Noise Impact Assessment for Proposed Fan Zone at the STōK Cae Ras

STōK Cae Ras, Wrexham AFC

Report Quality Management			
Prepared by:	Joe Twentyman BSc (Hons), AMIOA	Assistant Consultant Acoustics, Noise and Vibration	
Reviewed by:	Peter Barling BSc (Hons), PGDip, MIOA	Associate Acoustics, Noise and Vibration	
Final Review & Authorisation:	Phil Evans BSc (Hons), MSc, FIOA, FGS	Director Acoustics, Noise and Vibration	
Report Ref:	687671_Report01_Rev01	**Date of Issue:**	03/09/2024

Assessment/Calculations Quality Management		
Prepared by:	Joe Twentyman BSc (Hons), AMIOA	Assistant Consultant Acoustics, Noise and Vibration
Reviewed by:	Peter Barling BSc (Hons), PGDip, MIOA	Associate Acoustics, Noise and Vibration

Revision History		
Rev	**Date of Issue**	**Comment**
00	29/08/2024	First draft
01	03/09/2024	Updated Version with correct job number

Contents

1 Introduction 1

2 Basis for Assessment & Assessment Methodology 2

Basis for Assessment 2

Planning Policy Wales 2

Noise and Soundscape Plan for Wales 3

Code of Practice on Environmental Noise Control at Concerts 4

3 Site and Baseline Noise Description 5

Establishing Baseline Conditions 5

Measurement Results 6

Representative Baseline Sound Levels 7

Previous Noise Survey & Assessment 7

4 Calculations and Modelling 8

Modelled Noise Sources 8

Model Results 9

5 Assessment 10

Matchdays 10

Away Day Screenings 10

Assessment Summary 11

6 Uncertainty 12

7 Summary & Conclusions 13

Tables, Figures and Appendices

Tables

Table 2.1 Guideline Noise Levels for Outdoor Music Events

Table 3.1 LT1 Baseline Sound Levels

Table 3.2 LT1 Baseline Sound Levels (14:00 and 17:00 hours on 24/08/204)

Table 3.3 Representative Baseline Sound Levels

Table 4.1 Predicted Sound Levels

Table 5.1 Matchday Noise Change Assessment

Table 5.2 Screening of Awayday Matches

Figures

Figure 1: Site & Survey Locations

Figure 2: LT1 Time History

Figure 3: Specific Sound Levels

Appendices

Appendix A: Qualifications Statements

Appendix B: Baseline Survey Data

Appendix C: Previous Nosie Assessment

1 Introduction

1.1 The Acoustics, Noise and Vibration Team at Savills has been appointed by Wrexham AFC to undertake a noise impact assessment in relation to a planning application for the use of land for a new Fan Zone at the STōK Cae Ras Stadium. The site is located within the administrative area of Wrexham County Borough Council (WCBC).

1.2 The Fan Zone will have a capacity of circa 1,500 fans and will be used primarily before home matches, but will also be used to put on screenings of away day matches, as well as other events on an ad hoc basis.

1.3 The proposed Fan Zone is located off Crispin Lane, behind the existing temporary stand. The Fan Zone will consist of a marquee which will have a stage on the south side. Toilet facilities will also be provided as well as timber clad concession stands, with an area assigned for a possible five further pop up concession stands. Access to the Fan Zone will be the same as that of the temporary stand.

1.4 The closest noise sensitive receptors (NSRs) to the proposed fan zone are the Wrexham Student Village student accommodation located adjacent to the site, as well as properties on Mold Road approximately 100 m to the south.

1.5 The technical content of this assessment has been provided by Savills personnel, all of whom are corporate members, i.e. Member (MIOA) or Fellow (FIOA), of the Institute of Acoustics (IOA), the UK's professional body for those working in acoustics, noise and vibration. The assessment has been undertaken with integrity, objectivity and honesty in accordance with the Code of Conduct of the IOA.

1.6 This report and assessment has been peer reviewed within the Savills team to ensure that it is technically robust and meets the requirements of our Integrated Management System.

1.7 Personnel and individual qualifications are provided within the Quality Management table at the start of this report and in Appendix A.

2 Basis for Assessment & Assessment Methodology

Basis for Assessment

2.1 This assessment has been undertaken to establish if operation of the Fan Zone would be compliant with relevant national and local planning policy and guidance upon which the planning application will be determined. A fundamental part of this consideration is whether noise immissions (noise received at receptors) from the events are likely to result in complaint from NSRs assuming a normal subjective response to noise.

