Construction of Park and Ride Facility, Land to the North-West of the A41, Bicester, Oxfordshire

Noise Assessment

ATKINS

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Plan Design Enable

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1. Introduction

Atkins Acoustic Noise and Vibration has been instructed to undertake an assessment of the operational noise arising from the proposed Park and Ride Facility on Land to the North-West of the A41 near Bicester, Oxfordshire. At this stage of the planning application the car park is expected to consist of 580 spaces, 3 bus stops and a bus shelter.

This report outlines the findings of a baseline noise survey undertaken in proximity to the proposed park and ride, and outlines the potential noise impacts from the operation of the car park.

Please refer to Appendix A for a glossary of acoustic terminology cited within this report.

2. Assessment Methodology

The noise survey methodology is detailed in the baseline noise survey chapter.

The assessment methodologies described below are used later in the report for assessing the likely impacts of the proposals.

2.1. BS 4142: 1997

This British Standard, entitled "Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas" is the main source of guidance used in the rating of noise of an industrial nature.

It is based upon the margin by which noise produced by such a source, after being adjusted for any tonal characteristics, impulsiveness or irregularity, exceeds the background noise level.

Although not directly applicable to the assessment of a park and ride development, the Standard may be used to provide a rough indication on the likelihood of complaints from local residents when considering elements of the development involving noise with different characteristics.

A difference of around +10 dB or more above measured background noise levels indicates that complaints are likely. A difference of around +5 dB is of marginal significance. If the rating level is more than 10 dB below the measured background noise level L_{A90} dB then this is a positive indication that complaints are unlikely.

2.2. BS 8233: 1999

This Standard, entitled "Sound insulation and noise reduction for buildings – code of practice" considers, amongst other matters, appropriate noise levels within various rooms under different uses. Included within this Standard is reasonable resting or sleeping conditions for living rooms and bedrooms as well as reasonable conditions for work requiring concentration. For these spaces, the following noise levels are considered 'good' and 'reasonable' respectively.

Table 2.1 – Quantification of Design Ranges for Noise Levels within Various Rooms

Room Type	Design Range $L_{Aeq,T}$ dB	
	Good	Reasonable
Living Rooms	30	40
Bedrooms	30	35

In gardens and balconies etc it is desirable that the steady noise level does not exceed 50 $L_{Aeq,T}$ dB and 55 $L_{Aeq,T}$ dB should be regarded as an upper limit (T is the time period over which the averaging is carried out).

BS8233 also refers to the maximum individual noise events for night time, it is not anticipated that the park and ride will operate at night so this has been excluded from the assessment.

2.3. Calculation of Road Traffic Noise

Calculation of Road Traffic Noise (CRTN) 1988 describes procedures for calculating noise from road traffic and procedures for undertaking noise measurements of road traffic noise.

Section 3 in CRTN details a measurement method for use when measuring noise from road traffic, which includes a 'Shortened measurement Procedure' (CRTN-SP). This shortened procedure has been utilised in the baseline noise survey in order to characterise the noise from the A7 a specific point and derive an $L_{A10,18hour\ (06:00-00:00)}$ value. Strictly speaking the 'Shortened measurement Procedure' requires hourly

measurements rather than 15-minute but due the nature of the noise sources in the area the two may be judged to be same

2.4. World Health Organisation (WHO) Guidelines for Community Noise

Published by the World Health Organisation (WHO) in 2000, this document has been prepared as a response to a need for action together with a generic need for improvements in legislation at a national level.

Although not legislation this guidance reflects the current thinking of the World Health Organisation in relation to Environmental Noise and its potential impact upon local residential areas.

The recommendations are that noise levels for outdoor living areas should not exceed 55 L_{Aeq} dB for a steady continuous noise, and to protect the majority of people from being moderately annoyed during the daytime, outdoor sound pressure levels should not exceed 50 L_{Aeq} dB. This is in general agreement with the guidance of BS8233 above.

2.5. Significance of Predicted Changes in Ambient Noise

The response of the human hearing system is able to detect a noise level difference of about 1 dB(A) in controlled laboratory conditions. The smallest change in environmental noise that reliably results in a difference in public response is about 3 dB(A). A 10 dB(A) change in audible levels approximates to a subjective doubling or halving of loudness.

There are no British Standard definitions to describe the magnitude and significance of noise level changes from station or car park operations, however changes less than 3 dB are considered to be of negligible significance. Changes in noise of 3 dB or more are considered to be significant, but impacts should be considered alongside the predicted absolute noise levels predicted, which in turn will be compared with the guidance detailed above from WHO and BS8233.

