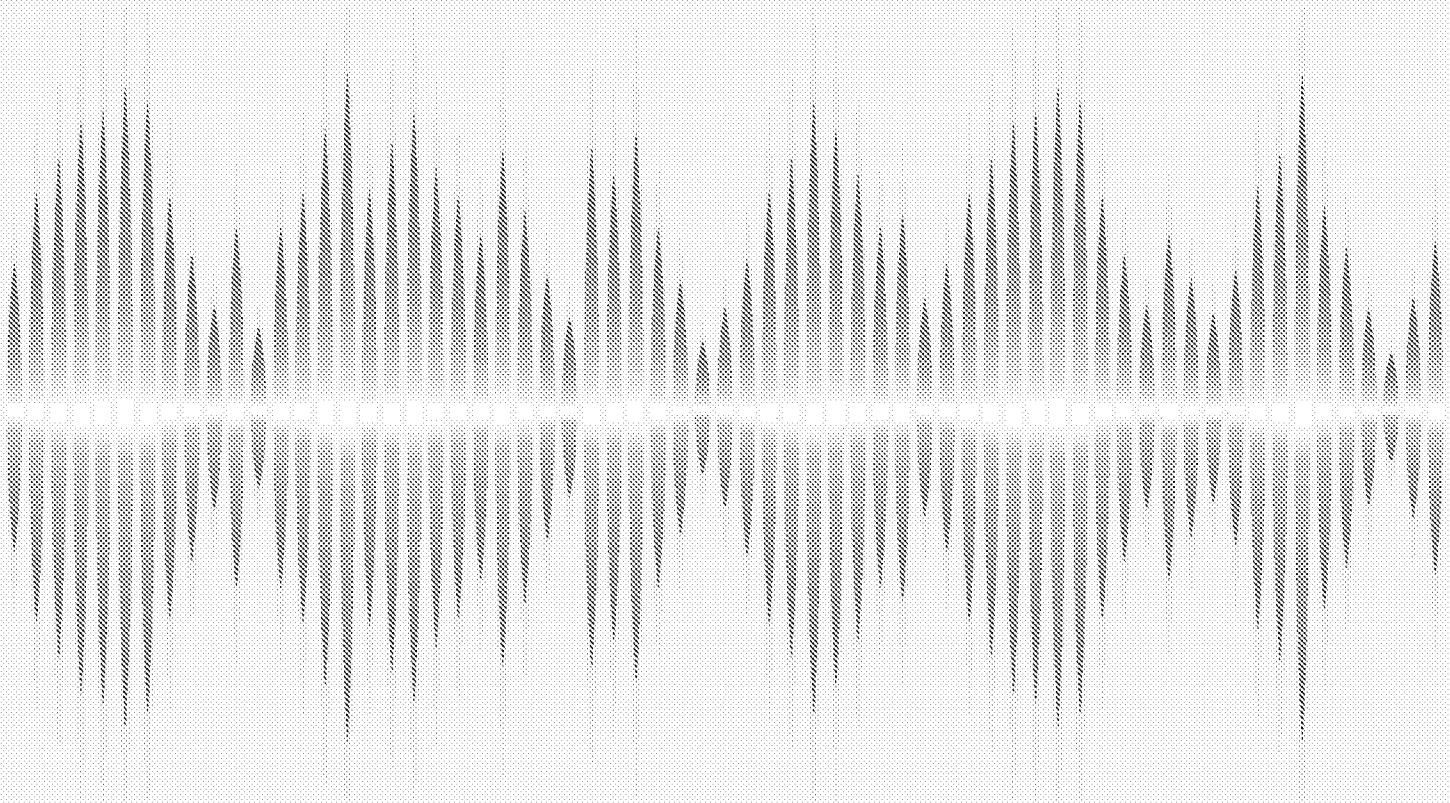


REPORT
NOISE IMPACT ASSESSMENT
PROPOSED NEW CARPARKING AREA FOR A PROPOSED RESIDENTIAL PREMISES

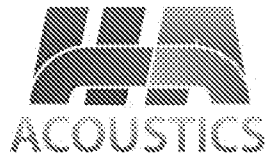
SITE ADDRESS
99 VICTORIA DRIVE, BOGNOR REGIS, WEST SUSSEX PO21 2DZ



REFERENCE
HA/AE71/V1

HEALTHY ABODE ACOUSTICS
BUILDING ACOUSTICIANS & ENVIRONMENTAL NOISE CONSULTANTS

Our Ref HA/AE71/V1
Site Address 99 Victoria Drive, Bognor Regis, West Sussex, PO21 2DZ
For Mr Sam Quinn (Samson Carpentry Contractors)
Client Address 19 Crophorn Drive, Climping, West Sussex BN17 5GG
Date of Report 11 March 2022
Author Mr Jack Tunstall PGDip (IOA), AMIOA
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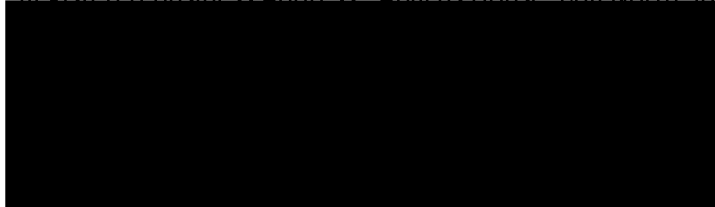


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This report has been prepared by Healthy Abode Limited t/a HA Acoustics with all reasonable expertise, care and diligence. The survey and report has been undertaken in accordance with accepted acoustic consultancy principles, it takes account of the services and terms and conditions agreed verbally and in writing between HA Acoustics and our client. Any information provided by third parties and referenced is considered to have undergone suitably thorough third-party checks to ensure accuracy. We can accept no liability for errors with a third-party data. This report is confidential to our client and therefore HA Acoustics accepts no responsibility whatsoever to third parties unless formally agreed in writing by HA Acoustics. Any such party relies upon the report at their own risk.

EXECUTIVE SUMMARY

- Mr Sam Quinn on behalf of Samson Carpentry Contractors instructed Healthy Abode Ltd t/a as HA Acoustics to undertake a noise impact assessment for the proposed addition of 9 carparking facilities at 99 Victoria Drive, Bognor Regis, West Sussex PO21 2DZ and to discharge planning condition 9.
- It is proposed to demolish an existing dwelling and erect a three-story building to provide 9 flats. As part of the proposal, 9 new parking spaces are proposed to the rear of the proposed property. The development was approved following a planning appeal and is subject to planning conditions. In planning condition 9 (ref. BR/3/22/DOC) Arun's District Council's Planning department raised concern over the potential for noise from cars utilizing the proposed car parking spaces affecting the existing neighbouring residential premises.
- HA Acoustics has undertaken an environmental noise survey at the site in order to determine prevailing background noise levels that are representative of the nearest noise sensitive receptors (NSR). The nearest NSR to the proposed car parking location is 97 Victoria Drive a detached residential dwelling with external amenity, which borders the site to the west. The site also borders the external amenity of 95 & 101 Victoria Drive and 5,7, 9 and 11 Hillsboro Road.
- A baseline noise survey and assessment has been undertaken with measurements being taken over continuous 5-minute periods. The unattended survey was conducted on Wednesday 16th February 2022 – Monday 28th February 2022, at a fixed monitoring point, located to the north façade of the site. Due to adverse weather conditions caused by storms, only data from the 25th February 2022 to 28th February 2022 has been used in this assessment.
- The typical background noise level has been calculated at 39dB $L_{A90,15mins}$ during the daytime and 33dB $L_{A90,15mins}$ at night.
- Acoustic modelling has been carried out of the proposed car park. The results of the modelling have been assessed considering the National Planning Policy Framework (NPPF), Noise Policy Statement for England (NPSE) and the internal noise level guidelines as stated in BS8233:2014.
- In accordance with NPPF and NPSE, the noise impact during the daytime and night-time from the proposed carparking with a 2m acoustic barrier to the east façade is a ***"No Observed Effect Level"*** at the nearby residential dwellings.

TABLE OF CONTENTS

EXECUTIVE SUMMARY.....	3
1. INTRODUCTION	5
2. SITE DESCRIPTION.....	6
3. ENVIRONMENTAL NOISE SURVEY METHODOLOGY	8
4. EXTERNAL NOISE EMISSION CRITERIA.....	10
5. NOISE SURVEY RESULTS.....	14
6. NOISE MODEL	16
7. NOISE IMPACT ASSESSMENT	17
8. PROPOSED ACOUSTIC BARRIER	20
9. UNCERTAINTY	23
10. CONCLUSION	24

Appendices

Appendix A – Site Location and Monitoring Positions (SP1)

Appendix B – Time History (TH1)

Appendix C – Acoustic Modelling Results (C.1 – C.6)

Appendix D – Architectural Drawings

1. INTRODUCTION

- 1.1. Mr Sam Quinn on behalf of Samson Carpentry Contractors instructed Healthy Abode Ltd t/a HA Acoustics to undertake a noise impact assessment at 99 Victoria Drive, Bognor Regis, West Sussex PO21 2DZ. An acoustic report is required as part of documentation to be provided to the Local Authority, Arun District Council to discharge planning condition 9.
- 1.2. 99 Victoria Drive, Bognor Regis, is proposing to develop the north of the site to include 9 new car parking spaces which will service the new proposed development, the noise from which could have the potential to affect existing noise sensitive properties nearby.
- 1.3. The purposes of this report are:
 - 1.3.1. To determine prevailing environmental noise levels affecting surrounding properties due to nearby noise sources (e.g. road traffic);
 - 1.3.2. Based on the above, to predict the impact of the proposed parking in accordance with the requirements of NPPF, NPSE and BS8233:2014.
 - 1.3.3. To undertake an assessment to demonstrate compliance with the Local Authority noise requirements.

