



Palmer Park
Sports
Stadium,
Wokingham
Road,
Reading, RG6
1LF

Noise Impact Assessment

November
2020



Ref: 20-6869

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Revision	-
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Forecast cost estimates do not include such costs associated with any negotiations, appeals or other non-technical actions associated with the agreement on measures to meet the requirements of the authorities, nor are potential business loss and interruption costs considered that may be incurred as part of any technical measures.

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1. Executive Summary

A noise impact assessment has been carried out for the proposed development at **Palmer Park Sports Stadium, Wokingham Road, Reading, RG6 1LF**.

The proposed development is for an extension of the Palmer Park Sports Stadium, set to include a swimming pool, gym and hub with café and kitchen areas. Times of use are expected to be 0700 hrs – 2230 hrs Mondays to Thursdays, 0700 hrs – 2130 hrs on Fridays and 0900 hrs – 1800 hrs on weekends.

The proposed development site is located in Palmer Park, with the A3290 to the east, the A329 Wokingham Road to the south west, St Bartholomew's Road to the north west and Palmer Park Road to the south. The nearest noise sensitive receptors are houses on St Bartholomew's Road, Wokingham Road and Palmer Park Road located to the north west, south west and south of the proposed development site respectively.

The assessment has identified that plant noise at the site is likely to be significantly below the existing ambient and background noise levels at the nearest noise sensitive receptor. **In consideration of the context of the noise source, the plant noise would not be expected to cause any adverse impacts on the health or quality of life of the nearest noise sensitive receptor and would achieve the requirements of the Local Authority.**

The change in road traffic on surrounding roads will result in a *negligible* change to noise levels, when assessed in line with the DMRB semantic scale, and should therefore be acceptable.

Achievement of the target noise criteria will ensure compliance with the aims of the NPPF and the PPG in that it will avoid noise from giving rise to adverse impacts on the health or quality of life of nearby noise sensitive receptors.

2. Introduction

This report has been prepared to assess the impact of plant and activity noise from the proposed development at **Palmer Park Sports Stadium, Wokingham Road, Reading RG6 1LF**.

The proposed development is for an extension of the Palmer Park Sports Stadium, set to include a swimming pool, gym and hub with café and kitchen areas. Times of use are expected to be 0700 hrs – 2230 hrs Mondays to Thursdays, 0700 hrs – 2130 hrs on Fridays and 0900 hrs – 1800 hrs on weekends.

The report has assessed, through on-site noise measurements, the impact of the proposed plant on the surrounding noise sensitive receptors. Also assessed in this report is the potential for increase in noise level for receptors around the site due to increased road traffic.

A glossary of acoustic terminology is provided in **Appendix 1**.

The proposed development site is located in Palmer Park, with the A3290 to the east, the A329 Wokingham Road to the south west, St Bartholomew's Road to the north west and Palmer Park Road to the south. The nearest noise sensitive receptors are houses on St Bartholomew's Road, Wokingham Road and Palmer Park Road located to the north west, south west and south of the proposed development site respectively. The location of the proposed development site is provided in **Figure 2.1** and the proposed site layout plan, including proposed plant location, is provided in **Figure 2.2**.