3. Site Description

The site identified by Oxfordshire County Council for the proposed Park and Ride is presently an arable field approximately 1 mile south of Bicester as shown in Appendix A.

The site is at the southwest corner of a recently constructed five arm roundabout on the A41. This roundabout has affected and realigned the A41 and provides a junction with the South West Bicester Perimeter Road, a replacement to the Chesterton slips, and direct access to the proposed Park and Ride facility.

An unclassified road to Chesterton forms the southern boundary of the Park and Ride site.

It is understood that there is a committed residential development to the north of the proposed Park and Ride which will be considered as part of this assessment at a distance of approximately 50 metres.

The nearest sensitive receivers to the site have been identified as:

- Committed development off Vendee Drive; 50 metres north of the proposed site;
- Mobile home site off Alchester Road; 150 metres east of the proposed site;
- Lakeside, off of Wendlebury Road; 250 metres east of the proposed site; and
- Lodge Farm south of Alchester Road; 400 metres south west of the proposed site.

4. Baseline Noise Survey

A baseline noise survey was undertaken as part of the assessment to establish the existing baseline noise climate in proximity to the park and ride car park. The dominant source of existing noise at most surveyed locations is Road Traffic Noise (RTN) either from the A41.

Baseline noise surveys were undertaken by Atkins' staff on Wednesday 30th October 2013 and covered typical weekday conditions. Measurements were taken between 09:30hrs and 18:30hrs due to the likely operational times of the park and ride.

A consultation with Mr Rob Lowther, Environmental Heath Practitioner at Cherwell District Council, was held before the commencement of the survey

Calibration of the sound level meter, microphones and calibrators used for the survey is traceable to UKAS accredited laboratories and are within their respective calibration dates. Furthermore the sound level meters and microphones were calibrated prior to and after each measurement period. No significant drift in calibration was observed.

All measurements were undertaken on an attended basis over 15 minute sample periods. During the survey periods notes were taken on the noise climate and meteorological conditions, the measurements were representative of the hourly noise levels due to a constant level of traffic within the hour

4.1. Measurement Positions

Four measurement positions were selected which represented the nearest noise sensitive receptors to the proposed car park. The approximate locations of all measurement positions are shown in Appendix B.

For all measurement positions the microphone was positioned in a free-filed location at a height of approximately 1.5 metres above ground.

A summary of measurement positions including brief description of the baseline noise climate at each of the position is provided in Table 4.1

Table 4.1 – Baseline Measurement Position Descriptions

Position Number	Name	Noise Climate Description
1	Lodge Farm	Approximately 300m from the proposed site, the dominant noise source was RTN from the A41 and the distant M40. Intermittent local road traffic noise was also noted
2	Representative of Mobile home site	Approximately 150m from the proposed park and ride on the opposite side of the A41. Dominant noise source was RTN from the A41
3	Lakeside	Approximately 250m from the proposed site. The dominant noise source was local traffic noise with distant RTN from the A41 and M40
4	Committed development	Approximately 50m form the proposed site, the dominant noise source consist of road traffic noise from the A41

4.2. Meteorological Conditions

The meteorological conditions were noted regularly during the baseline noise survey at the measurement positions with hand held anemometers were used to assess wind speed. During the survey period the weather generally cloudy with no precipitation, wind speeds were generally below 5m/s.

4.3. Results

The results from the baseline noise survey are presented in the table below. All measured noise data is included in Appendix C.

Table 4.2 – Baseline Measurement Results Summary

Position Number	Receptor	$L_{Aeq,15min}$ (dB)	L_{Amax} (dB)	$L_{A90,15min}$ (dB)
1	Lodge Farm	63.7	83.1	53.8
2	Representative of Mobile home site	59.7	74.9	53.6
3	Lakeside	59.9	78.0	53.5
4	Committed development	59.7	79.6	55.9

It was noted on site that the noise climate was primarily dominated by road traffic noise from the A41 and the more distant M40.

5. Assessment

At this stage of the planning application the car park is expected to consist of 580 spaces, 3 bus stops and a bus shelter.

5.1. Traffic Noise Assessment and Results

Traffic figures were provided by Atkins' Highways and Transportation for the development in 2019.

