VIBROCK

Assessment of Environmental Impact of Noise at Proposed Skate Park, Lossiemouth, Moray

LOSSIEMOUTH SKATE PARK INITIATIVE

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QUALITY MANAGEMENT

Report Title:	Assessment of Environmental Impact of Noise at Proposed Skate Park, Lossiemouth, Moray
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1.0 INTRODUCTION

1.1 At the request of the Lossiemouth Skate Park Initiative, Vibrock Limited were commissioned to undertake a noise evaluation study of the proposal to construct a skate park within Coulardbank Playing Fields, Moray.

1.2 It is understood that this report will accompany an application for planning permission that will be submitted to the Planning Authority.

1.3 This study benefits from a site inspection and baseline noise monitoring undertaken on 14 May 2019 and a previous survey of the noise levels generated by skateboarding activities at the South Inch Skate Park in Perth.

1.4 This report details the results of the baseline noise level surveys at the proposed site and the results of noise level predictions to noise sensitive receptors from skateboarding activities. These levels have been assessed against the existing levels and relevant noise criteria.

2.0 SITE DESCRIPTION

2.1 General Environs

2.1.1 The recreation ground at which it is proposed the skate park would be constructed is currently occupied by a football pitch, with a changing pavilion, and a playground. Lossiemouth High School is located some 250m south west of the proposed skate park.

2.1.2 It is proposed that the skate park be constructed towards the north east corner of the recreation ground, south of the existing playground and west of the A941. The ground on which the skate park will occupy falls from the A941, which is around 9.5m Above Ordnance datum (AOD), to the eastern edge of the football pitch that is at 5m AOD.

2.1.3 The nearest existing dwellings to the proposal are those on Elgin Road; No.'s 12 and 14, as well as 3 and 4 Church Court and 1 Church Street. The separation distance to these dwellings from the skate park range from around 22m to 35m. The closest properties on South Covesea Terrace are some 120m from the northern edge of the skate park.

2.2 Existing Noise Attenuating Features

2.2.1 The existing fall in the topography will offer some degree of screening to the properties that are located on and close to Elgin Road, particularly as the source height of the noise; skate board wheels, are at a low height.

2.3 Likely Activities

2.3.1 In order to assist in the noise prediction calculations, noise level measurements were recorded at the existing South Inch Skate Park, Perth, a facility similar to that in construction as that proposed for Lossiemouth.

2.3.2 In addition to the measurement of noise levels at the South Inch Skate Park, observations were also made of how the skate park was used and the activities generating, subjectively, the highest noise levels. A visit of the skate park took place on 8 April 2014, during the local schools Easter break, and, therefore, was particularly busy with skateboarders, BMX and scooter riders.

2.3.3 Due to the rubber wheels of the BMX and scooters, the noise levels generated by the riders were, subjectively, much lower than those using skateboards. The skateboarders generated intermittent higher levels of noise when performing tricks or jumps due to the impact of the skateboard hitting the concrete surface.

2.3.4 Although there was around 40 – 50 users/riders within the skate park, there appeared to be only 10 – 15 people skateboarding or riding BMX/scooters at any one time, with the remainder socialising/talking at the edges of the skate park.

2.3.5 It has been assumed that the proposed skate park at Lossiemouth would be used in a similar manner to that existing at the South Inch Park.

3.0 NOISE TERMINOLOGY

3.1 Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air.

3.2 Between the quietest audible sound and the loudest tolerable sound there is a million to one ratio in sound pressure level. It is because of this wide range that a noise level scale based on logarithms is used in noise measurement. This is the decibel or dB scale.

3.3 Audibility of sound covers a range of about 0 to 140 decibels (dB) corresponding to the intensity of the sound pressure level. The ability to recognise a particular sound is dependent on the pitch or frequencies present in the source. Sound pressure measurements taken with a microphone cannot differentiate in the same way as the ear, consequently a correction is applied by the noise measuring instrument in order to correspond more closely to the frequency response of the ear which responds to sounds from 20 Hz to 20000 Hz. This is known as 'A-weighting' and written as dB(A).

3.4 The use of this unit is internationally accepted and correlates well with subjective annoyance to noise.

3.5 The logarithmic basis of noise measurements means that when considering more than one noise source their addition must be undertaken in terms of logarithmic arithmetic. Thus, two noise sources each of 40 dB(A) acting together would not give rise to 40 + 40 = 80 dB(A) but rather 40 + 40 = 43 dB(A). This 3 dB(A) increase represents a doubling in sound energy but would be only just perceptible to a human ear.

3.6 The following table gives typical noise levels in terms of dB(A) for common situations.

Approximate Noise Level dB(A)	Example
0	Threshold of hearing
30	Rural area at night, still air
40	Public library
50	Quiet office, no machinery
60	Normal conversation
70	Inside a saloon car
80	Vacuum cleaner
100	Pneumatic drill
120	Threshold of pain

3.7 Noise levels can vary with time according to source activity and indices have been developed in order to be able to assign a value to represent a period of noise level variations and to correspond with subjective response.

3.8 The L_{Aeq} or A-weighted equivalent continuous noise level index is used to average the noise energy over a period of intermittent noise levels. It is the level of steady sound of equivalent energy and is usually referred to as the ambient noise level.

3.9 The L_{A90} index represents the noise level exceeded for 90% of the measurement period and is used to indicate the quieter sections of the measurement period. It is usually referred to as the background noise level.

