ACOUSTIC CONSULTANTS LTD

Environmental Noise Assessment

Proposed extension of hours
The Arc, Chippenham

Reference: 10700/DO

Client
Chippenham Borough Lands Charity

Document Control

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The report has been prepared in good faith, with all reasonable skill and care, based on information provided or available at the time of its preparation and within the scope of work agreement with the Client. We disclaim any responsibility to the Client and others in respect of any matters outside the scope of the above. The report is provided for the sole use of the named Client and is confidential to them and their professional advisors. No responsibility is accepted to other parties.

The report limits itself to addressing solely on the noise, acoustic, and vibration aspects as included in this report. We provide advice only in relation to noise, vibration and acoustics. It is recommended that appropriate expert advice is sought on all the ramifications (e.g. CDM, structural, condensation, fire, legal, etc.) associated with any proposals in this report or as advised and concerning the appointment. It should be noted that noise predictions are based on the current information as we understand it and, on the performances noted in this report. Any modification to these parameters can alter the predicted level. All predictions are in any event subject to a degree of tolerance of normally plus or minus three decibels. If this tolerance is not acceptable, then it would be necessary to consider further measures.

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1. Introduction

Chippenham Borough Lands Charity appointed Acoustic Consultants Limited to undertake an environmental noise assessment for the proposed extension of hours of the skate park at The Arc, off Westmead Lane in Chippenham.

The assessment considered the impact of environmental noise on the nearby noise-sensitive residential properties.

The assessment includes the prediction and assessment of noise emission from the proposed external skating area for use until 22:00 hours. The current permitted use is until 20:00 hours.

The assessment within this report is based on that submitted with the approved planning application for the application site which incorporated comments by the Environmental Health Officer made during the determination period.

2. The Site

The Arc includes buildings and facilities on the north west of open grass land located to the South of Westmead Lane and to the West of Avenue La Fleche in Chippenham.

The site comprises two buildings with different climbing environments and associated café and ancillary spaces. To the west of these buildings is an external concrete bowl type skating area.

The site is bordered by grassland to the South and East with commercial buildings directly to the north and the river Avon to the West.

The nearest noise sensitive receptors are the houses to the East on The Paddocks, to the West on Charter Road and to the north on Westmead Lane.

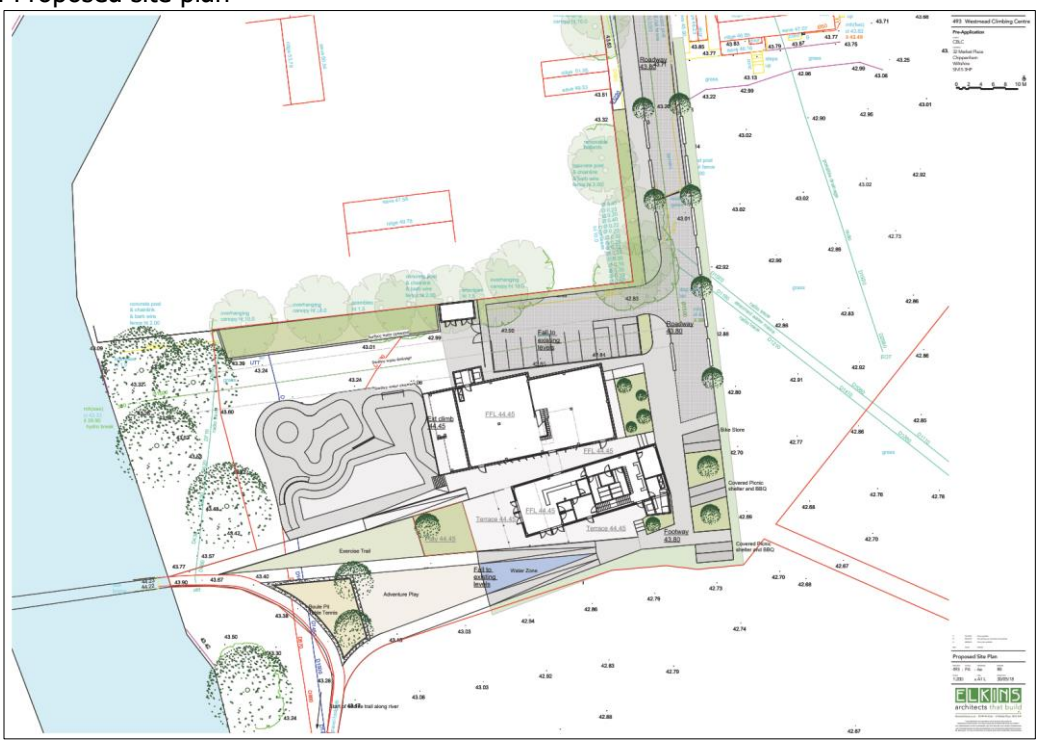
The existing noise climate in the area is determined primarily by road traffic on the A4 Avenue La Fleche.

The skating bowl is artificially lit with use currently restricted to 20:00 hours.

The application is to extend the hours of use until 22:00 hours.

The site is shown on Figure 1 below:

Figure 1: Proposed site plan



3. Planning and Noise

3.1. National Planning Policy Framework

The National Planning Policy Framework (NPPF) was published in March 2012 and revised in December 2023. Section 15 entitled 'Conserving and enhancing the natural environment' addresses noise as a requirement of planning. Paragraph 180 states:

"180. 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. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate."

Paragraph 191 states:

"191. 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; and
c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation. "

The document does not prescribe any assessment methodology or criteria to assess the adverse effect of noise and refers you to the NPSE.

3.2. Noise Policy Statement for England

The NPPF refers to the Noise Policy Statement for England (NPSE). This was published in March 2010 and aims to provide clarity regarding current policies and practices to enable noise management decisions to be made within the wider context, at the most appropriate level, in a cost-effective manner and in a timely fashion and applies to all forms of noise including environmental noise, neighbour noise and neighbourhood noise.

The NPSE sets out the long term vision of Government noise policy. This long term vision is supported by three noise policy aims as follows:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on 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."*

The NPSE introduces the concept of "Significant adverse" and "Adverse" impacts of noise which relate to the noise policy aims. These are applied as follows:

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.