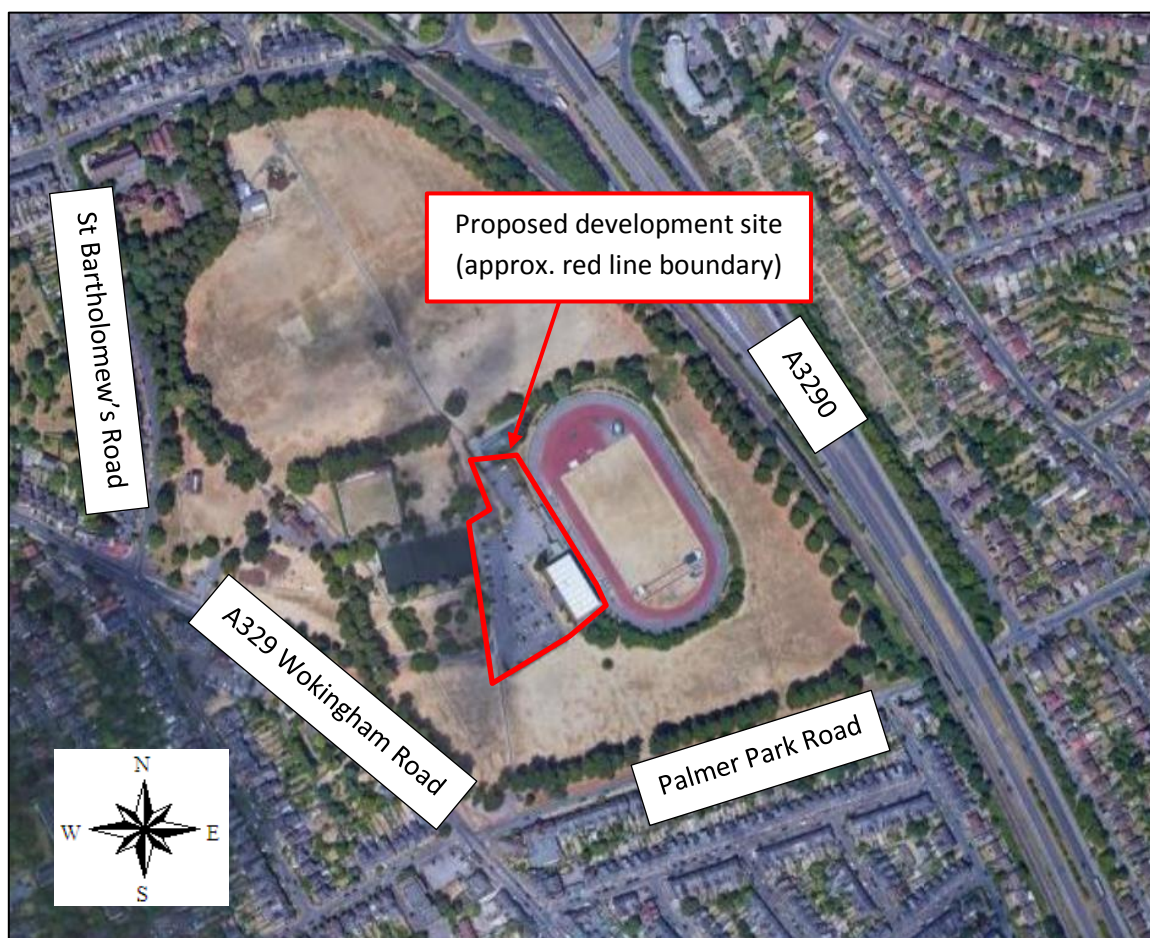


Figure 2.1: Site Location

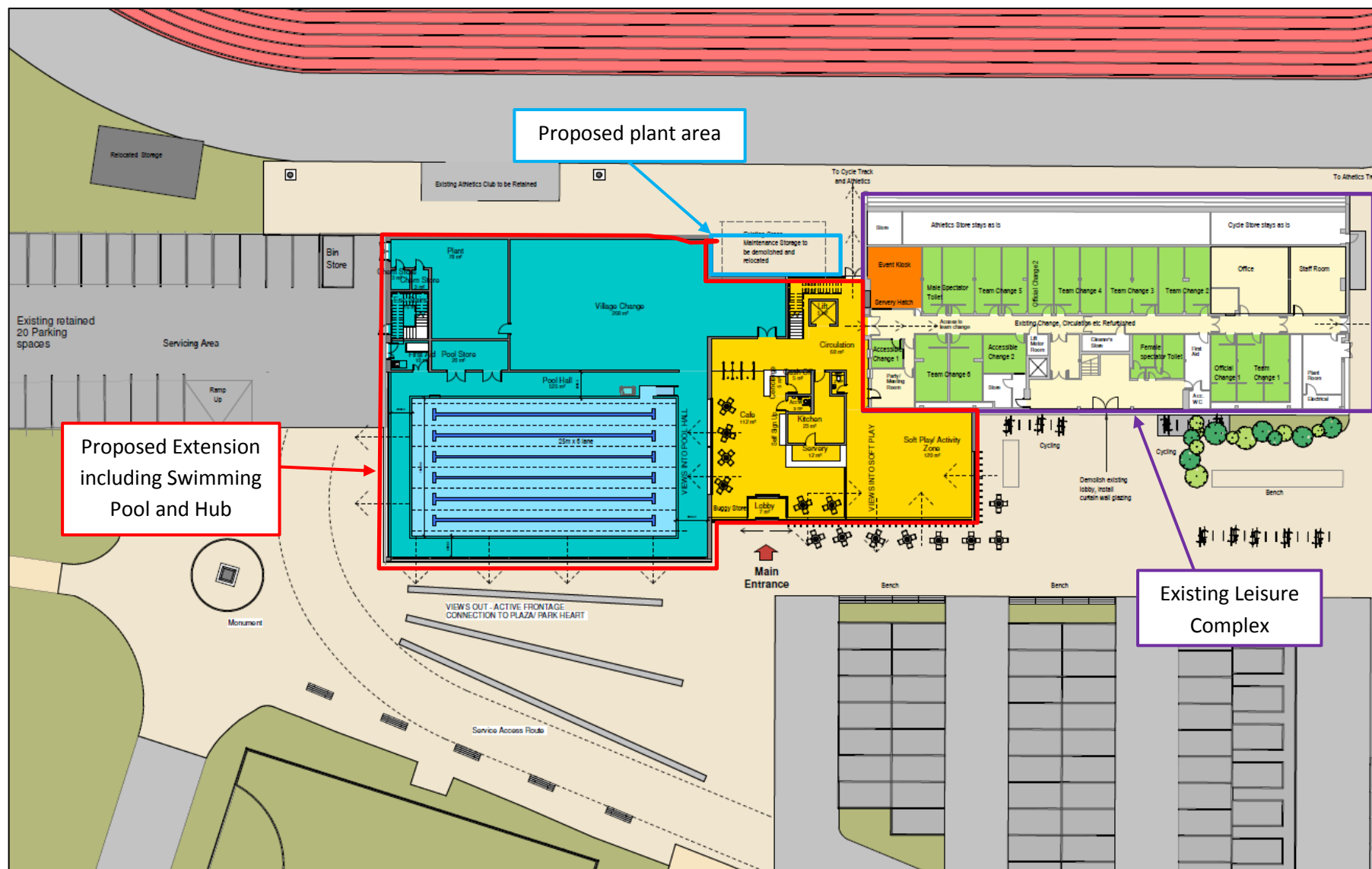


Figure 2.2: Proposed Site Layout Plan

3. Planning Policy

3.1. National Planning Policy Framework

The National Planning Policy Framework (NPPF) was released in March 2012 and last updated in February 2019. The purpose of the planning system is to contribute to the achievement of sustainable development and to encourage good design. There are three dimensions to sustainable development: economic, social and environmental.

Central to the NPPF, paragraph 10 states: *'At the heart of the National Planning Policy Framework is a presumption in favour of [permitting] sustainable development'*. This is expanded upon in paragraph 11, where it is stated:

'...For decision-taking this means:

- *approving development proposals that accord with an up-to-date development plan without delay; or*
- *where there are no relevant development plan policies, or the policies which are most important for determining the application are out-of-date, granting permission unless:*
 - *the application of policies in this Framework that protect areas or assets of particular importance provides a clear reason for refusing the development proposed; or*
 - *any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole'*

Paragraph 170 states *'Planning policies and decisions should contribute to and enhance the natural and local environment by... preventing new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by, unacceptable levels of... noise pollution...'*.

Paragraph 180 states: *'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:*

- *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 (see Explanatory Note to the Noise Policy Statement for England (DEFRA)).*
- *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*
- *limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.'*

3.2. Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) aims to *'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'.*

3.3. Local Planning Policy

The site is located within the administrative boundary of Reading Borough Council (RBC).

RBC have set the following aim in respect of noise in policy EN17: Noise Generating Equipment of their Local Plan (adopted 4th November 2019):