In the traffic assessment it has been assumed that all of the committed development will be operational in 2014. This includes the committed development to the north of the site:

The traffic flow data have been provided as 18 hour annual average weekday traffic flows (AAWT) as required by the methodology of CRTN. In order to assess the likelihood of the development giving rise to a 1 dB $L_{A10,18hr}$ change in noise level in the 2019, the predicted change in traffic flow has been screened for changes in excess of 25% (increase) or 20% (decrease). No other changes are expected in traffic speeds and the percentage composition of heavy goods vehicles. The results are shown in Table.1 below. The do-minimum (DM) scenario includes base traffic plus committed development traffic and the do-something (DS) scenario includes base + park and ride development.

Table.1.3 – Opening year Traffic Noise Screening Assessment

Link Ref	Link	18 hr AAWT		% Change
		DM 2014	DS 2014	
1	A41 South of Park and Ride	43797	43922	0%
2	Link to Wendelbury Road	2651	2651	0%
3	A41 North of P&R	41032	41460	1%
4	Vendee Drive	8001	8119	1%
5	A41 West	30506	30621	0%
6	Oxford Road	31898	32212	1%
7	Middleton Stoney Road East	8237	8257	0%
8	Howes Lane	10178	10256	1%
9	B4030 East	6037	6057	0%

This assessment shows that the Bicester Park and Ride is unlikely to increase the noise levels on any surrounding roads in the opening year.

Table.2.4 – Opening year Traffic Noise Screening Assessment

Link Ref	Link	18 hr AAWT		% Change
		DM 2019	DS 2019	
1	A41 South of Park and Ride	51834	51959	0%
2	Link to Wendelbury Road	2664	2664	0%
3	A41 North of P&R	48755	49184	1%
4	Vendee Drive	8664	8783	1%
5	A41 West	39203	39318	0%
6	Oxford Road	34831	35144	1%
7	Middleton Stoney Road East	8091	8110	0%
8	Howes Lane	11006	11085	1%
9	B4030 East	6079	6100	0%

The above assessment shows that the Bicester Park and ride is unlikely to increase the noise levels on any surrounding roads in the future year, 2019.

5.2. Operational Noise Assessment and Results

There are no specific noise regulations relating to the operation of new car parks. The degree of noise impact has therefore been determined by predicting the noise level arising from a peak hour operation at the nearest noise sensitive receptors, adding this level to the existing ambient level and then comparing the resultant level with the existing baseline ambient noise level. The difference between these two levels has been used to assess the impacts in terms of significance bands, which are detailed in section 2.5 of this report.

The predicted maximum noise levels (L_{Amax}) are also presented and compared to the existing L_{Amax} levels regularly experience at the noise sensitive receptors.

5.2.1. Noise Source

The operational noise from car parks can be characterised by several individual noise events including;

- Car doors closing;
- Cars manoeuvring in and out of bays;
- Cars arriving/departing; and
- People talking.

The following noise source levels, $L_{Aeq,event\ duration}$ at 10 metres, have been derived from previous similar projects and are used in this assessment to determine the car park activity noise level at nearby residential receptors to the proposed car parks.

Table 5.3 – Car Park Activity Noise Levels at 10 metres

Event	$L_{Aeq,event}$ (dB)	L_{Amax} (dB)
Car doors	52.5	62.5
Cars manoeuvring	53.5	57.0
Cars arriving departing	57.0	61.9
People talking	45.0	n/a

5.2.2. Assessment and Results

The assessment is considered to be a worst case, whereby all spaces are assumed to be in use during a 1 hour period and all activity noise occurs at the closest point of the car park to the assessment receptor.

The 1 hour activity noise level predicted at the receptors has been calculated based on the car park capacity, the distance attenuation between the car park and receptors and where applicable a screening correction has been applied for intervening topographic features and/or buildings i.e. no screening 0 dB, partial screening -5 dB, full screening -10 dB.

The noise impacts have been predicted for the daytime periods.

Table 5.4 – Daytime Car Park Noise Impact Assessment

Assessment Position	Existing Daytime Ambient $L_{Aeq,T}$ dB	Activity Noise Level at Assessment Position $L_{Aeq,T}$ dB	Resultant Ambient $L_{Aeq,1hr}$ dB	Change from Existing Ambient dB
Measurement Position 1 – Lodge Farm	64	47	64	0
Measurement Position 2 – Mobile home site	60	38	60	0
Measurement Position 3 – Lakeside	60	33	60	0
Measurement Position 4 – Committed Development	60	29	60	0

The existing ambient levels at the noise sensitive receivers are currently above the BS8233 guideline external values. Noise levels due to the scheme are predicted to be below the guideline levels and are not expected to increase the existing levels.

The results show that predicted noise impacts due to car park activity noise are more than 10dB lower than the existing noise levels, meaning that complaints would be unlikely in accordance with an assessment approach specified in BS4142:1997.