SOAEL – Significant Observed Adverse Effect Level

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

The Noise Policy Statement for England (NPSE) states that noise levels above the Lowest Observed Adverse Effect Level are acceptable in planning where reduced to a minimum.

With regard to where there is potential for noise impact it states the following in relation to the second noise policy aim:

"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."

The NPSE does not provide any assessment criteria for the noted effect levels and each case must be considered on its merits.

The NPSE does, however, emphasise that in dealing with noise Local Planning Authorities are required to take a balanced approach in considering the benefits of development as against any adverse effects which arise. Paragraph 2.18 of the NPSE is particularly relevant in this respect and states:

"There is a need to integrate consideration of the economic and social benefits of the activity or policy under examination with proper consideration of the adverse environmental effects, including the impact of noise on health and quality of life. This should avoid noise being treated in isolation in any particular situation, i.e. not focusing solely on the noise impact without taking into account other related factors."

The planning need is outside the scope of noise and acoustics and will need to be addressed by others.

3.3. Planning Practice Guidance, Noise

The Planning Practice Guidance (PPG) on noise referred to here is based on the current version (January 2019) as provided on the Planning Guidance Website. It states that, *"Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment."*

It provides generic guidance on how to determine the noise impact and what factors could be a concern.

It includes the option types to mitigate any adverse effects of noise stating that there are four broad types of mitigation. These are engineering, layout, using planning conditions or obligations and noise insulation.

Paragraph 5 of the PPG provides a table identifying the effect level and examples of effect relating to the impact effect levels provided in the NPSE. The table is duplicated below:

Table 1: PPG Noise – Perception of Effect Levels

Perception	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

The table does not provide any objective assessment which equates to the noted effect levels. However, the PPG identifies that where noise is audible, it is not necessarily intrusive. The effect and impact on people are based primarily on the level of noise.

4. Relevant Noise Guidance

The following sections identify criteria which is considered appropriate for the assessment of recreational use of the skate park.

4.1. World Health Organisation 'Guidelines for Community Noise'

The World Health Organisation 'Guidelines for Community Noise' published in 1999 gives the following description of community noise.

"Community noise (also called environmental noise, residential noise or domestic noise) is defined as noise emitted from 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. Typical neighbourhood noise comes from premises and installations related to the catering trade (restaurant, cafeterias, discotheques, etc.); from live or recorded music; sport events including motor sports; playgrounds; car parks; and domestic animals such as barking dogs."

This includes "*sport events*" and "playgrounds" which in our view would cover skate parks.

For noise levels internally and externally to dwellings it states:

"In Dwellings. The effect of noise in dwellings, typically, are sleep disturbance, annoyance and speech interference. For bedrooms the critical effect is sleep disturbance. Indoor guideline values for bedrooms are 30 L_{Aeq} for continuous noise and 45 L_{Amax} for single sound events. Lower noise levels may be disturbing depending on the nature of the noise source. At night-time, outside sound levels about 1 metre from façades of living spaces should not exceed 45 dB L_{Aeq}, so that people may sleep with bedrooms open. This value was obtained by assuming the noise reduction from outside to inside with the window open is 15 dB. To enable casual conversation indoors during daytime, the sound level of interfering noise should not exceed 35 dB L_{Aeq}. The maximum sound pressure level should be measured with the sound pressure meter set at "fast"."

Based on the same methodology used to determine the night time noise level (with a 15 dB(A) for an open window) outside a residential property, the daytime noise level about 1 metre from façades of living spaces should not exceed 50 dB L_{Aeq}.

Table 4.1 of the document provides guidelines for community noise in specific environments, suggesting noise levels at which adverse health and annoyance effects are likely. The relevant noise criteria are as follows:

Table 2: WHO Noise Criteria

Specific Environment	Critical Health Effect	$L_{eq(T)}$ dB(A)
Outdoor living area	Serious annoyance, daytime and evening	55
	Moderate annoyance, daytime and evening	50
Dwelling indoors	Speech intelligibility & moderate annoyance, daytime & evening	35

According to the WHO guidance, moderate annoyance is caused by noise levels exceeding 50 $L_{Aeq(T)}$ dB externally and 35 $L_{Aeq(T)}$ dB internally. With relation to the adverse effect level, we would consider this the threshold of the Lowest Observed Adverse Effect Level.

Therefore, where noise levels from the proposed development do not exceed 50 $L_{Aeq(T)}$ dB externally and 35 $L_{Aeq(T)}$ dB internally, the effect is below the Lowest Observed Adverse Effect Level and will have no adverse effect. The noise level of the skate park may be noticeable but not intrusive and is considered acceptable in planning terms.

The equivalent noise level is determined over a specific time period. The World Health Organisation guidelines for residential development are typically equivalent noise levels calculated over a 16-hour daytime period.

In our opinion, a 16-hour assessment period may not truly reflect the noise impact as it takes into account times of use and non-use. We would propose an alternative, more stringent but appropriate assessment time period of one hour, $L_{Aeq\ (T)}$ where it is assumed T is a period of continuous skate park use. In reality the use of skate park is intermittent and skaters often pause between runs so this assessment is expected to present a worst-case where the real-world impact is less.

The WHO criteria were reviewed in a report by the National Physical Laboratory (reference CMAM16) which states:

"Exceedance of the WHO guideline values does not necessarily imply significant noise impact and indeed, it may be that significant impacts do not occur until much higher levels of noise exposure are reached."

Therefore, it is not necessarily the case that where these levels are exceeded the noise will adversely affect nearby residential properties. The proposed criteria are a conservative and stringent noise criteria.

4.2. British Standard 8233:2014 Guidance on sound insulation and noise reduction for buildings

British Standard 8233:2014 entitled 'Guidance on sound insulation and noise reduction for buildings' came into effect on 28th February 2014 and supersedes British Standard 8233:1999.

Table 4 of the British Standard provides internal ambient noise levels for dwellings from noise sources 'without a specific character' and are based on existing guidelines issued by the World Health Organisation in 1999. The British Standard provides no definition of noise 'without a specific character'.

No reference of guidance on sporting or recreational uses is given in the British Standard, unlike the WHO Guidelines. As such, we propose that the definition of community noise is applicable to the proposed noise limits. The British Standard 8233:2014 provides the same guidance levels as the World Health Organisation document.