2. SITE DESCRIPTION

2.1. 99 Victoria Drive, Bognor Regis, West Sussex PO21 2DZ (hereafter referred to as 'the site') is a private residential premises located on Victoria Drive. It is proposed to demolish the existing dwelling and erect a three-story building comprising of 9 flats. Planning consent has been granted for the residential premises, with condition. The proposal includes 9 car parking spaces to the rear of the proposed flats. Arun's District Council's Planning department raised concern over the potential for noise levels from cars utilising the proposed car parking spaces affecting the existing neighbouring residential premises, and have included planning condition 9 in the consent (ref. BR/3/22/DOC). A site plan can be found in Appendix A and architectural drawings are presented in Appendix D.

The site is located within Bognor Regis, in an area predominantly consists of residential dwellings. The site is accessed off Victoria Drive, which borders the site to the front. A detached house borders the site to the west and a residential flat block to the east. At time of the survey, the site comprises of vacant land with the previously existing dwelling demolished. It is understood that a new 3-story dwelling is proposed to the south of the site with the parking located to the north.

2.2. The worst affected NSR from the proposed car parking location is 97 Victoria Drive a detached residential dwelling with external amenity which borders the site to the west. The site also borders the external amenity of 95 & 101 Victoria Drive and 5,7, 9 and 11 Hillsboro Road (NSR2 – NSR6 respectively). During the site visit, it was noted that there is a standard garden fence in place along the boundary between 99 and 97 Victoria Drive. It is often challenging to determine what acoustic performance an existing boundary standard fence already offers the assessed site. Therefore, our noise model and report does not account for any existing standard fence. There it was a 1.8 metre brick/block boundary wall to the north and east, it is assumed that the worst affected noise sensitive receptors are 95 and 97 Victoria Drive as the site's west boundary consists of a standard boundary fence.

2.2.1. It can be confidently assumed that if the noise impact assessment indicates that the sound source has a low impact at 95 & 97 Victoria Drive then it can be safely assumed it will be met at upper floors and other properties of equal distance and/or those further away.

2.3. At the time of installation and collection of the monitoring equipment, the dominant noise sources emanated from road traffic on Victoria drive and some residential activity noise. These noise sources are considered normal to the site location. No significant abnormal noise sources were identifiable. It

is considered that the measured noise levels are reasonable given the location of the measurement position.

3. ENVIRONMENTAL NOISE SURVEY METHODOLOGY

3.1. An unmanned environmental noise survey was undertaken at a single measurement location to the west of the site. The survey was undertaken between 12:15 hours on the Wednesday 16th February 2022 and 12:30 hours on Monday 28th February 2022. Due to adverse weather conditions caused by storms, only data from 00:00 hours on Friday 25th February 2022 to 12:30 hours on Monday 28th February 2022 have been used in this assessment.

3.2.

The sound level meter (SLM) was mounted onto a tripod 1.5m above ground floor level and positioned towards the east façade of 97 Victoria Drive. The monitoring position is not considered to be in ‘free-field’ conditions, so a -3dB façade correction has been applied to the data.

3.3. The position is considered to be representative of background noise levels at the nearest identified NSR. The measurement position is indicated in orange in Appendix A. The position was chosen to gain representative noise levels from any noise sources as well as for monitoring equipment security reasons.

3.4. The equipment used for the noise survey is summarised in Table 3.1.

Equipment	Description	Quantity	Serial Number
Larson Davis LxT SE	Class 1 automated logging sound level meter	1	0005445
377B02 microphone	Class 1 ½" microphone	1	177077
Larson Davis CAL200	Class 1 Calibrator	1	14432

Table 3.1 Description of Equipment used for Noise Survey

3.5. Ambient, background and maximum noise levels (L_{Aeq} , L_{A10} , L_{A90} and $L_{Amax,F}$ respectively) were measured throughout the noise survey in consecutive 15-minute periods.

3.6. The noise survey and measurements were conducted, wherever possible, in accordance with BS7445-1:2003 ‘Description and measurement of environmental noise. Guide to quantities and procedures’. Measurements were made generally in accordance with ISO 1996-2:2007 ‘Acoustics – Description, measurement and assessment of environmental noise – Part 2: Determination of environmental noise levels’.

3.7. The noise monitoring equipment was calibrated before and after the noise survey period. No significant drift was recorded. Equipment calibration certificates can be provided upon request.

3.8. Weather conditions were noted to be:

3.8.1.during installation: mild (approximately 12° Celsius), dry, with cloudy skies (approximately 90 - 100% cloud cover) and a light wind (<5m/s).

3.8.2.during collection: mild (approximately 10° Celsius), dry, with cloudy skies (approximately 80 - 90% cloud cover) and a light wind (<5m/s).

3.8.3.Due to adverse weather conditions caused by storms, only data from 00:00 hours on the 25th February 2022 to 12:30 hours on the 28th February 2022 have been used. Weather conditions between 25th of February to the 28th of February were cold to mild (approximately 0-11° Celsius), generally dry and a light wind (<5m/s).

3.9. These weather conditions were checked against and confirmed by the use of the Met Office mobile application available on smart phone technology. These conditions were maintained throughout the whole survey period and are considered reasonable for undertaking environmental noise measurements.

4. EXTERNAL NOISE EMISSION CRITERIA

4.1. Local Authority Criteria

4.2. The proposed site lies within the jurisdiction of the Local Authority, Arun District Council. An acoustic report is required to support a planning application to discharge condition 9 (ref. BR/3/22/DOC).

4.3. Planning Condition 9 states:

Condition Number 9

No development above damp-proof course (DPC) level shall take place until details of any new screen walls and/or fences (including the acoustic fence to be erected along the boundary with Nos. 95 & 97 as shown on the proposed site plan and as may also be required for other boundaries) have been submitted to and approved in writing by the Local Planning Authority and no part of the development shall be occupied until such agreed screen walls and/or fences have been erected in accordance with the approved details;

4.4. Arun's District Council's Planning department raised concern over the potential for noise levels from cars utilising the proposed car parking spaces affecting the existing nearby residential dwellings and amenity.

4.5. The Planning Officer reason for objection on the grounds of noise stated:

Decision:

Arun District Council have decided to **REFUSE details reserved by condition for the following reasons:**

The submitted details in respect of the fencing and screen walls including the acoustic fence have been provided and assessed by the ADC EH Officer. No noise assessment has been submitted to identify the background or environmental noise level, specific noise level at facade of nearest receptor, impact to receptor or the performance required from an acoustic fence.

4.6. In order to provide a robust assessment and address the local authority's concerns the noise impact of the proposed car parking space will be assessed in line with NPPF and NPSE. The typical daytime and night-time background levels will be considered and for robustness, the internal noise levels within the nearest residential dwelling will also be assessed after accounting for open window attenuation.

4.4. National Planning Policy Framework (2021)

4.5. In March 2012, the National Planning Policy Framework (NPPF) came into force and was revised in 2019 and 2021. This document replaces a great many planning guidance documents, which previously informed the planning system in England.

4.6. The NPPF (2021) sets out the Government's economic, environmental and social planning policies for England and these policies articulate the Government's vision of sustainable development.

4.7. The Noise Policy Statement for England (NPSE) published 2010 applies to *‘all forms of noise, including environmental noise, neighbour noise and neighbourhood noise’*.

4.8. **Paragraph 185 of the NPPF (2021) considers noise, stating:**

“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 impact 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; and*
- c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.”*

4.9. National Planning Policy is guided by the NPPF. With regard to noise, the terms ‘significant adverse impact’ and ‘other adverse impacts’ are defined in the explanatory notes of the ‘Noise Policy Statement for England’ (NPSE). These state that there are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

- ‘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, and
- LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.

4.10. Extending these concepts for the purpose of this NPSE leads to the concept of SOAEL - significant observed adverse effect level. This is the level above which significant adverse effects on health and quality of life occur’. However, no specific noise limits for LOAEL and SOAEL have been defined. Therefore, guidance from other acoustic standards must be employed to determine suitable levels within the overall principal of the National Planning Policy Framework; such as BS 8233:2014.

4.11. IEMA Guidelines on Noise Impact Assessments (Institute of Environmental Management and Assessment)

4.12. The Guidelines for Environmental Noise Impact Assessment set out key principles for undertaking noise impact assessments. The guidance provides advice with regards to the collection of baseline noise data, prediction of noise levels and how noise should be assessed. They are applicable to all development proposals, regardless of size.

4.13. The guidance recommends that the character of the noise, as well as the overall emission level, must be considered for a robust approach and suggests comparing the following noise parameters. L_{Aeq} , L_{Amax} and L_{A90} .