“Where noise generating equipment is proposed, the noise source specific level (Plant Noise Level) should be at least 10 dBA below the existing background level as measured at the nearest noise sensitive receptor.”

Additionally, it is understood, through liaison with Rebecca Moon, Senior Environmental Health Officer at RBC, that the rating level of new plant, when assessed in accordance with BS 4142:2014, should not exceed a level that is equal to the existing background noise level.

4. Guidance Documents

4.1. Planning Practice Guidance for Noise

The Planning Practice Guidance for Noise (PPG-Noise) was published in March 2014 and updated in December 2014. The PPG-Noise provides advice on how to determine the noise impact on development:

‘Local planning authorities’ plan-making and decision taking should take account of the acoustic environment and in doing so consider:

- *whether or not a significant adverse effect is occurring or likely to occur;*
- *whether or not an adverse effect is occurring or likely to occur; and*
- *whether or not a good standard of amenity can be achieved.*

In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation. As noise is a complex technical issue, it may be appropriate to seek experienced specialist assistance when applying this policy.’

The document goes on to provide a definition for the levels of noise exposure at which an effect may occur:

‘Significant observed adverse effect level: *this is the level of noise exposure above which significant adverse effects on health and quality of life occur.*

Lowest observed adverse effect level: *this is the level of noise exposure above which adverse effects on health and quality of life can be detected.*

No observed effect level: *this is the level of noise exposure below which no effect at all on health and quality of life can be detected.’*

It is important to understand that as the PPG-Noise does not provide any advice with respect to specific noise levels/ limits for different sources of noise, it is appropriate to consider other sources of advice and guidance documents when considering whether new developments would be sensitive to the prevailing acoustic environment.