4.3. Comparative Assessment

The criteria set out in section 4.1 is an absolute level in a dwelling or external amenity area. As such, it does not consider existing noise levels on or around the site. However, for certain applications it may be more suitable to consider a comparative assessment as part of the overall impact assessment.

For example, this would be a site where the existing noise levels already exceed the WHO guideline values. This existing noise for example, could be due to transportation noise or other sporting facilities.

The Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment, Version 1.2 published in November 2014 categorises the significance of a change in noise level this is summarised as follows and taken from Table 7-14 of the guidance:

Table 3: IEMA Impact from the Change in Sound Levels (Table 7-14)

Long-term impact classification	Short-term impact classification	Sound Level Change LpT
Negligible	Negligible	≥ 0 dB and < 1 dB
	Minor	≥ 1 dB and < 3 dB
Minor	Moderate	≥ 3 dB and < 5 dB
Moderate	Major	≥ 5 dB and < 10 dB
Major		≥ 10 dB

Where noise from the proposed development does not exceed the existing noise climate, the increase in noise will be no more than 3 decibels. It is expected there will be no observed effect on nearby residential properties.

This would be applicable where noise levels currently exceed the WHO guidelines which would be used as a lower limit. The noise levels are both measured in the $L_{Aeq(T)}$ parameter over the same time period, T.

4.4. Maximum noise levels

The local authority requested that the noise impact of maximum noise levels on residential properties is considered.

We are not aware of any relevant criteria for the assessment of maximum noise levels during the day. We have compared the predicted levels against the existing noise climate.

Within BS8233:2014 and WHO1999 there is a night time maximum noise criterion of 45dB $L_{Amax(fast)}$ for bedrooms at night. With sound reduction through an open window this would equate to 60dB $L_{Amax(fast)}$ outside a dwelling. No equivalent criteria are given for daytime activity, although, if the above is not exceeded it would demonstrate no observed adverse impact.

4.5. Proposed Assessment Methodology for Recreational Use

It is proposed to assess the development against the WHO guidelines. Where the predicted noise level of the recreational use is below the WHO guidelines threshold for the onset of 'moderate annoyance' in terms of the PPG, the development will have 'no observed adverse effect'.

It is considered that where the proposal exceeds the WHO guidelines but does not increase the existing evening noise climate by more than 3 decibels, there will be no adverse impact on the nearby noise sensitive residential properties and by more than 3-6 decibels, there will be no significant adverse impact on the nearby noise sensitive residential properties. It is our opinion that this would also fall within the Lowest Observed Adverse Effect Level of the PPG.

The PPG states that the perception of 'No Observed Adverse Effect' is 'Present and not intrusive' and gives an example outcome as follows:

"Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life."

The 'No Observed Adverse Effect' level falls below the Lowest Observed Adverse Effect Level of the PPG.

5. Noise Levels of Skate Park Activity

Noise emission levels have been identified from the TÜV Thüringen Analagentechnik GmbH report entitled "Sonic study of skating obstacles, Skate-Park Rodgausee, Measurement of Skate Stone skating obstacles" dated 21st August 2000. This is based on three skateboarders using various obstacles of the skate park simultaneously. According to the report, the noise level from the skate park is 55 L_{Aeq} decibels at 25 metres.

A total of seven skateboarders were measured using various obstacles continuously for a 10-minute measurement period at Somerton Skate Park, TA11 6RU. During the measurement period the skateboarders were using the obstacles constantly, queuing to use the obstacles. As such, this is considered to be a measurement of the Somerton Skate Park at maximum use during the monitoring period.

Measurements were taken at 5 metres from the Skate Park to ensure that the Skate Park was the primary source of noise. The measured noise level was 68 dB $L_{Aeq,T}$ free-field.

Additional Skate Park measurements were requested by Wiltshire Council Environmental Health Department in order to consider the L_{Amax} of Skate Park activity. Acoustic Consultants undertook noise monitoring at an existing Skate Park in Bedminster, Bristol on the 24th May 2019 to determine noise levels from Skate Park activities. The most significant source of noise was due to impact of the wheels on the concrete obstacles/ pavement.

One skateboarder was measured using various obstacles continuously during short periods of time, this allowed us to obtain consistent measurements in a controlled environment and request specific exercises that would result in the loudest possible L_{Amax} Skate Parking activity noise. Samples of noise were measured in two main locations: on a concrete half pipe and on at the perimeter of a skate park bowl. In addition, we have also measure individual samples of noise from the skateboard wheels skidding and impacting on the pavement. Obtained results are shown below.

Table 4: Skateboard noise L_{Amax} noise measurements

Location	Measured L_{Amax}, dB
Skateboard activity measured on a flat concrete pavement between two small ramps at 10 metres distance from the source	82
Skateboard activity measured on a flat concrete pavement between two small ramps at 5 metres distance from the source	85
Skateboard activity measured on a concrete skate hole's perimeter	93
Skateboard wheels skidding and impacting on the pavement at 1 metre distance from the source	102

6. Site Noise Monitoring

An attended site noise survey was undertaken on the 8th and 9th October 2018 at a monitoring 'Location A' considered representative of the noise sensitive properties in the area located to the east.

In addition, attended site noise surveys were carried out at two different locations simultaneously; Charter Road to the West ('Location B') and Bowles Court/Waterford Place - Westmead Lane ('Location C') to the north of the proposed development site on the 16th of May 2019 between 17:00 and 20:00 hours for the originally permitted hours. Measurements at these locations did not extend to 22:00 hours.

Sound pressure levels were measured using a Class 1 sound level meter, with a half-inch condenser microphone, using the 'fast' setting. The equipment is checked regularly using a Quality System meeting the requirements of British Standard EN ISO/IEC 17025:2005, and in accordance with British Standard EN 10012:2003, and traceable to the National Standards.

This equipment was checked and calibrated as noted below and the certificates are available for inspection. Table 5 provides the equipment and calibration status.