4.14. The guidance also recommends other factors such as; frequency spectra, operational hours, frequency of operation and any other factors should be considered, to allow the noise to be assessed in context.

4.15. The guidance provides effect descriptors for changes in noise levels as seen below in Table 4.

Effect Descriptors	
Very Substantial	Greater than 10dB L_{Aeq} change in sound level perceived at a receptor of great sensitivity to noise.
Substantial	Greater than 5dB L_{Aeq} change in sound level at a noise-sensitive receptor, or a 5 to 9.9dB L_{Aeq} change in sound level at a receptor of great sensitivity to noise
Moderate	A 3 to 4.9 dB L_{Aeq} change in sound level at a sensitive or highly sensitive noise receptor, or a greater than 5dB L_{Aeq} change in sound level at a receptor of some sensitivity
Slight	A 3 to 4.9 dB L_{Aeq} change in sound level at a receptor of some sensitivity
None / Not Significant	Less than 2.9 dB L_{Aeq} change in sound level and/or all receptors are of negligible sensitivity to noise or marginal to the zone of influence of the proposals

Table 4.1 IEMA Noise Guidelines Effect Descriptors (Source: IEMA Noise Guidelines 2nd Edition Table 7-12)

4.16. Noise effect levels are also provided in the guidance, in relation to LOAEL and SOAEL's. These are provided in Table 4.2.

Noise Effect Level		
Time	LOAEL	SOAEL
Daytime (07:00 – 23:00)	50 dB $L_{Aeq, 16\text{hour}}$	60 $L_{Aeq, 16\text{hour}}$
Night-time (23:00 – 07:00)	40 dB $L_{Aeq, 8\text{hour}}$	55 $L_{Aeq, 16\text{hour}}$
	60 dB L_{Amax}^*	80 L_{Amax}^*

Table 4.2 IEMA Noise Effect Level (Source: IEMA Noise Guidelines 2nd Edition Table 7-13)

4.14. BS 4142: 2014 +A1: 2019

4.15. BS 4142: 2014 +A1: 2019 “Methods for Rating and Assessing Industrial and Commercial Sound” presents a method for assessing the significance and possible adverse impact due to an industrial or commercial noise source, based on a comparison of the source noise levels and the background noise levels, both of which are measured or predicted at a noise sensitive receiver e.g. a residential property.

4.16. BS 4142: 2014 +A1: 2019 will not be used as the carpark is for residential (not commercial) use and is therefore not applicable. BS 4142: 2014 +A1: 2019 also states circumstances where the guidance document should not be used as follows:

- *Sound of an industrial and/or commercial nature does not include sound from the passage of vehicles on public roads and railway systems.*

4.17. For this reason, the assessment does not consider the guidance as stated in BS 4142: 2014 +A1: 2019 as applicable.

5. NOISE SURVEY RESULTS

5.1. The ambient and background noise levels at the measurement position as seen in Appendix A are provided below and have been based on an analysis of the monitoring data.

5.2. A summary of the data results is provided in Table 5.1. The time history (including the -3 correction factor) can be seen in Appendix B (TH1).

	Ambient Noise Level $L_{Aeq, 15min}$	Typical Background Noise Level $L_{A90, 15min}$
Daytime (07:00 – 23:00)	48dB*	39dB*
Night-time (23:00 – 07:00)	42dB*	33dB*

Table 5.1 Summary of typical noise measurement data

* -3dB facade correction

5.3. These noise levels are considered normal to the site location. No significant abnormal noise sources were identifiable during installation or collection of the equipment. It is considered that the measured noise levels are reasonable given the location of the measurement position.

5.4. Statistical analysis has been carried out to determine the typical daytime and night-time background noise level as shown in Figure 5.2 and Figure 5.3.

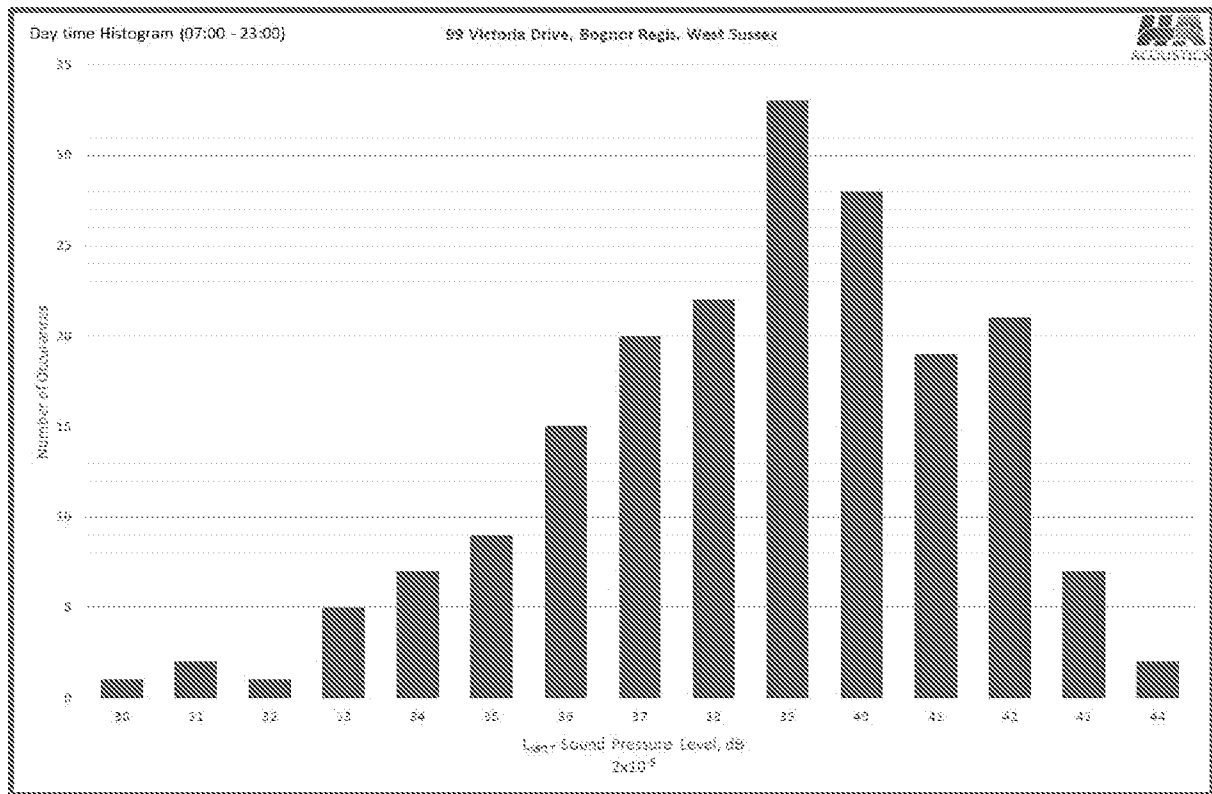


Figure 5.2 Statistical analysis of the typical daytime background noise level (LA90)

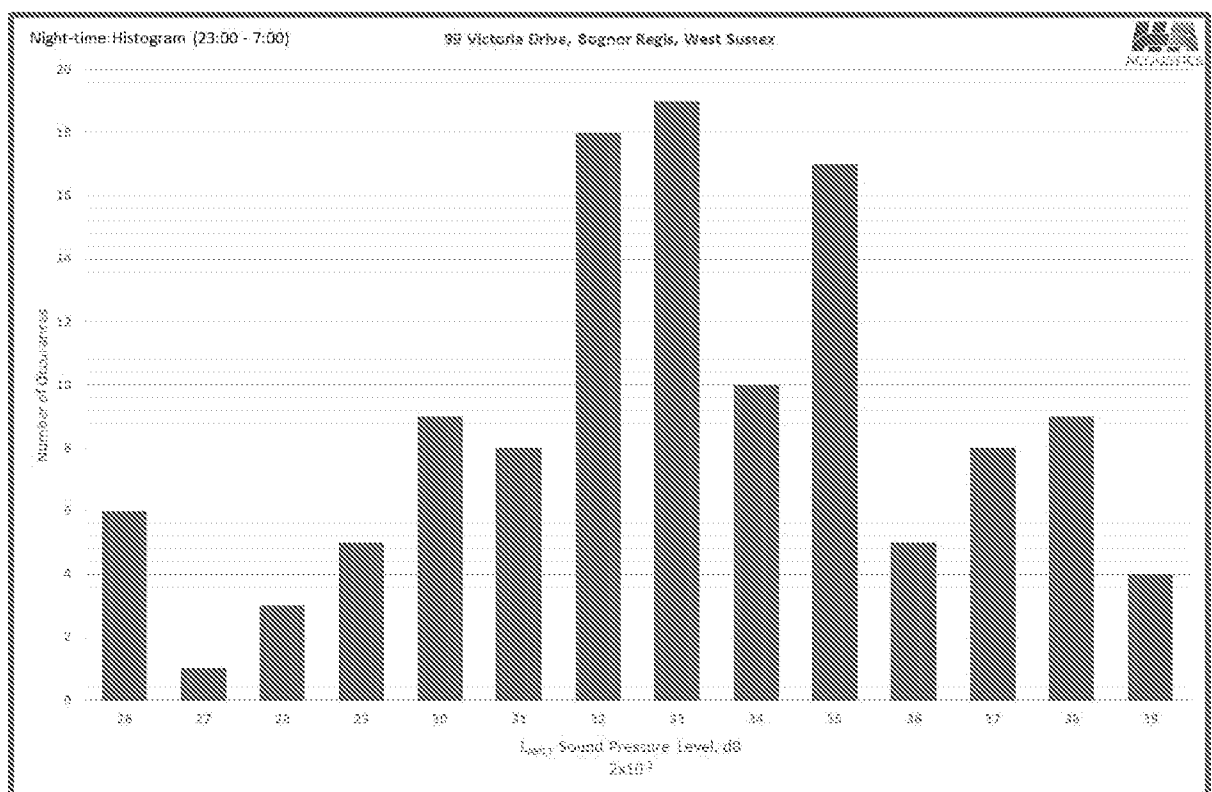


Figure 5.3 Statistical analysis of the typical night-time background noise level (LA90)

6. NOISE MODEL

6.1. Noise modelling of the site has been undertaken using SoundPLAN Essential 5.1 to determine the noise levels from the proposed parking at worst affected Noise sensitive receptor. For robustness, the noise model assessment is representative of the daytime (07:00 – 23:00) and night-time (23:00 – 07:00) so as to be inclusive of all potential vehicle movements within the carpark.