3.10 The L_{Amax} index is the maximum root mean square A-weighted noise level occurring during the measurement period.

4.0 NOISE CRITERIA

4.1 Introduction

4.1.1 The ambient environmental noise at any location will vary according to the activities in progress around that location. In the vicinity of a busy motorway, for example, the noise level will remain fairly constant due to the relatively steady noise input from road traffic, whereas the noise level close to a source of high noise over short periods, such as an airport, will vary over a much wider range. It is therefore necessary to consider how to quantify the existing noise levels in an area in order to accurately assess the acceptability of the introduction of a new noise source.

4.1.2 The background noise level, defined as the L_{A90} parameter, represents the noise level exceeded for 90% of a measurement period, or the ninety percentile level. It generally reflects the quieter noise level between noise events and generally ignores the effects of short term higher noise level events.

4.1.3 The fifty and ten percentile levels, L_{A50} and L_{A10}, represent the average noise level and the level exceeded for 10% of the measurement period, respectively. The latter, for example, is commonly used to describe and quantify noise from road traffic.

4.1.4 The equivalent continuous sound pressure level, or L_{Aeq} parameter, is a measure of the average sound energy over a given time period. It will include noise from all contributing sources. Unless the noise level at the receiving point is perfectly steady, the L_{Aeq} will always be higher than the L_{A90} over any one measurement period.

4.2 Planning Advice Note (PAN) 1/2011: Planning and Noise: March 2011

4.2.1 This advice builds on that presented in various documents since 1973 and revokes the most recent, Circular 10/1999 and PAN 56. It identifies how the Environmental Noise (Scotland) Regulations 2006 transposed European Directive 2002/49/EC (the Environmental Noise Directive) into Scottish law and the role that the planning system plays, in the areas affected by the Regulations, in helping to prevent and limit the adverse effects of environmental noise.

4.2.2 Published at around the same time was Technical Advice Note: Assessment of Noise, which contains information and advice on noise impact assessment methods together with details of legislation, standards and codes of practice for specific noise issues.

4.2.3 In relation to development plans the advice note highlights the role these can play in helping limit the number of people exposed to the potential adverse effects of noise through such actions as identifying the acceptable land uses in areas affected by existing high noise levels or by discouraging noisy development in areas that are relatively undisturbed by noise.

4.2.4 Development management advice details that discussions with the planning authority should take place before any application is submitted, with both parties agreeing the level of detail that is required in respect of noise; more extensive information being provided, for example, where developments will generate significant levels of noise or for noise sensitive developments.

4.2.5 The guidance states that it is preferable that satisfactory internal noise levels can be achieved within dwellings with windows open for ventilation but acknowledges that this may not always be possible and that local circumstances may influence the approach taken to open or closed windows. In cases where satisfactory internal levels are not possible with open windows, it recommends that practical mitigation solutions are explored, looking at such aspects as layout and the use of windows that offer improved sound insulation whilst providing ventilation. It does however acknowledge that in some cases closed windows with alternative means of ventilation will be unavoidable.

4.2.6 The benefit to the determination of a planning application through the provision of a noise impact assessment (NIA) is discussed in paragraph 19. It explains how the NIA can demonstrate whether or not a significant adverse noise impact is likely and if so, identifies what effective measures could reduce, control and mitigate the impact. A range of possible control of noise options is provided in paragraph 20 of the document.

4.2.7 A range of noisy developments is presented along with the advice on the assessment of noise from such sources. It also directs any reader to the previously mentioned Technical Advice Note for further advice on NIA methodology and technical standards.

4.3 Technical Advice Note: Assessment of Noise (TAN)

4.3.1 This document provides guidance to assist in the preparation and evaluation of NIAs and in the significance of noise impact. It promotes the adoption of good acoustic design and a sensitive and pragmatic approach to the location of new development to ensure the quality of life is not unreasonably affected by noise. It also recommends that new development should continue to support sustainable economic growth.

4.3.2 In relation to NIA it highlights that the assessment of change can, and should be, both qualitative and quantitative. For quantitative change it advises that the correct noise metrics, sampling periods and survey duration are used. For qualitative changes it suggests that one method of assessing noise impact is to consider whether or not there are likely to be changes to behaviour as a result of noise from a development.

4.3.3 The concept of significance of noise impact is introduced, this being related to both the magnitude of any noise level change and the sensitivity of a particular receptor to noise. Also introduced are the terms noise generating development (NGD) and noise sensitive development (NSD).

4.3.4 A five stage approach, suitable for both NGD and NSD developments, to the assessment methodology is recommended. This involves, at Stage 1, the identification of all noise sensitive receptors (NSR) that could be affected by the development. There are three levels of sensitivity, High, Medium and Low, and examples of the types of buildings within each are provided.

4.3.5 Stage 2 is the quantitative assessment to determine the magnitude of the impact. For NGD this will involve comparing the noise climate before and after a noise source is introduced. In the case of NSD the quantitative assessment will compare an absolute noise level with a target level. A list of generic criteria for the magnitude of impact is contained within the document, addressing both positive and adverse impacts on scale from No Change through to Major.

4.3.6 At Stage 3 the qualitative assessment is undertaken, based on perception and how noticeable the noise impact is in affecting the amenity value of a NSR or behaviour of a resident, for example the likelihood of sleep disturbance, turning up the volume on the TV or closing windows more frequently. These additional factors are included to augment the quantitative assessment and they can be used to adjust the magnitude of impacts determined at Stage 2.