None of the sensitive receivers are likely to experience a perceptible increase in noise due to the car park operations with increases. The park and ride scheme is not expected to run during the night time period therefore an assessment of the L_{Amax} levels is not required.

6. Mitigation

It is not expected that the proposed park and ride scheme would result in significant adverse noise impacts. Therefore no mitigation measures would be required.

7. Conclusions

Atkins Acoustic Noise and Vibration has been instructed to undertake an assessment of the operational noise arising from the proposed park and ride to be situated to the south of Bicester.

A consultation was undertaken with Mr Rob Lowther, Environmental Heath Practitioner at Cherwell District Council.

Baseline noise surveys were undertaken by Atkins' staff as part of this assessment, on 30th October 2013.

With reference to the measured baseline noise levels in the study area, assessments were undertaken in accordance with BS 8233 and BS 4142.

The results of the assessment show that no significant noise impacts would be expected as a result of the proposed scheme.

Appendix A. Acoustic Terminology

a) Description of Noise Characteristics

Sound Pressure Level and the decibel (dB)

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. Although it might seem unusual to use a logarithmic scale to measure a physical phenomenon, it has been found that human hearing also responds to sound in an approximately logarithmic fashion. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120 dB (threshold of pain).

Due to the logarithmic nature of decibels, when two noises of the same level are combined together, the total noise level is (under normal circumstances) 3 dB(A) higher than each of the individual noise levels e.g. 60 dB(A) plus 60 dB(A) = 63dB(A). In terms of perceived 'loudness', a 3 dB(A) variation in noise level is a relatively small (but nevertheless just noticeable) change. An increase in noise level of 10 dB(A) generally corresponds to a doubling of perceived loudness. Likewise, a reduction in noise level of 10 dB(A) generally corresponds to a halving of perceived loudness.

Frequency and Hertz (Hz)

As well as the loudness of a sound, the frequency content of a sound is also very important. Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Young people with normal hearing can hear frequencies in the range 20 Hz to 20,000 Hz. However, the upper frequency limit gradually decreases as a person gets older.

A-weighting

The ear is not equally sensitive to sound at all frequencies. It is less sensitive to sound at low and very high frequencies, compared with the frequencies in between. Therefore, when measuring a sound made up of different frequencies, it is often useful to 'weight' each frequency appropriately, so that the measurement correlates better with what a person would actually hear. This is usually achieved by using an electronic filter called the 'A' weighting, which is built into sound level meters. Noise levels measured using the 'A' weighting are denoted dB(A) or dB L_A.

b) Description of Noise Characteristics

When a noise level is constant and does not fluctuate over time, it can be described adequately by measuring the dB(A) level. However, when the noise level varies with time, the measured dB(A) level will vary as well. In order to describe noise where the level is varying, a number of other indices, including statistical parameters, are used. The indices used in this report are described below.

L_{Amax} This is the maximum A-weighted noise level that was recorded during the monitoring period.