4.2. British Standard 4142:2014

British Standard 4142:2014 “Methods for rating and assessing industrial and commercial sound” provides a method for the measurement and rating of industrial type noise sources and background noise levels outside dwellings. The rating level (defined in the BS) is used to rate the noise source outside residential dwellings (this is defined as the “specific sound level”).

The rating level is determined by assessing the character of the noise and applying an acoustic feature correction if appropriate. Corrections are applied for the tonality and intermittency of the noise source which can both make noise more noticeable.

The initial assessment described in BS 4142 to determine whether an adverse impact is likely is based on establishing the difference between the rating level and the background noise level outside the

residential property of interest. The British Standard states that the following points should be considered:

- *‘Typically, the greater this difference, the greater the magnitude of the impact.*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
- *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.’*

4.3. The Design Manual for Roads and Bridges

The Design Manual for Roads and Bridges (DMRB) provides methods for quantifying the noise and vibration impacts generated by changes in road traffic. For the assessment of road traffic noise, the current document is: Design Manual for Roads and Bridges, Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 7 Noise and Vibration HD 213/11 – Revision 1 (published by the Highways Agency in 2011).

The relative levels are reproduced from the semantic scale for long-term changes in road traffic noise levels found in the DMRB guidance document (Table 3.2 of that document) and are summarised in **Table 4.1** below.

Noise Change, $L_{A10,18hr}$	Magnitude of Impact
0	No change
0.1 – 2.9	Negligible
3.0 – 4.9	Minor
5.0 – 9.9	Moderate
10+	Major

Table 4.1: Classification of Magnitude of Noise Impacts in the Long Term

5. Baseline Noise Levels

In order to determine the baseline noise levels in the vicinity of the nearest residential receptors, a series of manned measurements have been carried out at three locations surrounding the site. Two 20 minute measurements were taken at each position in the daytime and one at each position during the night. The local noise climate was dominated by road traffic noise from the A3290 and the A329 Wokingham Road as well as the surrounding road networks and occasional noise from the rail line that passes by the eastern boundary of the site.

The noise measurements utilised a Rion NL-52 Type 1 Precision Sound Level Meter with a current certificate of calibration. Before and after the measurement period the equipment was calibrated in order to ensure that the equipment had remained within reasonable calibration limits (+/- 0.5 dB). Noise Measurements were carried out in consecutive 5 minutes periods with a 1 second resolution.

Measurements were carried out between 1500 hrs – 1700 hrs on Tuesday 3rd November 2020 and 0030 hrs – 0130 hrs on Wednesday 4th November 2020.

During the noise measurement survey, the temperature was up to 10°C during the daytime dropping to approximately 1°C during the night. There was a moderate (approximately 5 m/s) predominantly westerly wind in the day which dropped to a light (approximately 1-2 m/s) south westerly wind, with occasional stronger gusts. The cloud cover was noted to be 40% at the start of the survey and 10% at the end of the survey. No precipitation was recorded during the survey period.

Noise measurements were carried out at three measurement positions MP1, MP2 and MP3 in a free-field location at a height of 1.5m above ground level close to each road. The positions were chosen in order to determine the existing background noise level at a position representative of the noise climate at the nearest noise sensitive receptors.

The noise monitoring position is shown in **Figure 5.1**.



Figure 5.1: Noise Monitoring Location

Table 5.1 below displays a summary of the measured noise levels. Detailed measurement results are presented in **Appendix 3**.

Position	Period (hours)	L _{Aeq,T} (dB)	L _{A90} (dB)
Measurement Position 1	Daytime (1500-1700)	58	50
	Night-time (0030-0130)	45	39
Measurement Position 2	Daytime (1500-1700)	72	59
	Night-time (0030-0130)	63	39
Measurement Position 3	Daytime (1500-1700)	59	49
	Night-time (0030-0130)	47	38

Table 5.1: Summary of Free Field Semi-Permanent Noise Levels

Note: The average noise levels stated are logarithmic for L_{Aeq}. The L_{A90} is the most commonly measured L_{A90,5min} during the assessment time period.

6. Plant Noise Level Assessment

6.1. Plant Noise Levels

The plant noise levels have been obtained from manufacturers data obtained from Pellikan Construction Ltd on 10.11.2020. A summary of the manufacturers noise levels are presented in **Table 6.1**. Detailed noise levels are presented in **Appendix 4**.