4.3.7 Stage 4 provides a level of significance, obtained through the relationship of a receptor's sensitivity to noise and the magnitude of noise impact. Table 2.6 of the advice note provides a framework that can be used to find the significance of impact for a NSR. For each level of significance an explanation is provided, together with its relevance in the decision making process. The result of this stage of the assessment is entered into the Summary Table of Significance and is repeated for each NSR.

4.3.8 The final step in the process, Stage 5, is the decision process when the numbers of NSRs within each level of significance is totalled to complete the Summary table. This step is normally only required when applying for planning permission.

4.4 BS 4142:2014 + A1:2019 Methods for rating and assessing industrial and commercial sound

4.4.1 This British Standard was initially published in October 2014, had some further text added or altered in 2019, and supersedes BS 4142:1997, which is withdrawn.

4.4.2 This edition describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods described, use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes.

4.4.3 Section 1 of the document; "Scope" defines what type of sound can be considered by the guidance and, at paragraph 1.3, the sound sources that should not be assessed following the Standard and states:

"The standard is not intended to be applied to the rating and assessment of sound from:

a) recreational activities, including all forms of motorsport;

4.5 World Health Organisation (WHO): Guidelines for Community Noise: April 1999

4.5.1 This document provides information on noise and its affects on the community. Within the document for noise 'In Dwellings', it states that 'The effects of noise in dwellings, typically, are sleep disturbance, annoyance and speech interference. To enable casual conversation indoors during daytime, the sound level of interfering noise should not exceed 35 dB L_{Aeq}.'

4.5.2 It goes on to state 'To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55 dB L_{Aeq} on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50 dB L_{Aeq}. Where it is practical and feasible, the lower outdoor sound level should be considered the maximum desirable sound level for new development.'

4.5.3 With respect to individual noise events, the guidance suggests that noise levels should not exceed 60 dB L_{Amax} outside bedrooms with windows open, in order to avoid sleep disturbance.

4.6 BS 8233: 2014 Guidance on sound insulation and noise reduction for buildings

4.6.1 British Standard 8233:2014 provides guidance for sound insulation and noise reduction in buildings. Tables in the document advise on acoustic criteria and limits which are appropriate for various types of space that have different functions. The guidance applies to external noise as it affects the internal acoustic environment from steady sources without a specific character.

4.6.2 For dwellings, the main considerations are; for bedrooms, the acoustic effect on sleep and for other rooms the acoustic effect on resting, listening and communicating. Table 4 in the BS gives desirable ambient noise levels that should not be exceeded. For dwellings the daytime, 0700 – 2300 hours, values are between 35 – 40 dB $L_{Aeq,16h}$ depending on the specific use of the room. The guideline value for bedrooms at night-time, 2300 – 0700 hours, is 30 dB $L_{Aeq,8h}$.

4.6.3 BS 8233 states that for external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. There is also a recognition that the above guideline values may not be achievable in all circumstances and that a balance between noise and other factors will require to be made.

5.0 NOISE LEVEL PREDICTIONS

5.1 Introduction

5.1.1 Noise has been defined as sound which is undesired by the recipient. The effects of noise on the neighbourhood are varied and complicated, including such things as interference with speech communication, disturbance of work, leisure or sleep. A further complicating factor is that in any one neighbourhood some individuals will be more sensitive to noise than others.

5.1.2 A measure that is in general use and is recommended internationally for the description of environmental noise is the equivalent continuous noise level or L_{Aeq} parameter.

5.1.3 In general, the level of noise in the local environs that arises from a development site will depend on a number of factors. The more significant of which are:

(a) The sound power levels (L_{WA}) of the noise source

(b) The periods of operation of the noise source

(c) The distance between the source noise and the receiving position.

(d) The presence or absence of screening effects due to barriers, or ground absorption.

(e) Any reflection effects due to the façades of buildings, etc.

5.2 Prediction Methodology

5.2.1 In order to assist in the noise assessment Cadna 'A' environmental noise prediction software, Version 2017, has been used to model the noise emanating from the proposed development site.

5.2.2 The noise prediction software has been configured to undertake the noise calculations in accordance with ISO 9613-2 – 'Acoustics – Attenuation of sound during propagation outdoors – Part 2: General Method of Calculation'.

5.2.3 In order to accurately represent the frequency content of the noise emanating from the proposed development, modelled noise sources include noise levels within the normal octave frequency bands. Octave band noise levels were recorded during the noise survey at the existing South Inch Skate Park.

5.3 Noise Sources

5.3.1 The sound power levels used within the scope of this report were determined from the noise data obtained at the existing South Inch Skate Park. The results of the South Inch Skate Park noise survey are presented in Table 2.

5.4 Noise Prediction Assumptions

5.4.1 The noise prediction exercise is based on a number of assumptions concerning the use of the proposed site. These assumptions are presented below.

5.4.2 At present no design is available for the proposed skate park, the intention being that a design and build contract will be put in place. A design for a park of similar size has therefore been modelled to provide an indication of what the likely noise levels might be.

5.4.3 For the assumed design three individual routes of a skateboarder using the skate park have been considered, the route generating the highest predicted noise level has been reported. When considering more than one user of the skate park, it has been assumed that each additional user uses the same route – generating the highest predicted noise level.