Table 5: Equipment and Calibration Status

Equipment Description / Manufacturer / Type	Serial number	Date of calibration	Calibration Certification Number
'Location A'			
SLM, NTI, XL2	A2A-13617-E0	13/09/2018	FL-18-082
Pre-Amp, NTI, MA220	7727	13/09/2018	FL-18-082
Microphone, NTI, MC230A	A16151	13/09/2018	FL-18-082
Calibrator, Larson Davis, CAL200	12605	16/04/2018	283673
'Location B'			
SLM, NTI, XL2	A2A-13561-E0	25/07/2018	K354684
Pre-Amp, NTI, MA220	7606	25/07/2018	K354684
Microphone, NTI, MC230A	A15862	25/07/2018	K354684
Calibrator, Larson Davis, CAL200	15064	25/07/2018	K354684
'Location C'			
SLM, NTI, XL2	A2A-09705-E0	04/09/2017	15284
Pre-Amp, NTI, MA220	5332	04/09/2017	15284
Microphone, NTI, MC230A	A14374	04/09/2017	15284
Calibrator, CEL, Type 284/2	3/02716829	04/09/2017	15283

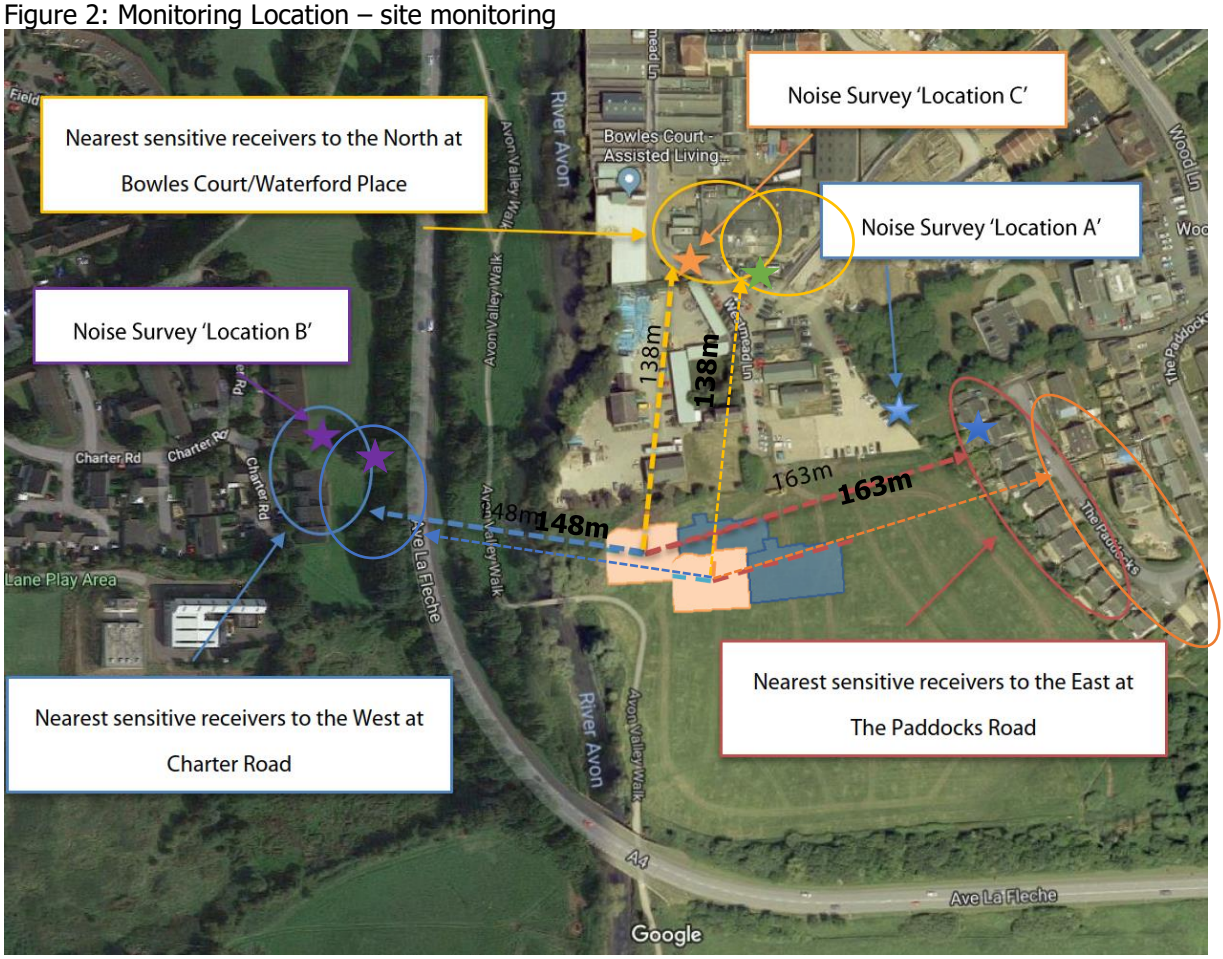
The measurement system was checked before and after use with the noted calibrator and no significant drift was detected.

The nearest noise sensitive receivers are understood to be dwellings located to the west on 'Charter Road' and at approximately 148 metres from skatepark, dwellings to the north on 'Bowles Court/Waterford Place - Westmead Lane' and at approximately 138 metres from skatepark and dwelling to the east on 'The paddocks' road approx. 163 metres from the skatepark.

Although the dwellings located to the north and west are considered to be closer to the proposed skate park than the dwellings located to the east, they are considered to be closer to the Ave La Fleche Road and therefore likely to have higher levels or road traffic noise.

The measurements were undertaken generally in accordance with British Standard 7445. During the monitoring exercise, the main noise source was road traffic along the A4, Avenue La Fleche.

Figure 2: Monitoring Location – site monitoring



The weather conditions throughout the survey were dry, with an air temperature of 12 degrees Celsius and a South Easterly wind of less than 5 metres per second.