Plant Reference	Quoted Noise Level $L_{Aeq,T}$ (dB)	Quoted Distance from Source (m)	Commentary
System 1 – Café, Activity & Party Room	61	SPL @ 1m	Opening hours only
System 2 – Functional Studio	60	SPL @ 1m	Opening hours only
System 3 – Fitness Studio	60	SPL @ 1m	Opening hours only
System 4 – Main Gym	64	SPL @ 1m	Opening hours only
System 5 – Main Gym	64	SPL @ 1m	Opening hours only
System 6 – Qton Hot Water	63*	SPL @ 1m	Opening hours only
System 7 – Qton Hot Water	63*	SPL @ 1m	Opening hours only
System 8 – Pool Pre Heat	63	SPL @ 1m	Potentially 24/7 operation
System 9 – Pool Pre Heat	63	SPL @ 1m	Potentially 24/7 operation
System 10 – AHU Condenser 1	63	SPL @ 1m	Opening hours only
System 11 – AHU Condenser 2	63	SPL @ 1m	Opening hours only

Table 6.1: Plant Noise Levels

** Low frequency content possibly resulting in audible hum (refer to **Appendix 4** for a detailed assessment of the frequency content of plant noise)*

6.1.1. Plant Noise Levels – Penalties

The plant noise levels and operating conditions have been assessed by Syntegra in line with the advice provided within BS 4142:2014 and the following penalties will be added:

- Tonality: 0 dB (see **Appendix 4**)
- Impulsivity: 0 dB
- Noticeable feature (e.g. hum, whine, hiss): +3 dB due to low frequency noise produced by systems 6 & 7. (see **Appendix 4**)

The total penalty for the plant noise level features will therefore be + 3 dB as a worst-case.

6.2. Receptor Noise Levels

The future plant noise levels at the nearest noise sensitive receptors have been predicted using standard acoustic formulae based on the measured noise levels and are detailed in **Table 6.2** for the sound emitted from all plant in the plant area. A -10 dB screening correction has been applied as the plant will be located at ground floor level behind the proposed building from all noise sensitive receptors.

The daytime noise level calculations have considered all plant and the night-time noise level calculations have considered only the pool pre-heat condensers, as indicated in **Table 6.1** above.

	Receptor		
	17 Palmer Park Road	94 Wokingham Road	20 St Bartholomew's Road
Daytime			
Sound Pressure Level of all condenser units at 1m from Condenser Compound (L_{Aeq} dB)	73	73	73
Reflections (dB)	+6	+6	+6
Distance to Nearest Habitable Room Window (approx.)	200m	220m	320m
Distance Correction (dB)	-46	-47	-50
Screening Correction (dB)	-10	-10	-10
Predicted Noise Level at Receptor (L_{Aeq} dB)	23	22	19
Night-time			
Sound Pressure Level of all condenser units at 1m from Condenser Compound (L_{Aeq} dB)	66	66	66
Reflections (dB)	+6	+6	+6
Distance to Nearest Habitable Room Window (approx.)	200m	220m	320m
Distance Correction (dB)	-46	-47	-50
Screening Correction (dB)	-10	-10	-10
Predicted Noise Level at Receptor (L_{Aeq} dB)	16	15	12

Table 6.2: Predicted Plant Noise Levels

6.3. BS 4142 Assessment

The background noise level and plant noise data presented in **Sections 5** and **6** has been utilised to determine the noise impact at the nearest noise sensitive receptor when assessed using the methodology in BS 4142:2014. The aim is to meet the requirements of the Reading Borough Council which is for the specific noise level to be 10 dB below the existing background level and the rating level to be equal to the background noise level.

Tables 6.3 and **6.4** below summarise the BS 4142 assessment procedure carried out for the site for the daytime and night-time respectively.

Results	Palmer Park Road	Wokingham Road	St Bartholomew's Road	Relevant Clauses of BS 4142:2014	Commentary
Measured Ambient Sound Level	58	72	59	7.3.2	Refer to Table 5.1
Residual Sound Level	58	72	59	7.3.3	<i>The ambient noise level without the plant operating.</i> Refer to Table 5.1
Typical Background Sound Level L_{A90} (dB)	50	59	49	8.1, 8.2	Refer to Table 5.1

Results	Palmer Park Road	Wokingham Road	St Bartholomew's Road	Relevant Clauses of BS 4142:2014	Commentary
Specific Sound Level	23	22	19	9.1, 9.2	Refer to Table 6.2
Acoustic Feature Correction	+3	+3	+3	9.2	Refer to Section 6.1.1
Rating Level L_{Ar} (dB)	26	25	22	9.1	Specific Sound Level + Acoustic Feature Correction
Specific Sound Level comparison to Background Sound Level	-27	-37	-30	n/a	
Rating Level comparison to Background Sound Level	-24	-34	-27	11	
	Assessment indicates below <i>low impact</i>	Assessment indicates below <i>low impact</i>	Assessment indicates below <i>low impact</i>	11	
Achievement of Reading Borough Council Criteria	Yes	Yes	Yes	n/a	Specific Sound Level 10 dB below L_{A90} and Rating Level equal to L_{A90}