6.2. Receiver positions representative of the site were chosen based on their proximity to the proposed car parking spaces. Appendix C shows the noise map with predicted daytime and night-time noise levels.

6.3. In predicting the sound levels across the site we have made the following assumptions:

- There are 9 proposed car parking spaces.
- No transmission of sound through the existing and / or proposed barriers.
- No transmission under the existing and / or proposed barrier.
- The total sound level predicted only stems from the carparking noise
- Source height (cars passing) at 1 metre, receiver height (residential amenity space) at 1.5 metres height).
- Calculations with proposed barrier installed at 2 metres and 2.7 metres height
- The parking surface is natural stone paving and therefore has been modelled with a hard surface.
- The number of vehicle movements per hour is 0.4 per space during the daytime and 0.15 per space during the night (in line with 'housing estate' criteria stated in Parkplazalärmstudie 2007)
- Receiver heights are set at 1.5 metres height per floor.
- Conditions are free-field and there is no reverberant field.
- Noise levels predicted are only from the proposed vehicles parking and exiting the carpark.

6.4. During site visit it was noted that there is a standard garden fence in place along the boundary between 99 and 97 Victoria Drive. It is often challenging to determine what acoustic performance an existing boundary standard fence already offers the assessed site. Furthermore, it is not possible to noise model existing standard fences sound reduction performance. Therefore, our noise model and report does not account for any existing standard fence and does not quantify the difference in performance that the acoustic barrier will offer over the existing standard fence.

7. NOISE IMPACT ASSESSMENT

- 7.1. It is proposed to create 9 carparking spaces to the rear of the proposed new residential development site. Acoustic Modelling has been undertaken to predict the noise impact of the proposed parking at the neighbouring residential dwelling façades and external amenity. Due to a 1.8 metre brick/block boundary wall to the north and the south, it is assumed that the worst affected noise sensitive receptors are 95 and 97 Victoria Drive as the sites west boundary consists of a standard boundary fence.
- 7.2. During site visit it was noted that there is a standard garden fence in place along the boundary between 99 and 97 Victoria Drive. It is often challenging to determine what acoustic performance an existing boundary standard fence already offers the assessed site. Furthermore, it is not possible to noise model an existing standard fences sound reduction. Therefore, our noise model and report does not account for any existing standard fence and does not quantify the difference in performance that the acoustic barrier will offer over the existing standard fence.
- 7.3. Appendix C.1 illustrates the daytime and night-time noise emission levels from the new proposed parking noise in a receiver point format.
- 7.4. Appendix C.2, and C.3, illustrates the daytime and night-time noise emission levels from the new proposed parking noise (before the installation of an acoustic barrier), in noise map format.
- 7.5. Table 6.1 gives the predicted noise levels from the noise modelling at the NSR's façades.

	Ground Floor (GF) (1m From Façade)		First Floor (1F) (1m From Façade)		External Amenity	
	Daytime <i>L_{Aeq,16hour}</i>	Night <i>L_{Aeq,8hour}</i>	Daytime <i>L_{Aeq,16hour}</i>	Night <i>L_{Aeq,8hour}</i>	Daytime <i>L_{Aeq,16hour}</i>	Night <i>L_{Aeq,8hour}</i>
97 Victoria Drive Predicted Noise Levels (No Acoustic Barrier)	44 dB(A)	39 dB(A)	42 dB(A)	37 dB(A)	41 dB(A)	37 dB(A)
95 Victoria Drive Predicted Noise Levels (No Acoustic Barrier)	34 dB(A)	29 dB(A)	34 dB(A)	30 dB(A)	37 dB(A)	33 dB(A)
101 Victoria Drive Predicted Noise Levels (No Acoustic Barrier)	28 dB(A)	23 dB(A)	32 dB(A)	28 dB(A)	30 dB(A)	25 dB(A)

	Ground Floor (GF) (1m From Façade)		First Floor (1F) (1m From Façade)		External Amenity	
	Daytime	Night	Daytime	Night	Daytime	Night
	$L_{Aeq,16hour}$	$L_{Aeq,8hour}$	$L_{Aeq,16hour}$	$L_{Aeq,8hour}$	$L_{Aeq,16hour}$	$L_{Aeq,8hour}$
7 Hillsboro Road Predicted Noise Levels (No Acoustic Barrier)	28 dB(A)	24 dB(A)	32 dB(A)	28 dB(A)	33 dB(A)	28 dB(A)
9 & 11 Hillsboro Road Predicted Noise Levels (No Acoustic Barrier)	30 dB(A)	26 dB(A)	34 dB(A)	29 dB(A)	33 dB(A)	29 dB(A)
15 Hillsboro Road Predicted Noise Levels (No Acoustic Barrier)	28 dB(A)	24 dB(A)	32 dB(A)	28 dB(A)	33 dB(A)	28 dB(A)

Table 7.1 Noise level results at 1m from façade from the proposed parking spaces (no additional mitigation)

7.6. As seen from table 7.1, noise levels from the proposed new parking at 1 metre from the east façade of 97 Victoria Drive at ground floor, which is the worst effected façade, is predicted to be 44dB $L_{Aeq,16hour}$ during the daytime and 39dB $L_{Aeq,8hour}$ at night. The external amenity within the two worst affected neighbouring premises is predicted to be 37-41 $L_{Aeq,16hour}$ during the daytime and 33-37dB $L_{Aeq,8hour}$ during the night at 95 and 97 Victoria drive, respectively.

7.7. Prior the installation of an acoustic barrier, it is predicted that the proposed parking noise levels will exceed the typical background noise level at daytime and night-time within both 95 & 97 Victoria Drive external amenity. However, this is due to the measured typical background level being low. It should be noted that BS8233:2014 recommends guideline levels for the external amenity. The ‘desirable’ criteria is <50dB(A) with an upper limit of 55dB(A). As such, it can be seen that the levels experienced within the neighbouring external amenity is below the ‘desirable’ guideline level.

7.8. In accordance with BS8233:2014, further assessment was carried out to assess the impact on internal noise levels at 97 Victoria Drive. British Standard 8233:2014 ‘Sound insulation and noise reduction for buildings – Code of Practice’ is the guidance followed for internal noise levels. The Standard gives recommendations for acceptable internal noise levels in residential properties. Assuming worst case conditions, of the closest window being for a bedroom, BS8233:2014 recommends 30dB(A) as being acceptable internal resting/sleeping conditions during night-time. According to BS8233:2014, the façade of a residential dwelling; with a window partially open for ventilation offers 15 dB attenuation.

7.9. Taking into account this reduction for a partially open window, the internal noise level at the nearest

NSR façade (97 Victoria Drive east facade) with the proposed carparking prior to the installation of an acoustic barrier would be 24dB(A) which is lower than the acceptable internal noise level as seen under BS 8233:2014.

7.10. The assessment shows that the noise level from the proposed parking space prior to the installation of an acoustic barrier is predicted to be **5 dB(A) above** the typical daytime background of 39dB $L_{A90, 15min}$ and be **6 dB(A) above** the typical night-time background of 33dB $L_{A90, 15min}$ at the ground floor of 97 Victoria Drive.

7.11. In accordance with NPPF and NSPE, the daytime and night-time noise impact from the proposed carparking prior to the installation of an acoustic barrier ***“is an indication of Low Observed Adverse Effect Level”*** at the NSRs. Therefore mitigation will be required and is recommended in the form of an acoustic barrier.