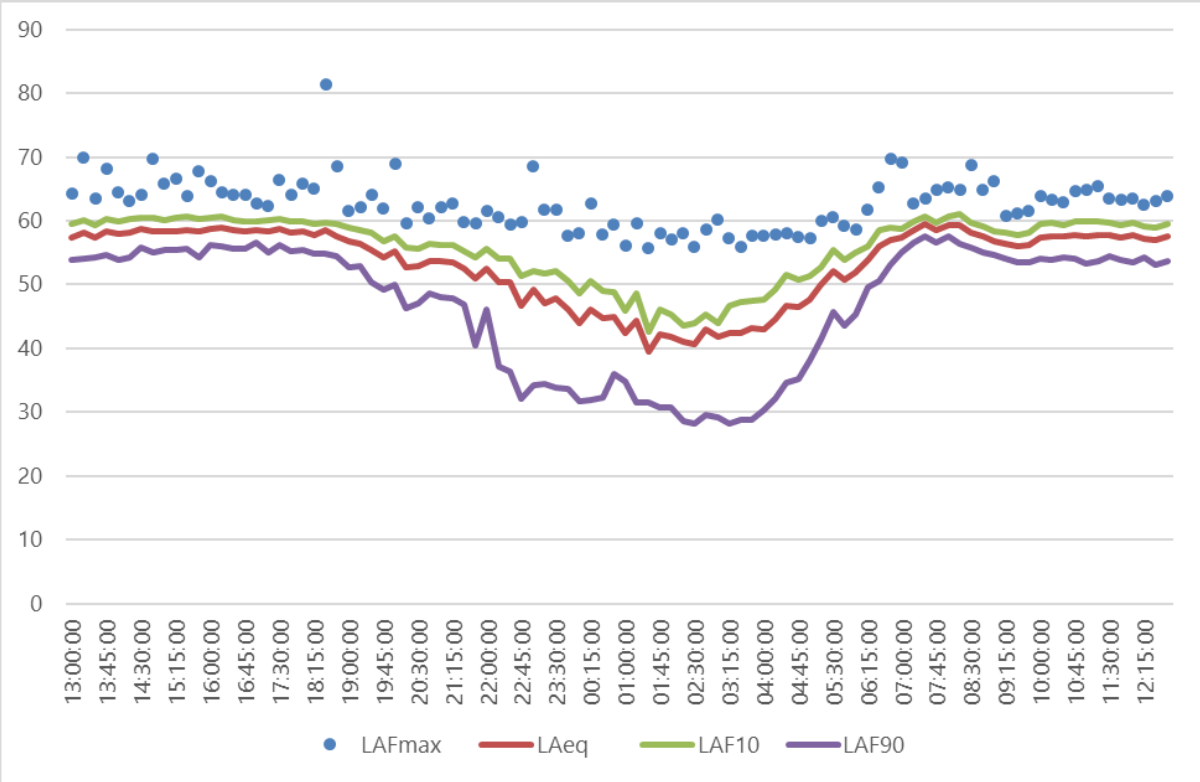
The equipment was set up in a free-field position on a tripod 1.5 metres above the ground. To the East of the site close to the houses on The Paddocks.

This survey location was chosen as these houses are expected to experience lower noise levels from road traffic than those to the West of the site and will therefore provide the more onerous criteria. The monitoring location is shown below in Figure 3.

The following charts provides the measurements obtained at the three different monitoring locations:

Monitoring 'Location A' – Receivers at 'The Paddocks Road'

Chart 1: Measured noise levels at 'Location A'



The following table provides the equivalent noise level from 13:00 hours to the proposed closing time of the site (22:00 hours) for comparison with the predicted noise level of the skate park.

Table 6: Measured noise levels at 'Location A'

Time	$L_{Aeq,1\ hour}$ (dB)	L_{AFmax}(dB)	L_{AF90}
13:00 hrs to 14:00 hrs	58	67	54
14:00 hrs to 15:00 hrs	58	66	55
15:00 hrs to 16:00 hrs	58	66	56
16:00 hrs to 17:00 hrs	59	65	56
17:00 hrs to 18:00 hrs	58	64	56
18:00 hrs to 19:00 hrs	58	76	55
19:00 hrs to 20:00 hrs	56	63	51
20:00 hrs to 21:00 hrs	54	62	48
21:00 hrs to 22:00 hrs	53	60	46

7. Skate Park Noise Emission Prediction

To determine noise levels across the site, noise modelling has been undertaken using computer modelling package Cadna:A by DataKustik and the measured data noted above. The software predicts industrial noise using the general method of calculation from 'ISO 9613'. The modelling parameters used are as follows:

A noise model has been generated of the development site and surrounding area.

The topography of the area has been determined from height points provided by Environment Agency Lidar data.

The location of surrounding buildings has been determined from data provided by Open Street Map.

The proposed site layout has been taken from the Elkins Architects drawing Proposed Site Plan 493/PA/6b dated 30/05/18.

The ground is generally considered to be soft and absorbent, the height of existing residential buildings has been assumed to be 6 metres and the height of the proposed buildings has been determined from the site elevation drawings.

Third-order reflections are calculated.

The noise source has been included as an area source over the location of the skate bowl. The bowl will be sunk into the ground but as the details of this are not available, we have placed the noise source 0.1 metres above the existing ground level. It is expected that noise within the sunken bowl will be lower at the noise sensitive properties than that at ground level but to ensure that this attenuation is not over estimated we have not included this within the model.