5.4.4 It has been assumed that each skateboarder is physically skateboarding for a continuous 30 minute period during the 1-hour assessment period.

5.4.5 Given that all prediction methods are estimates and that in practice measured levels are invariably lower due to the effects of interactions between such things as meteorological conditions and air absorption, these predicted levels are a reasonable representation of the worst case predictions assuming ideal meteorological conditions for sound propagation.

6.0 SURVEY METHOD

6.1 Introduction

6.1.1 The methodology described below was employed during the noise surveys. Wherever possible all measurements were undertaken to comply with the requirements of BS 7445:2003.

6.2 Environmental Noise Measurement Technique

6.2.1 At the survey location the microphone was placed 1.5 metres above the ground and at least 3.5 metres from the nearest reflecting surface. The sound level meter was programmed to monitor over 15 minute periods and the following parameters were recorded:

L_{A90} in dB
L_{Amax} in dB
L_{Aeq} in dB

6.2.2 Noise level surveys were undertaken at a location representative of the closest residential receptors to establish the existing noise levels in the vicinity of proposed skate park.

6.3 Existing Noise Measurement Location

6.3.1 The noise level survey location is presented in the table below, and shown on Figure 1.

Location No.	Description
1	Karibu, Elgin Road

6.4 Existing Premises Noise Level Survey

6.4.1 A series of spot noise level measurements were recorded at the South Inch Skate Park in Perth. Noise measurements were made during a number of skateboard passes and tricks.

6.4.2 All noise sound pressure levels were measured at the normal octave frequency bands.

7.0 SURVEY DETAILS

7.1 Instrumentation

7.1.1 The following instrumentation was used for noise level measurements:

Manufacturer	Description	Type	Serial No.
Cirrus	Integrating Sound Level Meter	CR 171B	G071372
Cirrus	½" Pre polarised Cond. Microphone	CRL 224	-
Cirrus	Foam Windshield	-	-
Cirrus	Electronic Calibrator	CR 515	87210

7.1.2 The following set-up parameters were used on the sound level meter during all noise measurements:

Time Weighting: Fast
Frequency Weighting: A
Measurement Period: 15 minutes

7.2 Calibration

7.2.1 The sound level meters were calibrated with the electronic calibrator prior to commencement and on completion of the surveys. No significant drift in calibration was observed.

7.3 Survey Dates and Personnel

7.3.1 Noise levels were measured between the hours of 19:00 and 21:00 on 14 May 2019. The baseline noise level surveys were undertaken during the evening period stated above as this would likely be the busiest time for users of the skate park and when baseline noise levels would be lower.

7.3.2 Noise levels were measured at the South Inch Skate Park in Perth on 8 April 2014.

7.3.3 All surveys were conducted by Mr A Findlay of Vibrock Limited.

7.4 Meteorological Conditions

7.4.1 Weather conditions were noted during the survey periods.

Tuesday 14 May 2019

7.4.2 At the start of the survey period the weather was noted as being mild, 15°C, with 5% cloud cover and dry. There was an easterly wind having speeds in the range 4 – 5 ms^{-1}. As the survey progressed the temperature fell slightly, as did the wind speed; to be 2 - 3 ms^{-1} at the end of the monitoring period. Cloud cover increased to be 30% at 19:30 hours and 50% at 21:00 hours.

Tuesday 8 April 2014

7.4.3 During the survey period on 8 April 2014 it was dry, mild and 50% overcast with a westerly wind of 3 – 4 ms^{-1}. The temperature was in the range of 12 – 13°C.

8.0 RESULTS

8.1 The results of the baseline noise survey are presented in Table 1. During the baseline survey there were several flights from the nearby RAF Lossiemouth. The noise associated with the jets has been removed in Table 1.2.

8.2 The results of the noise level survey from skateboarding activities in the South Inch Skate Park are presented in Table 2.

8.3 The predicted noise levels, calculated using sound power levels determined from the results in Table 2, are presented in Table 3.

9.0 DISCUSSION

9.1 Introduction

9.1.1 Summaries of the noise level predictions from the proposed development to four locations are given in Tables 3.1 - 3.4, together with an indication as to the difference between the predicted and, where relevant, measured existing levels and a target criterion – based on WHO guidance. It has been assumed that the skate park would only be used during the daytime period; 07:00 – 23:00 hours.

9.1.2 Noise level predictions have been undertaken in terms of the $L_{Aeq,1h}$ to assess the general noise from the skate park over a 1-hour period. Also provided, for information purposes, is the predicted L_{Amax} to demonstrate the potential noise impact from the intermittent noise of skateboards hitting the concrete after performing jumps and/or tricks.

9.1.3 A target level of 50 dB $L_{Aeq,}$ has been selected. This noise level is suggested by the World Health Organisations as a guideline value for which should not be exceeded to protect the majority of people from being moderately annoyed. In terms of the L_{Amax} parameter, no criterion is suggested by WHO for the daytime period. However, for night-time, the guidance suggests a limit of 60 dB L_{Amax} outside bedrooms, with windows open, to avoid sleep disturbance.