Table 6.3: BS 4142 Assessment – Daytime 0700 hrs – 2300 hrs

Results	Palmer Park Road	Wokingham Road	St Bartholomew's Road	Relevant Clauses of BS 4142:2014	Commentary
Measured Ambient Sound Level	45	63	47	7.3.2	Refer to Table 5.1
Residual Sound Level	45	63	47	7.3.3	<i>The ambient noise level without the plant operating.</i> Refer to Table 5.1
Typical Background Sound Level L_{A90} (dB)	39	39	38	8.1, 8.2	Refer to Table 5.1
Specific Sound Level	16	15	12	9.1, 9.2	Refer to Table 6.2
Acoustic Feature Correction	0	0	0	9.2	Refer to Section 6.1.1

Results	Palmer Park Road	Wokingham Road	St Bartholomew's Road	Relevant Clauses of BS 4142:2014	Commentary
Rating Level L_{Ar} (dB)	16	15	12	9.1	Specific Sound Level + Acoustic Feature Correction
Specific Sound Level comparison to Background Sound Level	-23	-24	-26	n/a	
Rating Level comparison to Background Sound Level	-23	-24	-26	11	
	Assessment indicates below <i>low impact</i>	Assessment indicates below <i>low impact</i>	Assessment indicates below <i>low impact</i>	11	
Achievement of Reading Borough Council Criteria	Yes	Yes	Yes	n/a	Specific Sound Level 10 dB below L_{A90} and Rating Level equal to L_{A90}

Table 6.4: BS 4142 Assessment – Night-time 2300 hrs – 0700 hrs

Tables 6.3 and 6.4 identify that an assessment in line with BS 4142 indicates that **the plant noise level is likely to be significantly below the level where a *low impact* would be expected upon the residents at the nearest noise sensitive receptors. The assessment also indicates that the plant is expected to achieve the requirements of Reading Borough Council.**

6.4. Context of the Noise Source

BS 4142 advises that the “context” of the noise needs to be considered to determine the results of the assessment. The predicted noise levels are significantly below the ambient and background noise levels at the nearest noise sensitive receptors and are therefore likely to be inaudible.

In consideration of the context of the noise source, the plant would not be expected to cause any adverse impacts on the health or quality of life of the nearest noise sensitive receptors.

6.5. Consideration of Uncertainty

The assessment has considered uncertainty by taking a cautious approach in terms of the likely noise levels from the activities and by taking conservative losses for the distance attenuation. The cautious approach means that the noise impact is more likely to be overstated, as opposed to understated, although it is not likely that the predicted noise levels would be significantly different from those stated within the report. Overall, it is unlikely that the conclusions of the assessment would be changed as a result of any uncertainty in the assessment process.

7. Road Traffic Noise Assessment

The change in road traffic due to the use of the site has been set out in the transport statement produced by Hydrock on 13th November 2020. The site trips of the current and proposed use have been determined to be:

- Development Site Existing Traffic Flows – 744 vehicles.
- Development Site Proposed Flows – 905 vehicles.

Accordingly, a change in noise level of +0.9 dB would be expected from the proposals, which would be considered to be within the range of “negligible” when assessed in line with DMRB semantic scale of noise impacts (refer to **Table 4.1**).

It can therefore be concluded that, as there would be a *negligible* change in noise levels, the proposed development is unlikely to result in any adverse impacts in respect of noise from the change in road traffic around the site.

8. Conclusion

A noise impact assessment has been carried out for the proposed development at **Palmer Park Sports Stadium, Wokingham Road, Reading, RG6 1LF.**

The proposed development is for an extension of the Palmer Park Sports Stadium, set to include a swimming pool, gym and hub with café and kitchen areas. Times of use are expected to be 0700 hrs – 2230 hrs Mondays to Thursdays, 0700 hrs – 2130 hrs on Fridays and 0900 hrs – 1800 hrs on weekends.

The assessment has identified that plant noise at the site is likely to be significantly below the existing ambient and background noise levels at the nearest noise sensitive receptor. **In consideration of the context of the noise source, the plant noise would not be expected to cause any adverse impacts on the health or quality of life of the nearest noise sensitive receptor and would achieve the requirements of the Local Authority.**

The change in road traffic on surrounding roads will result in a *negligible* change to noise levels, when assessed in line with the DMRB semantic scale, and should therefore be acceptable.