8. PROPOSED ACOUSTIC BARRIER

- 8.1. An acoustic barrier, also known as an acoustic screen, can be comprised of a variety of materials, typically for residential it is comprised of timber fence materials. The basic principle of an acoustic barrier is to act as a screen to noise. Cutting the 'line-of-sight' between the noise source and receiver provides the most attenuation. This requires a barrier of satisfactory height and length. The acoustic barrier should be a solid structure in order to intercept the direct sound path from the sound source to the receiver. The barrier reduces the sound pressure level within its shadow zone. High frequencies are attenuated more effectively than low frequencies. The 'line of sight' between the source and the receiver must be cut off completely by the barrier in order to obtain the full effect of screening.
- 8.2. There are a range of acoustic barrier fence manufacturers of which Jacksons is just one. The reason that we refer to their products either on-site or within this report is due to the fact their products are laboratory tested. Jakoustic fencing range offers three acoustic products; the Jakoustic Envirofence, Jakoustic Reflective fence and the Jakoustic Absorptive fence. A basic standard fence construction, but that remains in good order will often achieve 3dB in noise reduction. A dilapidated and damaged fence may offer negligible protection. A very good solid fence design will achieve up to 10dB noise reduction. Typically, a solid heavy-duty fence with a minimum mass of 12.5 kg/m² will achieve this. Though not tested in a laboratory setting, such good quality heavy duty, solid, fences include Jakoustic Envirofence.
- 8.3. Jackson's Jakoustic Reflective fence provides a laboratory certified 28dB reduction and has a mass of 28kg/m². It is understood from discussion with Jacksons that this therefore provides significant improved acoustic protection over the Jakoustic Envirofence. When considering sound attenuation due to an acoustic barrier up to 3m away from the dominant noise source, regard should be had to ISO 9613-2:1996 'Attenuation of sound during propagation outdoors -- Part 2: General method of calculation'. This states that sound waves are reduced by a barrier depending upon the frequency of the soundwave, for example lower frequencies are less affected than high frequencies. A general rule is that a barrier at eye level with a source and receiver will reduce the received noise level by approximately 5dB. ISO 9613-2:1996 states that in most instances barrier attenuation is limited to 20dB for a single barrier, though this is typically where complete line-of-sight is broken and generally relates to point source, rather than the line sources associated with transportation routes.
- 8.4. Appendix C.4 illustrates the daytime and night-time noise emission levels from the new proposed parking noise after the installation of an acoustic barrier, in a receiver point format.

8.5. Appendix C.5 and C.6 illustrates the daytime and night-time noise emission levels from the new proposed parking noise after the installation of an acoustic barrier, in noise map format.

8.6. Table 8.1 provides the predicted levels from the proposed car parking at the NSR's with a proposed acoustic barrier in place on the western façade, as seen in Appendix C.4, C.5 and C.6.

	Ground Floor (GF) (1m From Façade)		First Floor (1F) (1m From Façade)		External Amenity	
	Daytime $L_{Aeq,16hour}$	Night $L_{Aeq,8hour}$	Daytime $L_{Aeq,16hour}$	Night $L_{Aeq,8hour}$	Daytime $L_{Aeq,16hour}$	Night $L_{Aeq,8hour}$
97 Victoria Drive Predicted Noise Levels (2m Acoustic Barrier)	34 dB(A)	30 dB(A)	41 dB(A)	37 dB(A)	33dB(A)	29 dB(A)
95 Victoria Drive Predicted Noise Levels (2m Acoustic Barrier)	27 dB(A)	22 dB(A)	30 dB(A)	26 dB(A)	29 dB(A)	25 dB(A)
101 Victoria Drive Predicted Noise Levels (2m Acoustic Barrier)	28 dB(A)	23 dB(A)	32 dB(A)	28 dB(A)	30 dB(A)	25 dB(A)
7 Hillsboro Road Predicted Noise Levels (2m Acoustic Barrier)	28 dB(A)	24 dB(A)	32 dB(A)	28 dB(A)	33 dB(A)	28 dB(A)
9 & 11 Hillsboro Road Predicted Noise Levels (2m Acoustic Barrier)	29 dB(A)	25 dB(A)	33 dB(A)	29 dB(A)	32 dB(A)	28 dB(A)
15 Hillsboro Road Predicted Noise Levels (2m Acoustic Barrier)	28 dB(A)	24 dB(A)	32 dB(A)	28 dB(A)	33 dB(A)	28 dB(A)

Table 8.1 Noise level results at 1m from façade from the proposed parking spaces with acoustic barrier

8.7. As seen from table 7.1 and 8.1 the acoustic barrier has not affected the predicted results of 101 Victoria Drive, 7 or 15 Hillsboro Road, due to the layout. It has caused a reduction in level at all other NSR's.

8.8. Noise levels from the proposed new parking with a 2m acoustic barrier installed at 1 metre from the east façade of 97 Victoria Drive at ground floor, is predicted to be 33dB $L_{Aeq,16hour}$ during the daytime and 30dB $L_{Aeq,8hour}$ at night. The external amenity within the two worst affected neighbouring premises is predicted to be 29-33 $L_{Aeq,16hour}$ during the daytime and 29-25dB $L_{Aeq,8hour}$ during the night at 95 and 97 Victoria drive, respectively.

- 8.9. Following the installation of an acoustic barrier is predicted that the noise levels from the proposed carparking will be **6 dB(A) below** the typical daytime background of 39dB $L_{A90, 15min}$ and **3dB(A) below** the typical night-time background of 33dB $L_{A90, 15min}$ at the ground floor of 97 Victoria Drive.
- 8.10. In accordance with NPPF and NSPE, the daytime and night-time noise impact from the proposed carparking following the installation of a 2m acoustic barrier ***“is an indication of No Observed Effect Level”*** at the NSRs.

9. UNCERTAINTY

- 9.1. The levels of uncertainty in the data and calculations are considered to be low given the robust exercise undertaken in noise monitoring and the confidence in the statistical analysis.
- 9.2. All measurements taken on-site by instrumentation are subject to a margin of uncertainty. This is relatively small, with a sound level meter manufacturer's margin of uncertainty at +/-1.1dB. It is due to the tolerances associated with the Class 1 sound level meter and calibrator equipment used to measure background.
- 9.3. The meter and calibrator used have a traceable laboratory calibration and were field calibrated before and after the measurements.
- 9.4. Manufacturers' data for the plant is likely to be robust. Detailed calculations and resultant noise levels at the residential location are considered to be confidently predicted.
- 9.5. Uncertainty in the calculated impact has been reduced by the use of a well-established calculation method.
- 9.6. The variation in land height topography, together with variable height of noise emitted from the proposed carpark provides an element of uncertainty when predicting noise level reduction.
- 9.7. Uncertainties associated with the noise model using SoundPLAN Essential 5.1 are as follows;
- 9.7.1. Topographical map data, used to establish the digital ground model, was acquired from The Department for Environment, Food and Rural Affairs (DEFRA)'s national LIDAR survey.
- 9.7.2. Building heights and building floor heights have been estimated. Receptor positions at buildings have been estimated for ground floor to be best representative of noise sensitive receiver positions.
- 9.7.3. The number of vehicle movements is 0.4 per space during the daytime and 0.15 per space during the night (in line with the 'housing estate' criteria as stated in Parkplazalärmstudie 2007).

10. CONCLUSION

10.1. A noise assessment has been undertaken at 99 Victoria Drive, Bognor Regis, West Sussex PO21 2DZ.

The noise survey was undertaken at a fixed monitoring point, representative of the nearest noise sensitive receptors.

10.2. Following on-site measurement of pre-existing noise levels, acoustic modelling has been undertaken to predict the noise impact of the proposed parking at the nearest noise sensitive receptors (NSRs). From this assessment, together with information provided by the client, the potential noise impact has been determined.