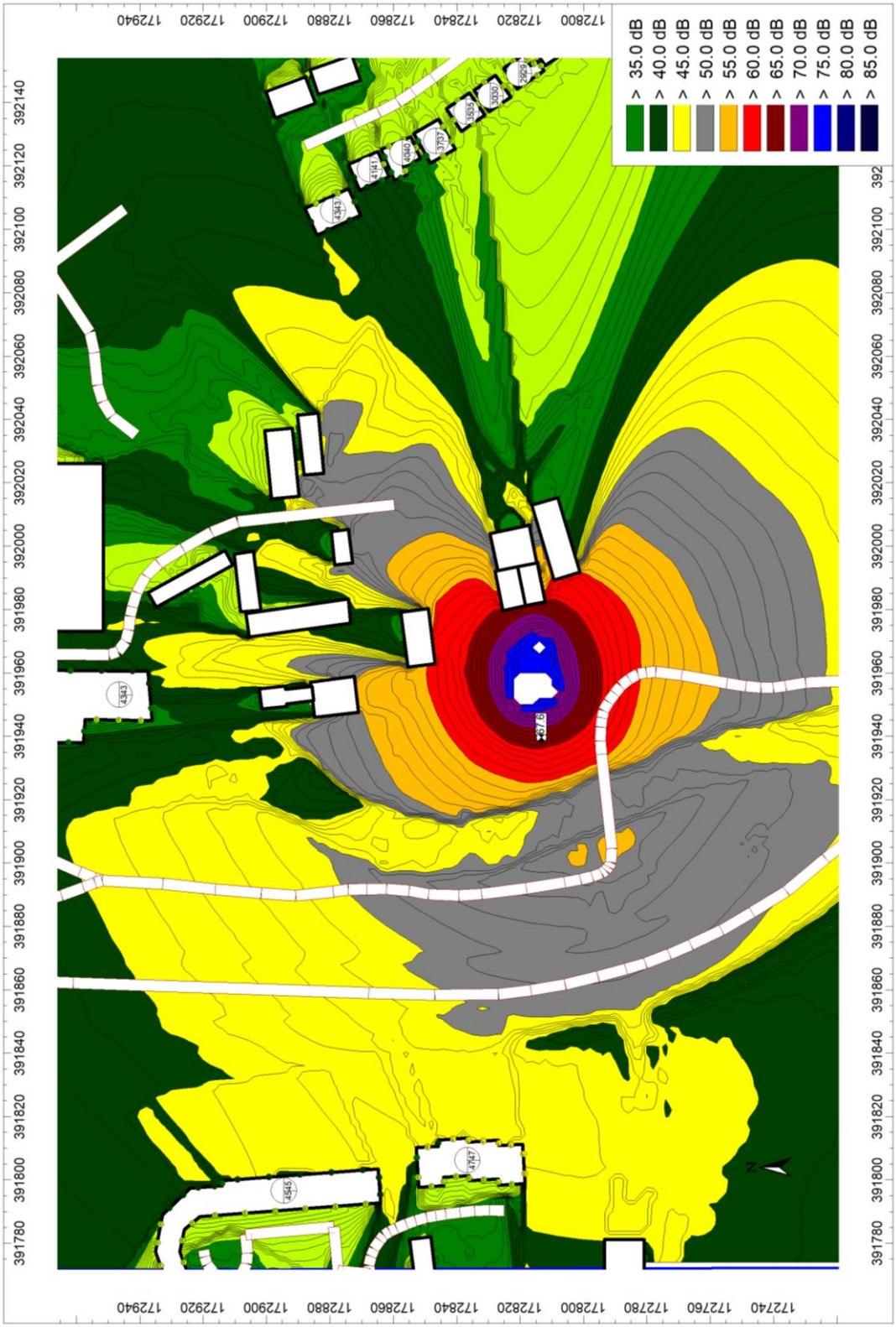
The sound reduction provided by the boundary fences around the gardens is not considered in the modelling as it cannot be demonstrated that the construction complies with the requirements of ISO 9613.

The noise map below in Section 8 shows noise emission from the skate park predicted at ground floor level (1.5 metres above the ground), which is typical of a 'daytime' habitable room in a house and external amenity areas.

8. Predicted Noise Level Assessment

The following figure shows the predicted noise emission from the proposed external skating area. Residential noise sensitive receivers are marked in beige.

Figure 3: Predicted L_{Aeq}, Skate Park Noise Emission (1.5 metres above the ground).



The highest predicted noise level at the residential properties to the West at Charters Road is 47 dB $L_{Aeq\ (1\ hour)}$ and 43 dB $L_{Aeq\ (1\ hour)}$ at both East and North residential properties on The Paddocks and Bowls Road respectively.

The predicted noise levels are below the proposed criterion of 50 dB $L_{Aeq\ (1\ hour)}$ derived from WHO1999 as being the threshold for the onset of moderate community annoyance.

The World Health Organisation provides a sound reduction through an open window of 15 dB(A) which results in a predicted internal equivalent noise level of 32 dB $L_{Aeq\ (1\ hour)}$. The World Health Organisation guidance states "*To enable casual conversation indoors during daytime, the sound level of interfering noise should not exceed 35 dB* L_{Aeq}*."* British Standard 8233:2014 provides the same noise criteria for a bedroom during the daytime period.

The predicted noise level of 47 dB in gardens is below the criteria at which moderate community annoyance in outside living areas (such as gardens) can occur, stated in World Health Organisation 1999 as 50 dB $L_{Aeq\ (1\ hour)}$.

On the basis of the above, the proposals are considered acceptable in terms of noise.

9. Impact on Existing Noise Climate

The impact of noise from the proposed skate park on the existing noise climate has been assessed using the IEMA guidelines. The following table gives the predicted noise level, representative existing noise level, overall change and IEMA classification at the noise sensitive locations.

Table 7: Impact on existing noise climate at location 'A' to the East on The Paddocks

Time	Existing Equivalent Noise Level, dBA	Predicted Equivalent Noise Level, dBA	Change, dB	Long-term Classification
13:00 to 14:00 hrs	58	43	0.1	Negligible
14:00 to 15:00 hrs	58	43	0.1	Negligible
15:00 to 16:00 hrs	58	43	0.1	Negligible
16:00 to 17:00 hrs	59	43	0.1	Negligible
17:00 to 18:00 hrs	58	43	0.1	Negligible
18:00 to 19:00 hrs	58	43	0.1	Negligible
19:00 to 20:00 hrs	56	43	0.2	Negligible
20:00 to 21:00 hrs	54	43	0.8	Negligible
21:00 to 22:00 hrs	53	43	1.0	Negligible / Minor*

*based on long term/ short term classification

On the basis of the IEMA guidelines the proposals result in a negligible or minor increase in the overall noise climate. This is considered acceptable in noise impact terms and indicates noise from the skate park is likely to be inaudible or barely audible over the existing noise climate.

It is also pertinent to note that the predicted noise levels, in addition to having a negligible impact on the existing noise climate, are at a level which is considered to be below the onset of community annoyance.

10. Predicted L_{Amax} Noise Level Assessment

Within the guidance documents noted in Section 4 the maximum noise levels are typically irrelevant during daytime periods as they relate to sleep disturbance.

