegno realizzato in AUTOCAD

28/04/2017

Car lift mod. Marte
Capacity: 3.000 Kg

Drw. 1

APPENDIX C

NOISE SURVEY RESULTS GRAPHICAL

3 Greenaway Gardens - Front Garden measurement (Freefield)