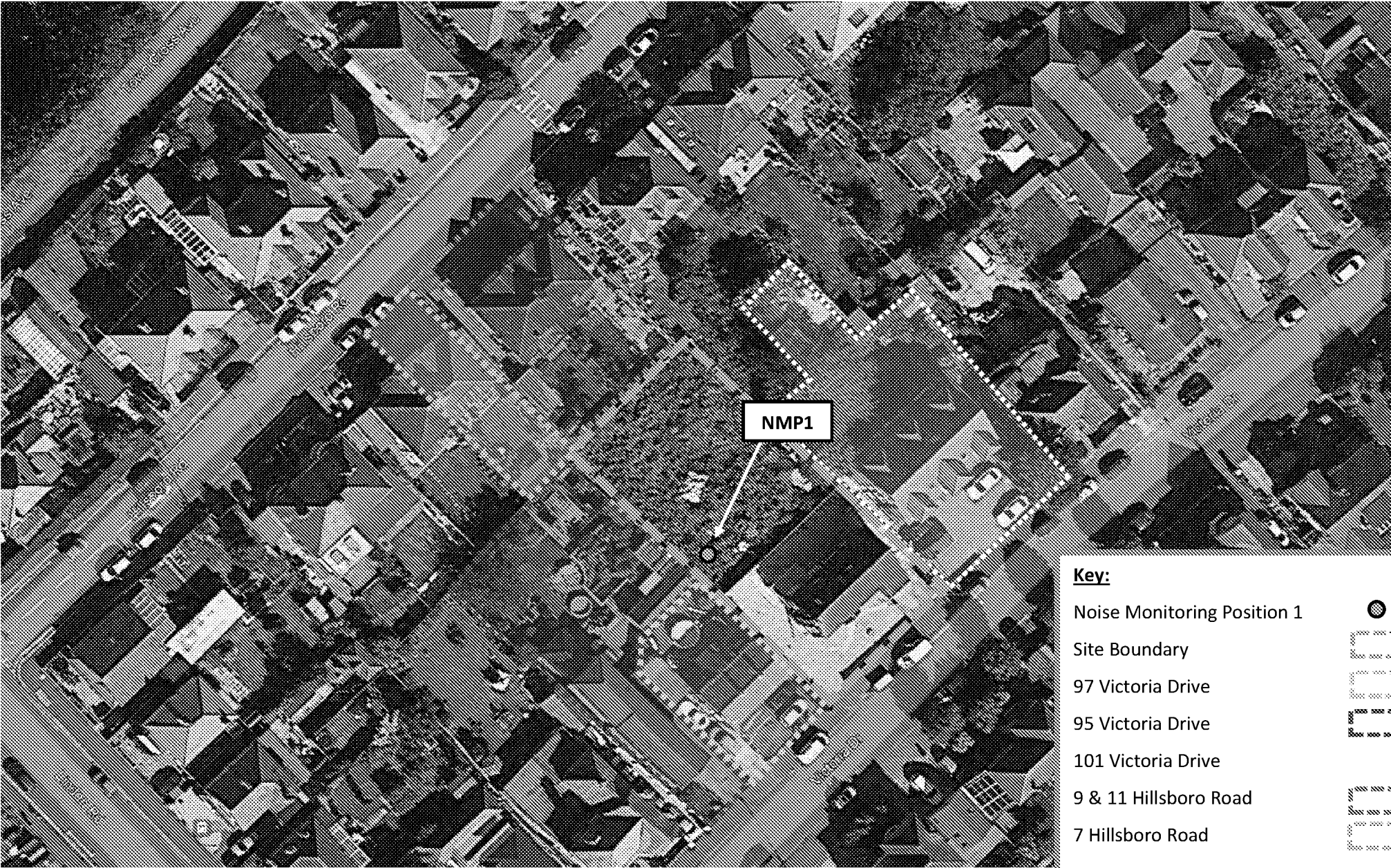
10.3. The assessment shows that the noise level from the proposed parking space prior to the installation of an acoustic barrier is predicted to be 5 dB(A) above the typical daytime background of 39dB $L_{A90, 15min}$ and be 6dB(A) above the typical night-time background of 33dB $L_{A90, 15min}$ at the ground floor of 97 Victoria Drive. Mitigation has been provided in the form of an acoustic barrier.

10.4. Noise levels at 1 metre from the ground floor of 97 Victoria Drive is predicted to be 33dB L_{Aeq} during the daytime and 30dB L_{Aeq} at night, with the acoustic barrier in situ, as stated herein.

10.5. Following the installation of an acoustic barrier is predicted that the noise levels from the proposed carparking will be **6 dB(A) below** the typical daytime background of 39dB $L_{A90, 15min}$ and **3dB(A) below** the typical night-time background of 33dB $L_{A90, 15min}$ at the ground floor of 97 Victoria Drive.

10.6. In accordance with NPPF and NSPE, the daytime and night-time noise impact from the proposed car parking with a 2m acoustic barrier ***“is an indication of No Observed Effect Level”*** at the NSRs.

10.7. Considering the results of the noise survey, the illustrative layouts and the calculations, the predicted resultant noise levels from the proposed new carpark is predicted to meet appropriate and reasonable guidance and the relevant noise criteria following the installation of a 2m acoustic boundary to the west and north of the site. Therefore, an adequate level of protection against noise for occupants of the nearest noise sensitive receptor is afforded; including when factoring in potential uncertainty.