9.1.4 The proposed skate park is not an industrial development and in the Scope of BS 4142: 2014 +A1:2019 recreational noise is an activity specifically excluded. Nevertheless, it has been considered appropriate to assess the predicted noise levels from the activities within the skate park in accordance with BS 4142, the results of which are presented in Table 4. As there is the possibility of noise being generated intermittently a + 3 dB acoustic feature correction has been applied. A further +3 dB penalty has been included to allow for the impulsive noise associated with tricks/jumps.

9.2 Skateboarding Noise Levels

9.2.1 The assessment is based on noise levels generated by activities within a typical skate park at the South Inch Skate Park, Perth.

9.2.2 As discussed earlier, whilst at the skate park it was established that the activity generating the highest noise levels was skateboarders either riding on their skateboards or performing tricks. Therefore a number of noise level measurements were recorded whilst skateboards passed by or performed tricks, the results of which are displayed in Table 2.

9.2.3 From the results presented in Table 2 sound power levels were determined for both $L_{Aeq,1h}$ and L_{Amax} noise predictions.

9.2.4 The noise measurement used for the $L_{Aeq,1h}$ noise prediction is No. 2 where a noise level of 72.9 dB $L_{Aeq,T}$ was recorded at a distance of 3m. During this measurement the skateboarder travelled towards and then down a small ramp, the sound level meter positioned close to the bottom of the ramp. The ramp was angular in shape and therefore the skateboard could be heard impacting the concrete at the base of the ramp.

9.2.5 The design of the skate park proposed for Lossiemouth, as explained previously, has not been finalised. Modern skate parks, we understand, consist of generally curved corners and, therefore, this type of impact noise from angular ramps will generally be avoided. However, in order to account for the likelihood of noise from jumps and/or skateboards impacting on concrete whilst skateboarders manoeuvre around the skate park this measurement has been used, providing a worst-case scenario. As the noise level recorded was effectively a pass-by type measurement, the highest 1-second L_{Aeq} recorded was used to determine the sound power level, this being a level of 77.5 dB $L_{Aeq,1sec}$.

9.2.6 From Table 2 representative noise level No. 10 was used for the L_{Amax} predictions, a noise level of 89.5 dB L_{Amax}, a measurement towards the upper end of those recorded. During this measurement the skateboarder approached the ramp then jumped from the top of the ramp to the lower level, impacting hard on the concrete.

9.3 Baseline Noise Survey Results

9.3.1 In order to assess the potential noise impact to nearby residents a baseline noise level survey was undertaken at a location close to the eastern side of the proposed skate park, in the grounds of a vacant plot where, previously a property known as Karibu was located.

9.3.2 Referring to Table 1.1, the un-edited results, the average weekday daytime background noise level, L_{A90}, was 50 dB, with measurements in the range 46.6 to 52.9 dB(A). The corresponding average weekday daytime $L_{Aeq,2h}$ was 62 dB comprising 15 minute measurements in the range 57.4 to 67.3 dB(A).

9.3.3 As was explained earlier, there were RAF jets flying over the area on occasion throughout the survey period. This, whilst not a daily occurrence, can happen regularly. However, to give a robust assessment the contribution the jets made to the noise measurement was removed post survey using editing software. Table 1.2 presents the edited results.

9.3.4 Referring to Table 1.2, the edited results, the average weekday daytime background noise level, L_{A90}, remained at 50 dB, with measurements in the range 46.6 to 52.7 dB(A). The corresponding average weekday daytime $L_{Aeq,2h}$ was 60 dB comprising 15 minute measurements in the range 57.4 to 60.5 dB(A).

9.3.5 Apart from the RAF aircraft, the other significant noise source in the area was the passage of traffic on Elgin Road; the A941. Birdsong was also audible, including gulls towards the end of the survey. There were children in the play park area and a small group playing football on a pitch to the west of the playground. Noise from these activities was not clearly audible.

9.4 Predicted Noise Levels

9.4.1 Although there was little change to the measured levels over the 2 hour survey period, to provide a worst case the existing baseline has been considered as being represented by the final 30 minute survey.

[redacted]

9.4.2 This receptor, a single dwelling sits back from the A941 by some 12m. As shown in Table 3.1, the highest predicted noise levels at the front of this receptor, due to 4 skateboarders using the skate park, is 45 dB $L_{Aeq,1h}$. The highest L_{Amax} noise level from a skateboarding trick is predicted to be 48 dB(A) at No. 14 Elgin Road

9.4.3 The predicted noise levels are below the criterion suggested in WHO guidance of 50 dB, a level for which it is suggest should not be exceeded *"to protect the majority of people from being moderately annoyed"*. In terms of the predicted L_{Amax} noise level it is comfortably below the 60 dB L_{Amax} criterion suggested in the WHO guidance for night-time.

9.4.4 Allowing for a façade reflection, 2 dB(A) and attenuation through an open window of -15dB(A), the predicted free field level of 45 dB $L_{Aeq,1h}$ would give rise to an internal level of 32 dB $L_{Aeq,1h}$, below the living room resting criterion given in BS 8233: 2014; 35 dB $L_{Aeq,16h}$.

[redacted]

9.4.5 This small block of dwellings is around 4m from the edge of the A941 carriageway and, as such, there is no amenity area to the west of the building; the closest part to the skate park. With 4 skate board riders assumed to be using the facility the predicted level at this receptor is 49 dB $L_{Aeq,1h}$ with a corresponding L_{Amax} of 54 dB(A).