Achievement of the target noise criteria will ensure compliance with the aims of the NPPF and the PPG in that it will avoid noise from giving rise to adverse impacts on the health or quality of life of nearby noise sensitive receptors.

9. Appendix 1: Glossary of Acoustic Terminology

Term	Description
'A'-Weighting	<i>This is the main way of adjusting measured sound pressure levels to take into account human hearing, and our uneven frequency response.</i>
Decibel (dB)	<i>This is a tenth (deci) of a bel. The decibel can be a measure of the magnitude of sound, changes in sound level and a measure of sound insulation. Decibels are not an absolute unit of measurement but are an expression of ratio between two quantities expressed in logarithmic form.</i>
$L_{Aeq,T}$	<i>The equivalent steady sound level in dB containing the same acoustic energy as the actual fluctuating sound level over the given period, T. T may be as short as 1 second when used to describe a single event, or as long as 24 hours when used to describe the noise climate at a specified location. $L_{Aeq,T}$ can be measured directly with an integrating sound level meter.</i>
L_{A10}	<i>The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 10 per cent of a given time and is the L_{A10T}. The L_{A10} is used to describe the levels of road traffic noise at a particular location.</i>
L_{A50}	<i>The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 50 per cent of a given time and is the L_{A50T}.</i>
L_{A90}	<i>The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 90 per cent of a given time and is the L_{A90T}. The L_{A90} is used to describe the background noise levels at a particular location.</i>
L_{Amax}	<i>The 'A'-weighted maximum sound pressure level measured over a measurement period.</i>

10. Appendix 2: Professional Statement

David Yates

David Yates is a full member of the Institute of Acoustics (MIOA) and has over ten years' experience in acoustic consultancy. David has particular expertise in environmental noise providing acoustic consultancy for residential and mixed use planning applications, plant noise and vibration, construction noise and the design of acoustic, noise and vibration control. David is also experienced in providing sound insulation testing and design advice. David is familiar with the application of all relevant standards associated with his work, including but not limited to, BS 4142, BS 8233, BS 7445, BS 6472, BS 5228, BS 140 series, BS 16283 series and BS 717 series. David manages the acoustic department and is responsible for maintaining Syntegra's ANC membership.

11. Appendix 4: Detailed Noise Measurement Results

Measured Noise levels – MP1 Daytime Attended Measurements 03.11.2020

Time	L _{Aeq,T} (dB)	L _{AF(max)} (dB)	L _{A10} (dB)	L _{A90} (dB)
15:55-16:00	61.4	78.7	64.3	50
16:00-16:05	60.9	71.1	65.1	51.9
16:05-16:10	60.4	74.1	64	51.9
16:10-16:15	62.1	79.1	65.4	51.4
1555 hrs – 1615 hrs	61.2	76.9	64.7	51.4

Measured Noise levels – MP1 Daytime Attended Measurements 03.11.2020

Time	L _{Aeq,T} (dB)	L _{AF(max)} (dB)	L _{A10} (dB)	L _{A90} (dB)
17:15-17:20	58.9	74.1	63	49.5
17:20-17:25	58.5	69.2	62.5	48.3
17:25-17:30	59.4	72.5	63.5	48.9
17:30-17:35	57.5	69.5	62	48.8
1715 hrs – 1735 hrs	58.6	71.8	62.8	48.9

Measured Noise levels – MP1 Night-time Attended Measurements 04.11.2020

Time	L _{Aeq,T} (dB)	L _{AF(max)} (dB)	L _{A10} (dB)	L _{A90} (dB)
01:25-01:30	44.8	70.4	46.3	38.8
01:30-01:35	43.6	52.3	47	38.2
01:35-01:40	43.8	51	46.5	40.1
01:40-01:45	47.7	70.5	48	39.9
0125 hrs – 0145 hrs	45.3	61.1	47.0	39.3

Measured Noise levels – MP2 Daytime Attended Measurements 03.11.2020

Time	L _{Aeq,T} (dB)	L _{AF(max)} (dB)	L _{A10} (dB)	L _{A90} (dB)
15:30-15:35	70	80	74	59.6
15:35-15:40	70.8	89.2	74.6	56.3
15:40-15:45	71.3	83.8	75	58.7
15:45-15:50	71	80.1	74.5	58
1530 hrs – 1550 hrs	70.8	85.0	74.5	58.3