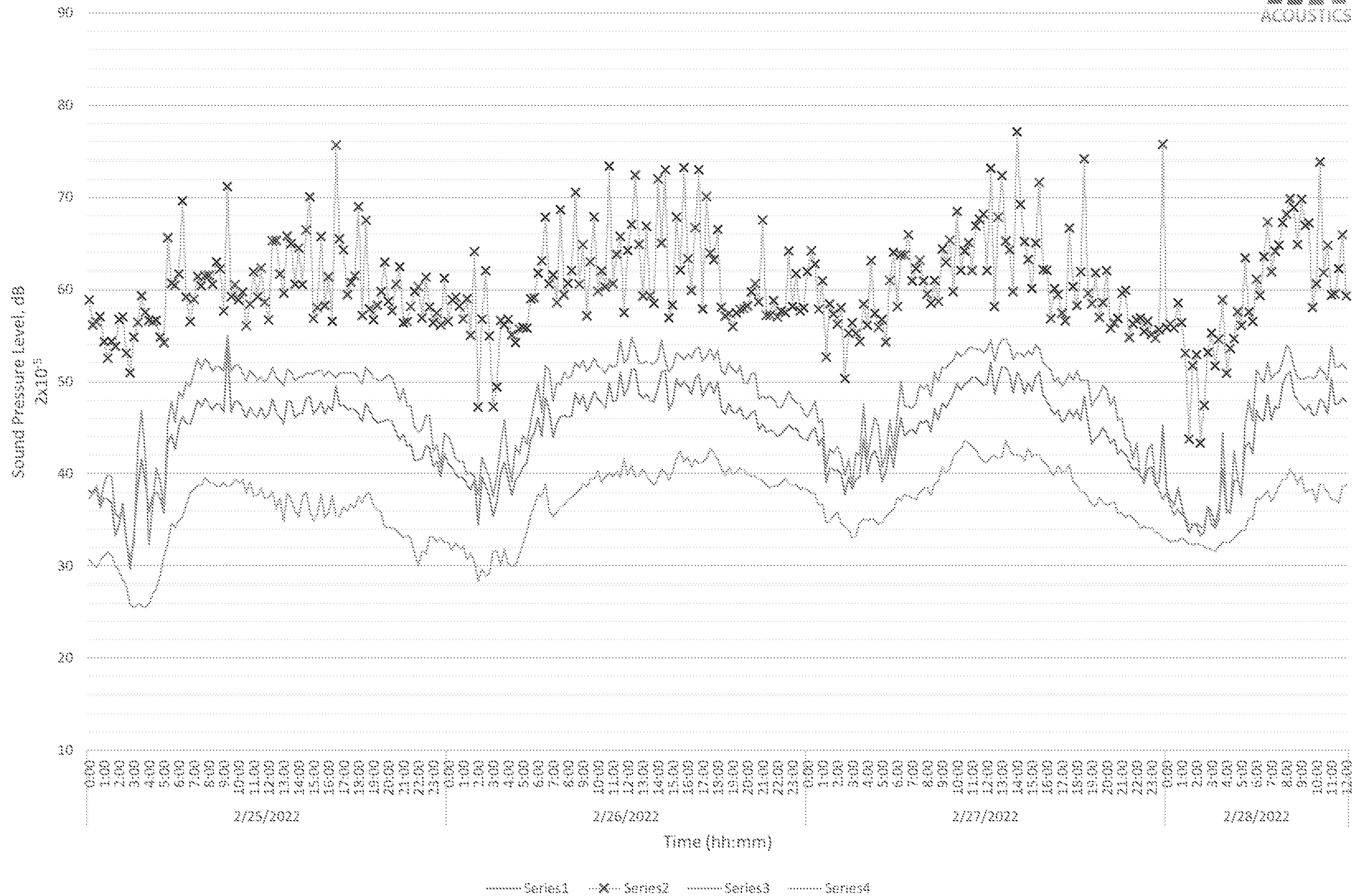


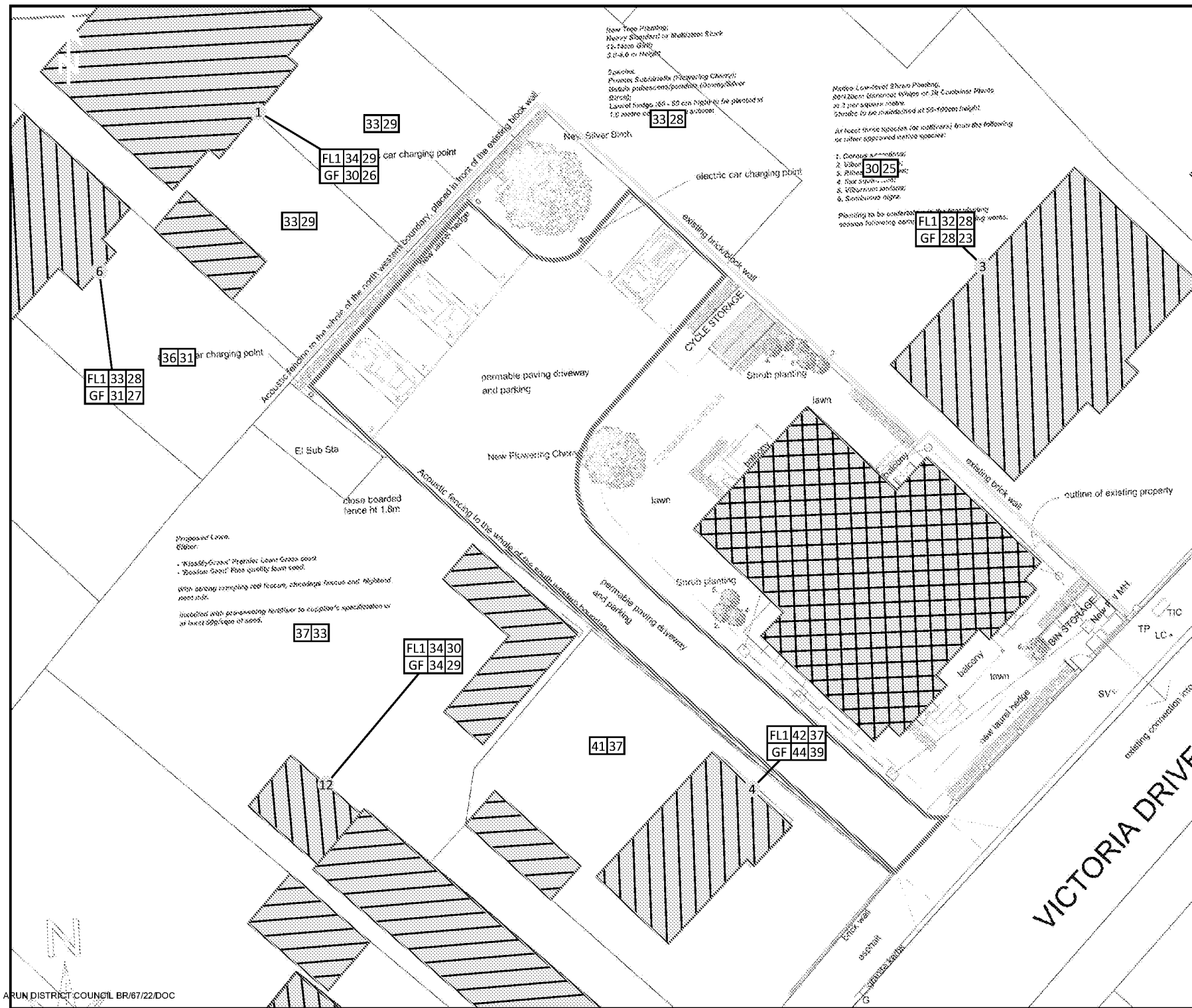
Key:

Noise Monitoring Position 1	
Site Boundary	
97 Victoria Drive	
95 Victoria Drive	
101 Victoria Drive	
9 & 11 Hillsboro Road	
7 Hillsboro Road	

Appendix B.1 - NMP1 Time History

99 Victoria Drive, Bognor Regis, West Sussex



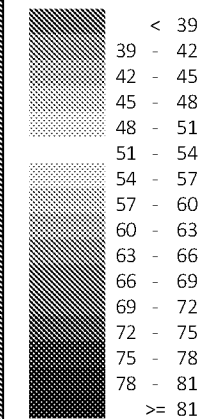


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99 Victoria Drive,
Bognor Regis,
West Sussex

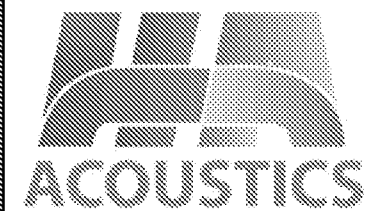
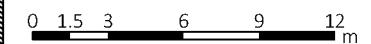
Daytime Noise Map
Predicted Carparking Noise
No Acoustic Barrier

Author: Jack Tunstall AMIOA

-  Existing Wall
-  Proposed Building
-  Existing Building
-  Parking lot



1 : 300

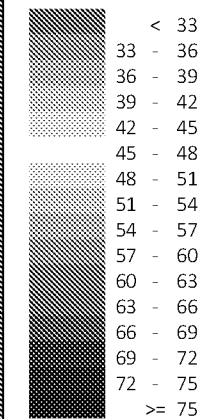


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99 Victoria Drive,
Bognor Regis,
West Sussex

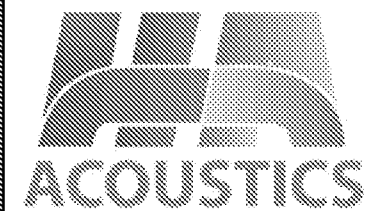
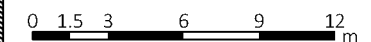
Night-time Noise Map Predicted Carparking Noise No Acoustic Barrier

Author: Jack Tunstall AMIOA

- Existing Wall
- Proposed Building
- Existing Building
- Parking lot



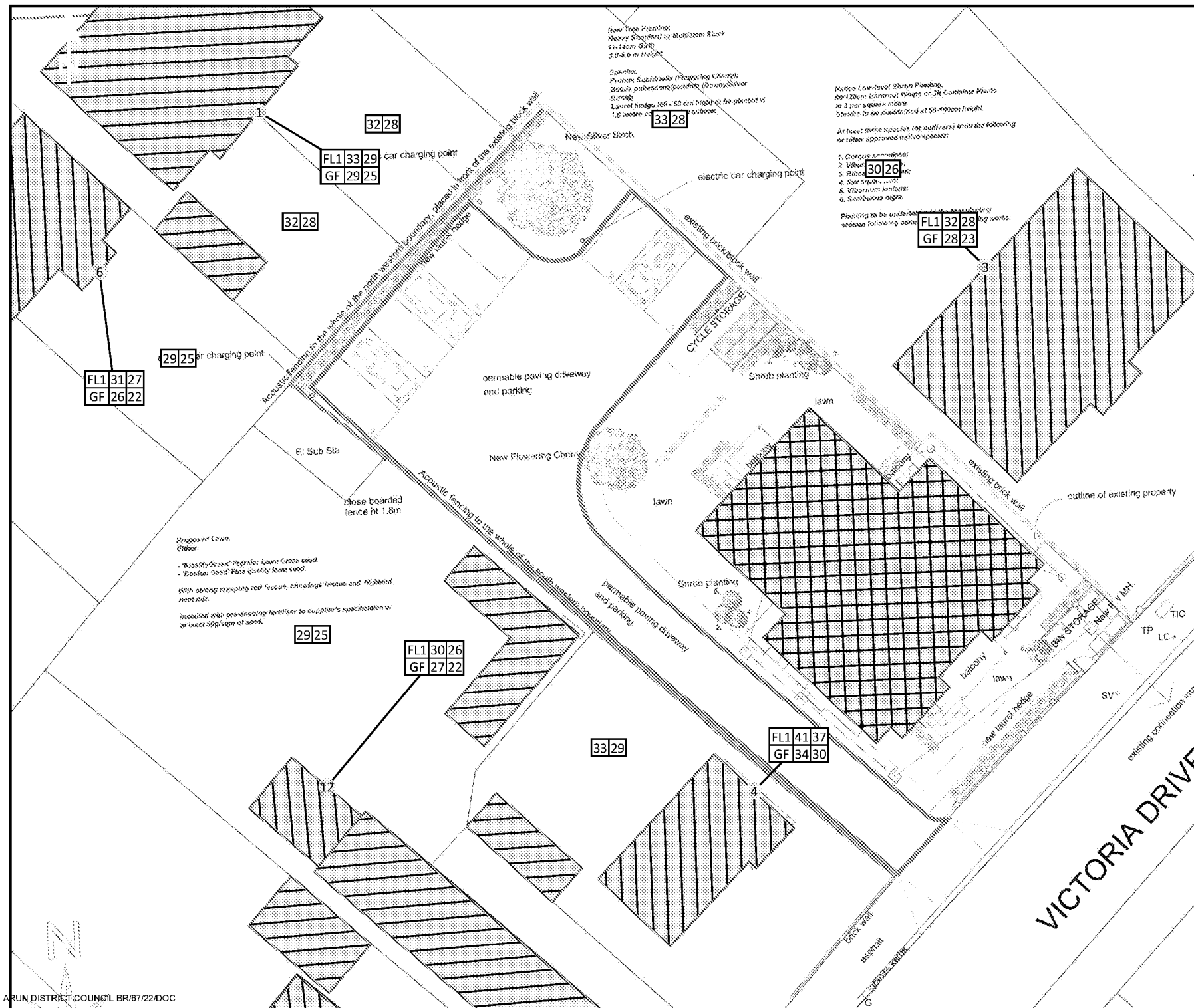
1 : 300



AE71
99 Victoria Drive,
Bognor Regis,
West Sussex

Receiver Points Map Day & Night Predicted Carparking Noise With 2m Acoustic Barrier