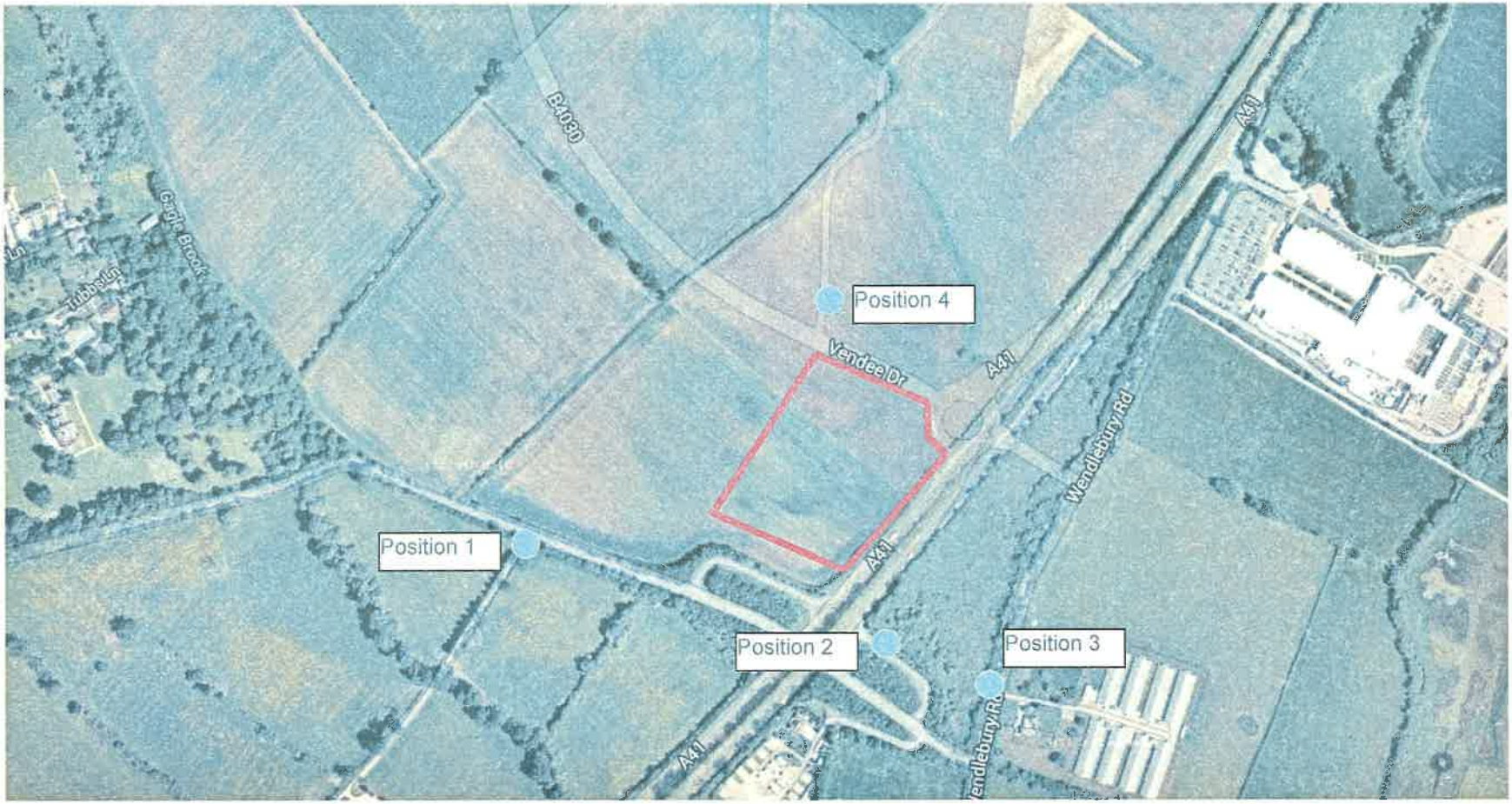
L_{A10} This is the A-weighted noise level exceeded for 10% of the specified time period. L_{A10} is an indication of the louder noise levels. It is most often used as a measure of road traffic noise.

L_{Aeq} This is the A-weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period. It is the level of a continuous noise that has the same total (A-weighted) energy as the real fluctuating noise, measured over the same time period.

L_{A90} This is the A-weighted noise level exceeded for 90% of the time period. L_{A90} is used as a measure of background noise

Appendix B. Measurement Position Locations

Measurement Positions



Appendix C. Measured Noise Data

Position 1

Time	$L_{Aeq, 15min}$ (dB)	L_{Amax} (dB)	L_{A10} (dB)	L_{A90} (dB)
09:20	63.6	53.1	65.1	54.1
11:10	62.9	81.2	61.8	51.5
13:40	63.0	80.6	62.6	54.4
15:20	62.7	80.2	61.7	55.8
16:55	65.7	82.2	68.4	53.4

Position 2

Date/Time	$L_{Aeq, 15min}$ (dB)	L_{Amax} (dB)	L_{A10} (dB)	L_{A90} (dB)
09:45	60.4	74.9	63.6	52.1
11:35	57.9	67.4	61.2	51.6
14:06	58.9	70.1	61.5	54.3
15:45	60.7	67.8	63.6	55.5
17:17	59.8	67.1	62.9	54.7

Position 3

Date/Time	$L_{Aeq, 15min}$ (dB)	L_{Amax} (dB)	L_{A10} (dB)	L_{A90} (dB)
10:05	59.8	77.5	63.1	49.4
12:00	60.1	78.0	62.8	53.2
14:30	59.5	72.9	61.7	54.9
16:05	60.3	75.2	63.4	55.0
17:36	59.8	76.5	62.6	54.9

Position 4

Date/Time	$L_{Aeq, 15min}$ (dB)	L_{Amax} (dB)	L_{A10} (dB)	L_{A90} (dB)
10:30	57.1	70.4	59.0	52.8
12:20	58.7	74.9	59.8	54.1
14:50	60.7	78.0	62.6	56.5
16:25	61.0	77.4	62.3	57.2
17:56	59.9	79.6	60.9	56.7

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