Measured Noise levels – MP2 Daytime Attended Measurements 03.11.2020

Time	L _{Aeq,T} (dB)	L _{AF(max)} (dB)	L _{A10} (dB)	L _{A90} (dB)
16:45-16:50	71.5	93.4	74.1	56.3
16:50-16:55	73.4	94	75	61.1
16:55-17:00	69.7	81.1	73.6	58.8
17:00-17:05	79.9	105.8	75	59.8
1645 hrs – 1705 hrs	75.5	100.3	74.5	59.3

Measured Noise levels – MP2 Night-time Attended Measurements 04.11.2020

Time	L _{Aeq,T} (dB)	L _{AF(max)} (dB)	L _{A10} (dB)	L _{A90} (dB)
01:00-01:05	64.6	82.4	68.5	40.2
01:05-01:10	62.7	84.9	59.3	37.5
01:10-01:15	63.2	79.3	67.7	39.9
01:15-01:20	55.2	77.2	48.3	38.1
0100 hrs – 0120 hrs	62.5	81.0	61.0	38.9

Measured Noise levels – MP3 Daytime Attended Measurements 03.11.2020

Time	L _{Aeq,T} (dB)	L _{AF(max)} (dB)	L _{A10} (dB)	L _{A90} (dB)
15:00-15:05	61.3	77.1	64.5	48.5
15:05-15:10	60.1	71.9	64.7	48.6
15:10-15:15	60.9	72.3	64.8	49.2
15:15-15:20	57.8	68.6	60.8	52.9
1500 hrs – 1520 hrs	60.2	73.6	64.0	50.2

Measured Noise levels – MP3 Daytime Attended Measurements 03.11.2020

Time	L _{Aeq,T} (dB)	L _{AF(max)} (dB)	L _{A10} (dB)	L _{A90} (dB)
16:20-16:25	61.1	72.3	65.6	48.5
16:25-16:30	61.3	77	64.8	47.5
16:30-16:35	60.5	70.9	64.5	49.3
16:35-16:40	58.7	70.9	63.1	47.6
1620 hrs – 1640 hrs	60.5	73.6	64.6	48.3

Measured Noise levels – MP3 Night-time Attended Measurements 04.11.2020

Time	L _{Aeq,T} (dB)	L _{AF(max)} (dB)	L _{A10} (dB)	L _{A90} (dB)
00:35-00:40	49	64.7	48.8	38.6
00:40-00:45	46.2	67.2	42	35
00:45-00:50	43	63.5	45.5	37.4
00:50-00:55	48.4	66.9	48	40.8
0035 hrs – 0055 hrs	47.2	65.6	46.1	38.0

12. Appendix 5: Detailed Plant Noise Levels and Tonality Assessment

System	Plant Model	Type of Data	Noise Levels (dB) in Octave Bands (Hz)								dB(A)
			63	125	250	500	1000	2000	4000	8000	
1	PURY-EP300 YNW-A(-BS) (Standard Mode)	SPL @ 1m	76	63	63	60	54	50	45	40	61
2 & 3	PUHY-P250 YNW-A(-BS) (Standard Mode)	SPL @ 1m	63	125	250	500	1000	2000	4000	8000	60
			71	63	62	59	53	49	49	43	
4&5	PUHY-P550 YSNW-A(-BS) (Standard Mode)	SPL @ 1m	63	125	250	500	1000	2000	4000	8000	64
			77	66	66	63	57	52	51	45	
6 & 7	ESA30 Series	SPL @ 1m	63	125	250	500	1000	2000	4000	8000	63
			72	55	50	54	50	46	42	37	
8 & 9	CAHV-P500YA-HPB(-BS) (Capacity Priority Mode)	SPL @ 1m	63	125	250	500	1000	2000	4000	8000	63
			66	60	67	60	52	50	56	48	
10 & 11	PUZ-ZM200-250	SPL @ 1m	63	125	250	500	1000	2000	4000	8000	63
			67	62	60	61	56	53	49	43	

In order to assess tonality, the plant noise levels should be assessed using the ‘Objective Method’ detailed in BS4142:2014. The ‘Objective Method’ states: “for a discrete tone to be identified as present, the time-averaged sound pressure level in the one-third-octave band of interest is required to exceed the time-averaged sound pressure levels of both adjacent one-third-octave bands by:

- 15 dB in the low-frequency one-third-octave bands (25 Hz to 125 Hz);
- 8 dB in the middle-frequency one-third-octave bands (160 Hz to 400 Hz); and
- 5 dB in the high-frequency one-third-octave bands (500 Hz to 10 000 Hz).”

The ‘Objective Method’ for assessing tonality, as set out in BS 4142:2014, has determined that no tones are present. However, the low frequency content of Systems 6 and 7 may produce an audible hum. As such a correction of +3dB has been applied to our calculations.