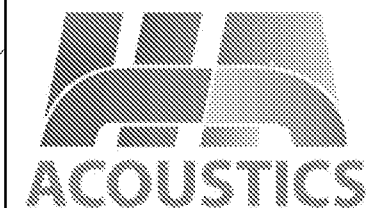
Author: Jack Tunstall AMIOA

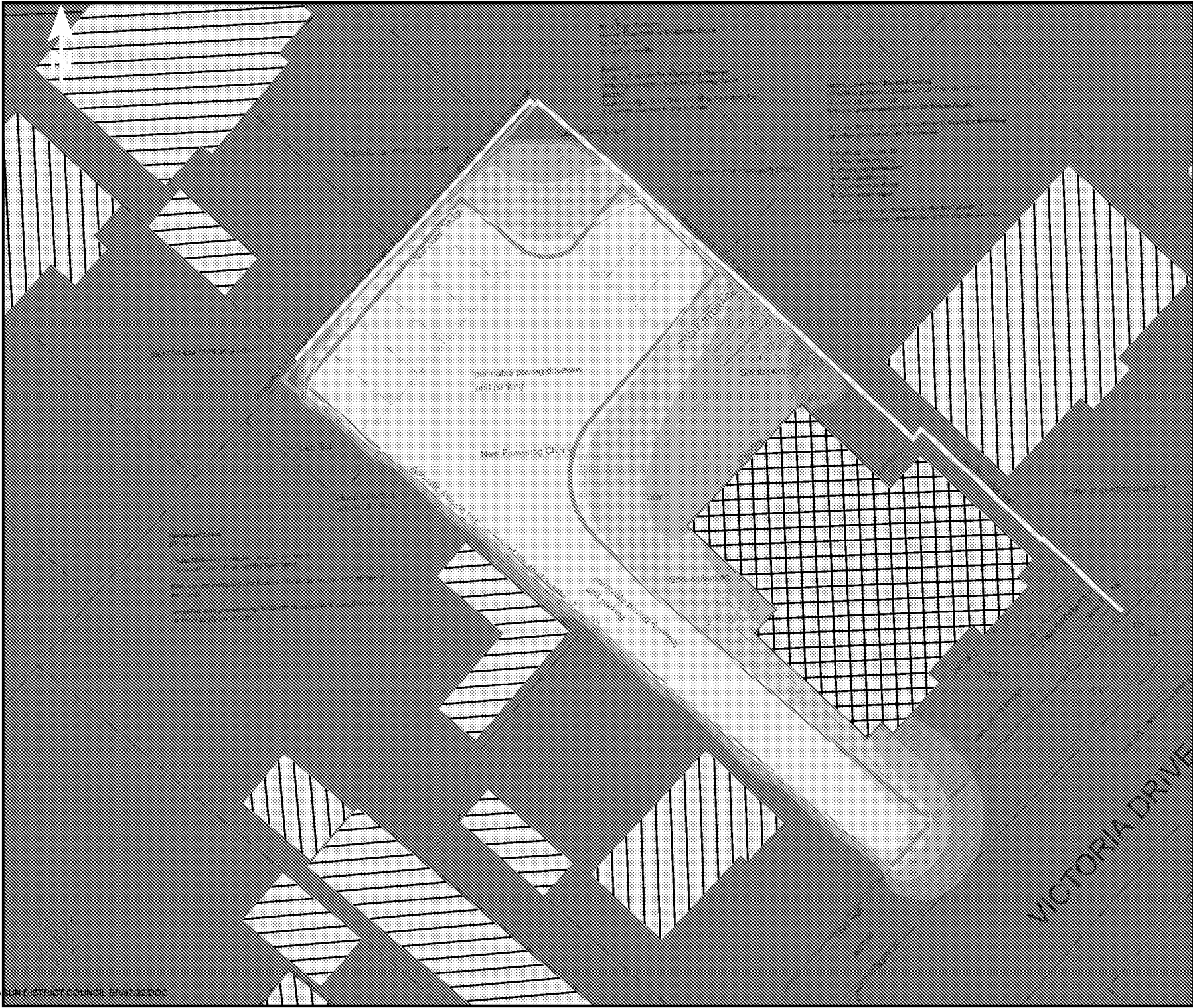


- Existing Wall
- Acoustic Barrier
- Proposed Building
- Existing Building
- Receiver
- Receiver at building
- Parking lot

1 : 300

0 1.5 3 6 9 12 m



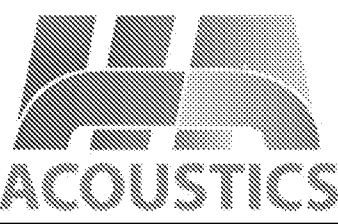
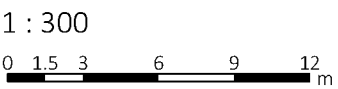
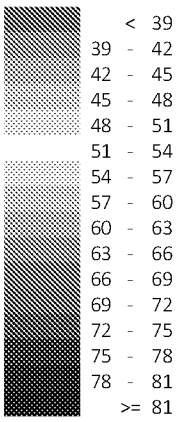


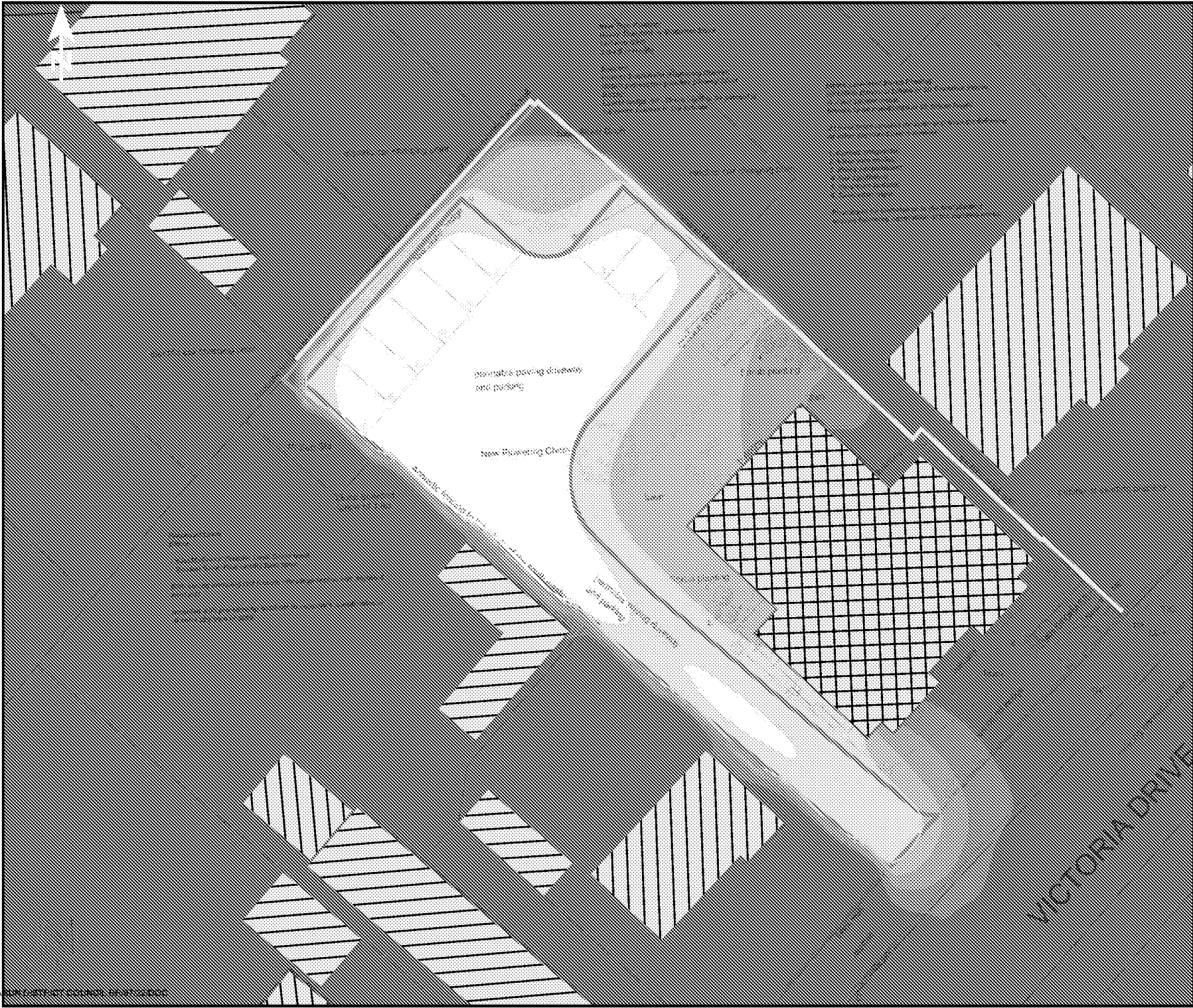
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Daytime Noise Map
Predicted Carparking Noise
With 2m Acoustic Barrier

Author: Jack Tunstall AMIOA

- Existing Wall
- Acoustic Barrier
- Proposed Building
- Existing Building
- Parking lot



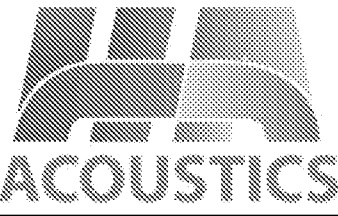
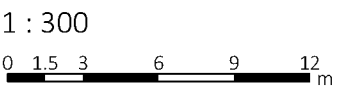
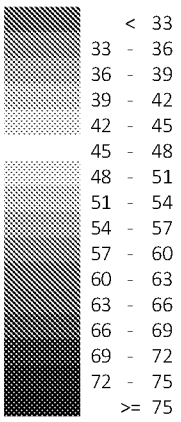


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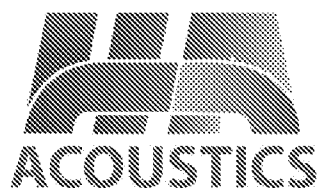
Night-time Noise Map
Predicted Carparking Noise
With 2m Acoustic Barrier

Author: Jack Tunstall AMIOA

- Existing Wall
- Acoustic Barrier
- Proposed Building
- Existing Building
- Parking lot







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