9.4.6 The predicted levels are slightly higher at this receptor location when compared to those at the previous receptor considered but remain below the WHO criteria of 50 dB $L_{Aeq,16h}$ and 60 dB L_{Amax}.

9.4.7 Continuing to consider 4 skate board users, the internal level from the skate park is calculated, with windows open for ventilation, to be 35 dB $L_{Aeq,1h}$ which does not breach the BS 8233 guideline criterion for resting during daytime.

[redacted]

9.4.8 This receptor is around 7m from the edge of the A941 carriageway although some of the intervening area is public open space, in the form of a wide verge. As was the case for Church Court, there is limited amenity area at the west side of the property, this being occupied by a driveway. With a high level of skate park activity, 4 riders all rolling for 30 minutes within the assessment hour, the predicted levels are 46 dB $L_{Aeq,1h}$ and 50 dB L_{Amax}.

9.4.9 In terms of the daytime WHO criterion of 50 dB $L_{Aeq,16h}$, given to avoid moderate annoyance, the worst case predicted level is comfortably below that limit. Equally, the L_{Amax} night-time criterion is not exceeded.

9.4.10 The internal level at this dwelling, when correcting the predicted free field level to an internal value as described above, will be 33 dB $L_{Aeq,1h}$, a level that is below the daytime resting criterion given in BS 8233.

[redacted]

9.4.11 Whilst the previously considered receptors are between 23 and 34m from the proposed skate park boundary, this receptor is some 118m from the boundary. The receptor, which is a similar 118m west of the A941 but with a clear line of sight to it, is elevated with respect to the skate park site.

9.4.12 The significantly increased separation distance results in substantially lower predicted levels when considering a high level of skate park activity; 37 dB $L_{Aeq,1h}$ and 35 dB L_{Amax}.

[redacted]

9.4.13 For the 3 receptors to the east of the proposed site, the beneficial effect of creating a 1 metre high embankment with 1 : 2.5 slope and a top width of 1 metre has also been modelled.

9.4.14 The predicted levels for this scenario are shown in Tables 3.1.to 3.3. The calculated reduction is shown to be in the range 4 – 5 dB(A).

9.5 PAN 1/2011 – Technical Advice Note (TAN) Assessment

9.5.1 The TAN suggests that sensitivities of the noise receptors should be determined in terms of the excess of the rating level over the background noise level, as established in a BS 4142 assessment. The TAN refers to a 1997 version of BS 4142, however the current, 2019 version, is considered is the assessment below. The relationship of the Sensitivity is reproduced from the TAN and shown in the table below.

Excess of rating over background level [Rating Level ($L_{Ar,Tr}$) – Background Noise Level ($L_{A90,T}$)]	Sensitivity
≥10 dB(A)	High
≥5 dB(A) and <10 dB(A)	Medium
<5 dB(A)	Low

9.5.2 Considering the previous table, the sensitivity of the receptors has been considered in the table below. Due to the likely impulsive nature of the noise emanating from the skate park an acoustic feature correction of + 6 dB has been applied for all scenarios considered. To give a worst case it has been assumed that 4 skate board riders are active.

PAN 1/2011: Sensitivity of Receptors						
Receptor	Specific Sound Level (dB $L_{Aeq,T}$)	Acoustic Feature Correction (dB)	Rating Level (dB $L_{Ar,Tr}$)	Background Sound Level ($L_{A90,T}$)	Excess of rating over background level	Sensitivity
[redacted]	45.2	6	51.2	47.4	+3.8	Low
[redacted]	48.8	6	54.8	47.4	+7.4	Medium
[redacted]	46.3	6	52.3	47.4	+4.9	Low
[redacted]	36.7	6	42.7	47.4	-4.7	Low

* Baseline levels assumed to be the same as those on Elgin Road

9.5.3 Shown in the table below are the criteria, suggested in the TAN, to define the magnitude of noise impacts used in this type of assessment, where the 'after' noise level is the sum of the existing $L_{Aeq,T}$ and the predicted $L_{Aeq,T}$.

Change in Noise Level, dB $L_{Aeq,T}$ (After – Before)	Magnitude
≥ 5	Major
3 to 4.9	Moderate
1 to 2.9	Minor
0.1 to 0.9	Negligible
0	No change

9.5.4 Therefore considering the previous table, the following table indicates the magnitude of impact assigned to the receptors for the scenarios considered.

PAN 1/2011: Magnitude of Impact				
Receptor	$L_{Aeq,T}$		Change in Noise Level dB $L_{Aeq,T}$	Magnitude of Impact
	Before	After		
[redacted]	58.5	58.7	+0.2	Negligible
	58.5	58.9	+0.4	Negligible
	58.5	58.8	+0.3	Negligible
	58.5	58.5	0.0	No Change

* Baseline levels assumed to be the same as those on Elgin Road

9.5.5 Considering the magnitude of impact and sensitivities determined previously, the matrix below is used in the assessment to determine the level of significance.