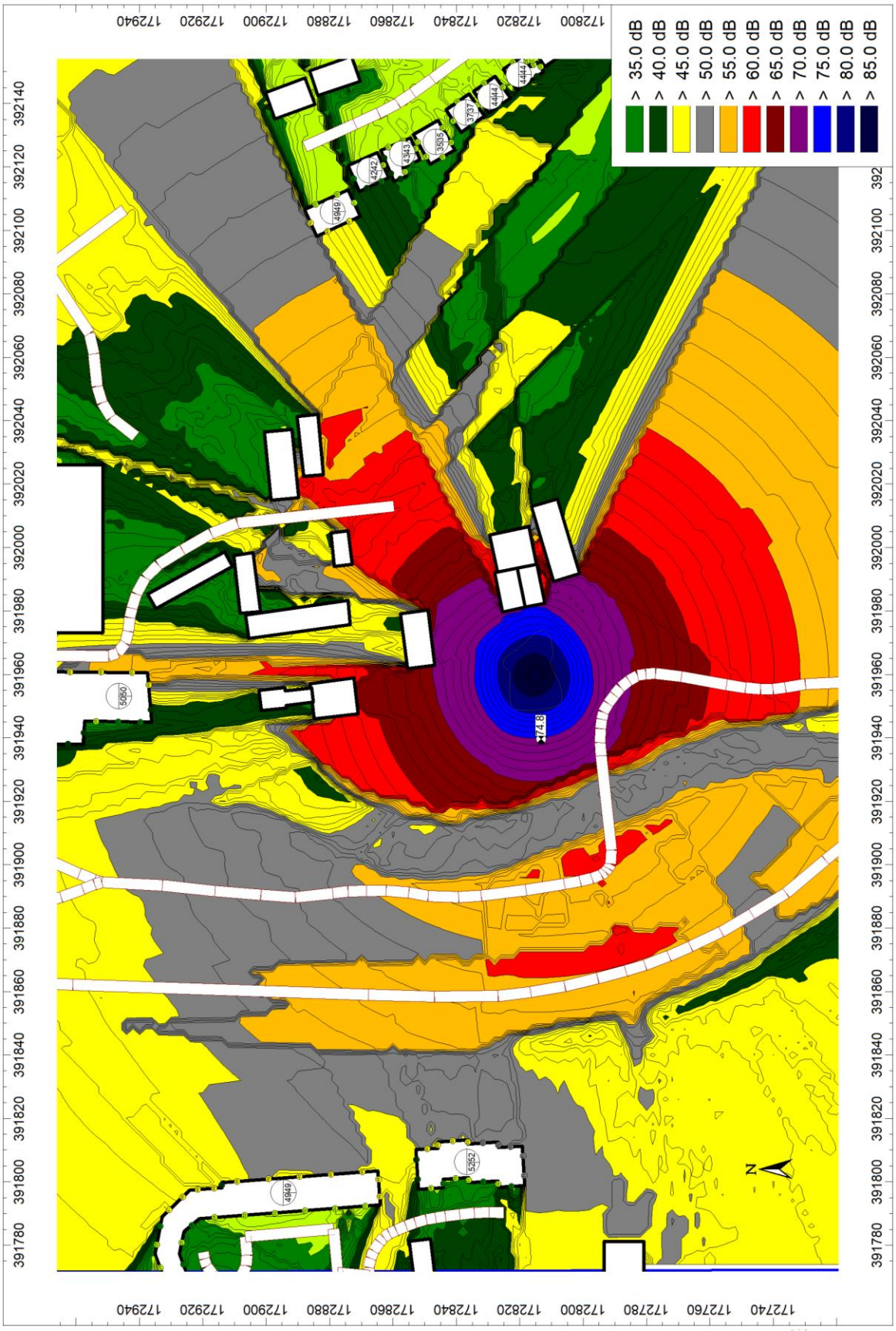
However, the Local Authority stated within the original application that *"the most noticeable and intrusive impacts from skate-boarding and will need to be prescribed and assessed contextually at the site in terms of significance"*.

To determine noise levels across the site, noise modelling has been undertaken using computer modelling package Cadna:A by DataKustik and the measured L_{Amax} data noted above. The modelling parameters used are the ones described above in section 8.0 with the following exception:

The noise source representative of the loudest measured Skate Park activity sample of 103dB L_{Aeq} at one metre from the source has been included as a point source over the location of the skate bowl. The bowl will be sunk into the ground but as the details of this are not available, we have placed the noise source 0.1 metres above the existing ground level. It is expected that noise within the sunken bowl will be lower at the noise sensitive properties than that at ground level but to ensure that this attenuation is not over estimated we have not included this within the model.

The following figure shows the predicted noise emission from the proposed external skating area.

Figure 4: Predicted L_{AFmax}, Skate Park Noise Emission (1.5 metres above the ground).



The highest predicted maximum noise level at the residential properties to the West is 52 dB L_{AFmax}, 50 dB dB L_{AFmax} at the residential properties to the North and 49 dB L_{AFmax} at the residential properties to the East.

The predicted L_{Amax} noise levels are significantly lower than the existing maximum noise levels and lower than the pre-existing equivalent noise levels in the proposed extended hours as well as the permitted hours.

There are no specific noise criteria for maximum noise levels from this type of noise during the day. There is a night time maximum noise criterion of 45dB $L_{Amax(fast)}$ for bedrooms at night in BS8233:2014 and WHO1999. With sound reduction through an open window this would equate to 60dB $L_{Amax(fast)}$ outside a dwelling. The predicted noise levels are significantly (8dB to 11dB) below this level at all noise sensitive locations.

This is a clear indication that maximum noise levels from noisy events will have no observed adverse effect on nearby noise sensitive dwellings.

12. Limitations

The report limits itself to addressing solely on the environmental noise aspects as included herein. We provide advice only in relation to noise and acoustics. It is recommended that appropriate expert advice is sought on all the ramifications (e.g. CDM, structural, condensation, fire, legal, etc.) associated with any proposals in this report or as advised and concerning the appointment.

The report has been prepared in good faith, with all reasonable skill and care, based on information provided or available at the time of its preparation and within the scope of work agreement with the client. We disclaim any responsibility to the Client and others in respect of any matters outside the scope of the above.

The report is provided for the sole use of the named Client and is confidential to them and their professional advisors. No responsibility is accepted to other parties.

It should be noted that noise predictions are based on the current information as we understand it and on the performances noted in this report. Any modification to these parameters can alter the predicted level. All predictions are in any event, subject to a degree of tolerance of normally plus or minus three decibels. If this tolerance is not acceptable, then it would be necessary to consider further measures.

13. Summary and Conclusions

Chippenham Borough Lands Charity appointed Acoustic Consultants Limited to undertake an environmental noise assessment for the proposed extension of hours of the skate park at The Arc, off Westmead Lane in Chippenham.

The assessment considered the impact of environmental noise on the nearby noise-sensitive residential properties.