Magnitude of Impact (After – Before) dB $L_{Aeq,T}$	Sensitivity of Receptor based on likelihood of complaint X = [Rating ($L_{Ar,Tr}$) – Background Level (L_{A90})] dB		
	Low (X <5)	Medium (5 ≤ X < 10)	High (X ≥ 10)
Major	Slight / Moderate	Moderate / Large	Large / Very Large
Moderate	Slight	Moderate	Moderate / Large
Minor	Neutral / Slight	Slight	Slight / Moderate
Negligible	Neutral / Slight	Neutral / Slight	Slight
No change	Neutral	Neutral	Neutral

9.5.6 The level of significance is established in the following table.

PAN 1/2011: Level of Significance			
Receptor	Sensitivity	Magnitude of Impact	Level of Significance
[redacted]	Low	Negligible	Neutral / Slight
	Medium	Negligible	Neutral / Slight
	Low	Negligible	Neutral / Slight
	Low	No Change	Neutral

* Baseline levels assumed to be the same as those on Elgin Road

9.5.7 In conclusion, the use of the proposed skate park is predicted to generate a neutral / slight level of significance at the nearest 3 representative properties to the development. At the receptor further away, on South Covesea Terrace the level of significance is predicted to be neutral.

9.5.8 The level of significances and their relevance in the decision making process, described in the TAN, are shown below:

Very Large: These effects represent key factors in the decision-making process. They are generally, but not exclusively associated with impacts where mitigation is not practical or would be ineffective.

Large: These effects are likely to be important considerations but where mitigation may be effectively employed such that resultant adverse effects are likely to have a Moderate or Slight significance.

Moderate: These effects, if adverse, while important, are not likely to be key decision making issues.

Slight: These effects may be raised but are unlikely to be of importance in the decision making process.

Neutral: No effect, not significant, noise need not be considered as a determining factor in the decision making process.

9.5.9 As has been referred to previously, the above noise study has been based on an assumed layout. In Section 11 – Recommendations, some features that could be incorporated into the ultimate design are suggested.

10.0 CONCLUSIONS

10.1 A visual survey of the proposed development site has been made and existing ambient noise levels measured at a location close to noise sensitive receptors. Measurements were made in terms of L_{Aeq}, L_{A90}, and L_{Amax} thus enabling the existing noise climate to be characterised.

10.2 A series of noise predictions, based upon ISO 9613 and including the assumptions embodied in Section 5 of this report, have been made to four noise sensitive locations around the proposed development and these have been assessed against relevant criteria.

10.3 It should be noted that all the predicted noise levels in this report refer to a worst case scenario, where a high level of activity has been assumed at the skate park.

10.4 With respect to the PAN 1/2011 assessment, the greatest level of significance is considered to be "Neutral / Slight", which in terms of the guidance suggests that noise should be considered but is unlikely to be of importance in the decision making process.

11.0 RECOMMENDATIONS

11.1 The site of the proposed skate park falls from the A941, the eastern side of the earmarked area, towards the football pitch, positioned on the western boundary of the area. It would be beneficial, as shown on Tables 3.1 to 3.3, to use some of the soil excavated during the construction of the skate park to create a screening mound along the A941 fence line.

11.2 There will be areas within the skate park where riders will congregate whilst waiting their turn to ride. The design should be such that these areas are not close to the eastern boundary but at the lower, western side of the site. This could be encouraged by placing seats / benches in these areas.

11.3 If lights are to be installed, so that the facility can be used in the evenings during the winter months, we would recommend that these turn off automatically to preclude late evening use.

11.4 The finished rolling surface should be as smooth as possible.

12.0 REFERENCES

1. British Standard 4142:2014 Methods for rating and assessing industrial and commercial sound. British Standards Institution, 2014.

2. British Standard 7445-1:2003 Description and measurement of environmental noise – Part 1: Guide to quantities and procedures. British Standards Institution, 2003.

3. World Health Organisation (WHO) Guidelines for Community Noise: April 1999.

4. International Organization for Standardization, ISO 9613-2:1996, Acoustics -- Attenuation of sound during propagation outdoors, Part 2: General method of calculation.

5. British Standard 8233: 2014 Guidance on sound insulation and noise reduction for buildings. British Standards Institution, 2014.

INDEX TO TABLES

TABLE 1

Table 1.1

**Results of Existing Noise Level Surveys,
Proposed Skate Park, Lossiemouth, Moray**

Date: 14 May 2019

Location No. 1: [redacted] (Un-edited Results)

Time Period	Statistical Parameters (dB(A))			
	L_{Aeq}	L_{A10}	L_{A90}	L_{Amax}
19:00 - 19:15	59.9	63.4	49.7	70.9
19:15 - 19:30	67.3	65.0	52.9	93.5
19:30 - 19:45	61.9	63.9	51.5	82.8
19:45 – 20:00	60.8	63.7	50.2	80.8
20:00 – 20:15	60.5	63.9	51.3	73.8
20:15 – 20:30	60.2	64.1	50.2	72.9
20:30 – 20:45	59.4	63.3	48.1	73.8
20:45 – 21:00	57.4	61.7	46.6	71.1
Average Daytime Period	**62**	**64**	**50**	**93.5***

*Highest L_{Amax} reached during survey period

Table 1.2

**Results of Existing Noise Level Surveys,
Proposed Skate Park, Lossiemouth, Moray**

Date: 14 May 2019

Location No. 1: [redacted] (Edited Results)

Time Period	Statistical Parameters (dB(A))			
	L_{Aeq}	L_{A10}	L_{A90}	L_{Amax}
19:00 - 19:15	59.9	63.4	49.7	70.9
19:15 - 19:30	60.3	63.6	52.7	72.0
19:30 - 19:45	60.1	63.4	51.5	73.8
19:45 – 20:00	59.6	63.0	50.0	72.9
20:00 – 20:15	60.5	63.9	51.3	73.8
20:15 – 20:30	60.2	64.1	50.2	72.9
20:30 – 20:45	59.4	63.3	48.1	73.8
20:45 – 21:00	57.4	61.7	46.6	71.1
Average Daytime Period	**60**	**63**	**50**	**73.8***

*Highest L_{Amax} reached during survey period

TABLE 2

South Inch, Perth - Skateboarding Noise Levels

Reference Number	Description	Distance from Source	dB $L_{Aeq,T}$	dB L_{Amax}
1	Down ramp	3	76.0	87.9
2	Down ramp	3	72.9	86.0
3	Up ramp	3	75.8	87.8
4	Jump off ramp	2	90.2	101.3
5	Jump onto ramp	2	78.9	92.6
6	Pass by (no jump)	3	68.6	77.0
7	Pass by (no jump)	2	70.7	76.6
8	Pass by (no jump)	1.5	76.8	88.7
9	Pass by (no jump)	2	71.7	77.3
10	Down ramp (jump)	1	77.4	89.5
11	Down ramp, little jump	3	71.6	78.5
12	Down ramp	3	71.2	81.4
13	Up ramp, jump off	4	74.3	84.3
14	Up ramp, no jump	3	74.0	80.0
15	Down ramp, smooth	2.5	68.4	76.8
16	Jump down	3.5	78.2	88.9
17	Jump	6	73.0	82.5

TABLE 3

Table 3.1

Summary of Predicted Noise Levels
Proposed Skate Park, Lossiemouth, Moray

Location No. 1: [redacted]

Description	Existing Noise Levels dB		Predicted (dB $L_{Aeq,1h}$ / L_{Amax})	Difference dB(A)	
	L_{Aeq}	L_{A90}		Existing L_{Aeq}	Target (50 dB $L_{Aeq,1h}$ / 60 dB L_{Aeq})
Highest likely noise levels (L_{Aeq}) from single skateboarder	59	47	39	-20	-11
Highest likely noise levels (L_{Aeq}) from 2 skateboarders	59	47	42	-17	-8
Highest likely noise levels (L_{Aeq}) from 4 skateboarders	59	47	45	-14	-5
Highest likely noise levels (L_{Aeq}) from 4 skateboarders, with 1m barrier on A941 fence line	59	47	41	-18	-9
Highest likely maximum noise level (L_{Amax}) from skateboarding trick	59	47	48	-	-12

Table 3.2

Summary of Predicted Noise Levels
Proposed Skate Park, Lossiemouth, Moray

Location No. 2: [redacted]

Description	Existing Noise Levels dB		Predicted (dB $L_{Aeq,1h}$ / L_{Amax})	Difference dB(A)	
	L_{Aeq}	L_{A90}		Existing L_{Aeq}	Target (50 dB $L_{Aeq,1h}$ / 60 dB L_{Aeq})
Highest likely noise levels (L_{Aeq}) from single skateboarder	59	47	43	-16	-7
Highest likely noise levels (L_{Aeq}) from 2 skateboarders	59	47	46	-13	-4
Highest likely noise levels (L_{Aeq}) from 4 skateboarders	59	47	49	-10	-1
Highest likely noise levels (L_{Aeq}) from 4 skateboarders, with 1m barrier on A941 fence line	59	47	44	-15	-6
Highest likely maximum noise level (L_{Amax}) from skateboarding trick	59	47	54	-	-6

Table 3.3

Summary of Predicted Noise Levels
Proposed Skate Park, Lossiemouth, Moray

Location No. 3: [redacted]

Description	Existing Noise Levels dB		Predicted (dB $L_{Aeq,1h}$ / L_{Amax})	Difference dB(A)	
	L_{Aeq}	L_{A90}		Existing L_{Aeq}	Target (50 dB $L_{Aeq,1h}$ / 60 dB L_{Aeq})
Highest likely noise levels (L_{Aeq}) from single skateboarder	59	47	40	-19	-10
Highest likely noise levels (L_{Aeq}) from 2 skateboarders	59	47	43	-16	-7
Highest likely noise levels (L_{Aeq}) from 4 skateboarders	59	47	46	-13	-3
Highest likely noise levels (L_{Aeq}) from 4 skateboarders, with 1m barrier on A941 fence line	59	47	41	-18	-9
Highest likely maximum noise level (L_{Amax}) from skateboarding trick	59	47	50	-	-10

Table 3.4

Summary of Predicted Noise Levels
Proposed Skate Park, Lossiemouth, Moray

Location No. 4: [redacted]

Description	Existing Noise Levels dB		Predicted (dB $L_{Aeq,1h}$ / L_{Amax})	Difference dB(A)	
	L_{Aeq}	L_{A90}		Existing L_{Aeq}	Target (50 dB $L_{Aeq,1h}$ / 60 dB L_{Aeq})
Highest likely noise levels (L_{Aeq}) from single skateboarder	59	47	31	-28	-19
Highest likely noise levels (L_{Aeq}) from 2 skateboarders	59	47	34	-25	-16
Highest likely noise levels (L_{Aeq}) from 4 skateboarders	59	47	37	-22	-13
Highest likely maximum noise level (L_{Amax}) from skateboarding trick	59	47	36	-	-24

FIGURE 1 – MONITORING AND PREDICTION LOCATIONS

Monitoring Location   Prediction Locations