The assessment includes the prediction and assessment of noise emission from the proposed external skating area for use until 22:00 hours. The current permitted use is until 20:00 hours.

The assessment within this report is based on that submitted with the approved planning application for the application site which incorporated comments by the Environmental Health Officer made during the determination period.

A noise model has been generated of the development site. The highest predicted noise level of skate park activity at the residential properties to the West is 47 dB $L_{Aeq\ (1\ hour)}$ and to the East and North is 43 dB $L_{Aeq\ (1\ hour)}$.

The predicted noise levels are below the proposed criterion of 50 dB $L_{Aeq\ (1\ hour)}$ derived from WHO1999 as being the threshold for the onset of moderate community annoyance.

On the basis of the above, the proposals are considered acceptable in terms of noise.

On the basis of the IEMA guidelines, the proposals result in a negligible/minor increase in the overall noise climate. This is considered acceptable in noise impact terms and indicates noise from the skate park is likely to be inaudible or barely audible over the existing noise climate.

The highest predicted maximum noise level at the residential properties to the West is 52 dB L_{AFmax}, 50 dB dB L_{AFmax} at the residential properties to the North and 49 dB L_{AFmax} at the residential properties to the East.

The predicted L_{Amax} noise levels are significantly lower than the existing maximum noise levels and lower than the pre-existing equivalent noise levels in the proposed extended hours as well as the permitted hours.

With regards to planning policy, we would expect that the development would potentially be noticeable but not intrusive and would result in 'no observed adverse effect'. This is defined in the PPG as *'Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life'*.

This falls below the 'lowest observed adverse effect level' of the PPG: Noise and therefore complies with the aims of the Noise Policy Statement for England (NPSE) requirements.

14. Appendix 1 – Glossary of Acoustic Terminology

A-weighted sound pressure pA – value of overall sound pressure, measured in pascals (Pa), after the electrical signal derived from a microphone has been passed through an A-weighting network.

A-weighted sound pressure level, L_{pA} - quantity of A-weighted sound pressure given by the following formula in decibels (dBA)

$L_{pA} = 10 \log_{10} (p_A/p_0)^2$

where:

p_A is the A-weighted sound pressure in pascals (Pa);
p_0 is the reference sound pressure (20 µPa)

Background sound level, $L_{A90,T}$– A-weighted sound pressure level that is exceeded by the residual sound assessment location for 90% of a given time interval, T, measured using weighting F and quoted to the nearest whole number of decibels

Break-in - noise transmission into a structure from outside.

Decibel (dB) – The decibel is the unit used to quantify sound pressure levels. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). Therefore, a logarithmic scale is used to describe sound pressure levels and also sound intensity and power levels. The logarithms are taken to base 10. Hence an increase of 10 dB in sound pressure level is equivalent to an increase by a factor of 10 in the sound pressure level (measured in Pascals). Subjectively, this increase would correspond to a doubling of the perceived loudness of sound.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$ – value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, T = t2 – t1, has the same mean-squared sound pressure as a sound that varies with time, and is given by the following equation:

$$L_{AeqT} = 10\lg_{10}\left\{(1/T)\int_{t_1}^{t_2}[p_A(t)^2/p_0^2]dt\right\} \quad (1)$$

where:

p_0 is the reference sound pressure (20 µPa); and
$p_A(t)$ is the instantaneous A-weighted sound pressure (Pa) at time t

NOTE The equivalent continuous A-weighted sound pressure level is quoted to the nearest whole number of decibels.

Facade level – sound pressure level 1 m in front of the façade. Facade level measurements of L_{pA} are typically 1 dB to 3 dB higher than corresponding free-field measurements because of the reflection from the facade.

Free-field level – sound pressure level away from reflecting surfaces. Measurements made 1.2 m to 1.5 m above the ground and at least 3.5 m away from other reflecting surfaces are usually regarded as free-field. To minimize the effect of reflections the measuring position has to be at least 3.5 m to the side of the reflecting surface (i.e. not 3.5 m from the reflecting surface in the direction of the source).

Octave and Third Octave Bands – The human ear is sensitive to sound over a range of frequencies between approximately 20 Hz to 20 kHz and is generally more sensitive to medium and high frequencies than to low frequencies within the range. There are many methods of describing the frequency content of a noise. The most common methods split the frequency range into defined bands, in which the mid-frequency is used as the band descriptor and in the case of octave bands is double that of the band lower. For example, two adjacent octave bands are 250 Hz and 500 Hz. Third octave bands provide a fine resolution by dividing each octave band into three bands. For example, third octave bands would be 160 Hz, 250 Hz, 315 Hz for the same 250 Hz octave band.

Sound pressure level – Sound pressure level is stated on many of the charts. It is the amplitude of the acoustic pressure fluctuations in a sound wave, fundamentally measured in Pascals (Pa), typically from 20 micro-Pascals to 100 Pascals, but commonly simplified onto the decibel scale.

Sound reduction index, R – laboratory measure of the sound insulating properties of a material or building element in a stated frequency band.

Specific sound level, $L_s = L_{Aeq,Tr}$ – equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r.

Structure-borne noise – audible noise caused by the vibration of elements of a structure, the source of which is within a building or structure with common elements.

Rating level, $L_{Ar,Tr}$ – Specific sound level plus any adjustment for the characteristic features of the sound.

Reverberation Time, T – The reverberation time is defined as the time taken for a noise level in an enclosed space to decay by 60 dB from a steady level once the noise source has stopped. It is measured in seconds. Often a 60 dB decay cannot be measured so the reverberation time is measured over a lesser range and corrected back to the time for a 60 dB drop assuming a constant decay rate. Common parameters are T20 (time taken for a 20 dB decay multiplied by three) and T30 (time taken for a 30 dB decay multiplied by two).

Vibration Dose Value, VDV – measure of the total vibration experienced over a specified period of time.

Estimated Vibration Dose Value, eVDV – estimation of the total vibration experienced over a specified period of time. This is usually based on the number of events and shortened measurement data.

Weighted sound reduction index, R_w – Single-number quantity which characterizes the airborne sound insulating properties of a material or building element over a range of frequencies. The weighted sound reduction index is used to characterize the insulation of a material or product that has been measured in a laboratory (see BS EN ISO 717-1).



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