National Planning Policy & Guidance

2.2 A summary of relevant National Planning Policy and Guidance, pertinent to this assessment, is provided below.

Planning Policy Wales

2.3 Planning Policy Wales (PPW) [1] sets out the land use planning policies of the Welsh Government. Section 6.7 of PPW provides guidance with regard to noise and development, with paragraph 6.7.6 stating:

"In proposing new development, planning authorities and developers must, therefore:

• address any implication arising as a result of its association with, or location within, air quality management areas, noise action planning priority areas or areas where there are sensitive receptors;

• not create areas of poor air quality or inappropriate soundscape; and

• seek to incorporate measures which reduce overall exposure to air and noise pollution and create appropriate soundscapes.

2.4 Paragraph 6.7.14 of PPW states:

"Proposed development should be designed wherever possible to prevent adverse effects to amenity, health and the environment but as a minimum to limit or constrain any effects that do occur. In circumstances where impacts are unacceptable, for example where adequate mitigation is unlikely to be sufficient to safeguard local amenity in terms of air quality and the acoustic environment it will be appropriate to refuse permission.

2.5 Paragraph 6.7.22 of PPW states:

"Certain qualities of sound can be associated with particular places and the activities within them. Taking steps to foster the continued longevity of uses and activities which provide wider cultural

benefit and experience for people and contribute towards the local economy, both in terms of a vibrancy of place and in creating a space for creativity to flourish, is an important role for the planning system.

2.6 PPW does not contain guidance in terms of numerical noise levels. Guidance is provided descriptively, which may be transposed to numerical noise levels for site-specific situations, using the methods contained within British Standards.

Technical advice note (TAN) 11: noise

2.7 The Technical Advice Note (Wales) (TAN) should be used in conjunction with 'Planning Guidance (Wales): Planning Policy'. Planning Guidance, Technical Advice Notes should be taken into account by local planning authorities in Wales in the preparation of development plans. The below is considered pertinent to this development

Noise generating development 8.

Local planning authorities must ensure that noise generating development does not cause an unacceptable degree of disturbance. They should also bear in mind that if subsequent intensification or change of use results in greater intrusion, consideration should be given to the use of appropriate conditions.

Local Planning Policy

2.8 The Wrexham Unitary Development Plan [2] provides a framework for local decision making and the reconciliation of development and conservation interests in order that land use changes proceed coherently and with maximum community benefit.

2.9 Policy GDP1 ‘Development Objectives of the Local Planning Document, is considered pertinent with regard to this assessment, stating:

“All new development should:-

…

f) Ensure the safety and amenity of the public and safeguard the environment from the adverse effects of pollution of water, land or air, hazards from industry and quarrying, and associated noise, odour or vibration arising from development….”

Noise and Soundscape Plan for Wales

2.10 The Noise and Soundscape Plan 2023-2028 (NSP) [3] is Wales’s national strategy on soundscapes, meaning the sound environment as perceived or experienced and/or understood by a person or people, in context.

2.11 The NSP Policy states:

> *"A healthy sound environment is more than simply the absence of unwanted sounds, and noise management must have a broader focus than simply reducing the decibels. The cities, towns and villages in which people live serve a variety of purposes, and should contain a variety of sound environments appropriate to the time and place. There should not be a one-size-fits-all sound environment, which is experienced everywhere, any more than every street and building should look alike."*

Code of Practice on Environmental Noise Control at Concerts

2.12 Guidelines for noise from outdoor music events were published in the Noise Council's 'Code of Practice on Environmental Noise Control at Concerts' (The Code) in 1995 [4]. This document presents recommended entertainment noise limits for events depending on how often they occur and the nature of the venue.

2.13 Table 1 of the Code, which provides guideline noise levels for outdoor music events is copied below for reference. This refers to the Music Noise Levels (MNL), which is defined as The L_{Aeq} of the music noise measured at a particular location.

Table 2.1 Guideline Noise Levels for Outdoor Music Events

Concert days per calendar year, per venue	Venue Category	Guideline
1 to 3	Urban Stadia or Arenas	The MNL should not exceed 75 dB(A) over a 15 minute period
1 to 3	Other Urban and Rural Venues	The MNL should not exceed 65 dB(A) over a 15 minute period
4 to 12	All Venues	The MNL should not exceed the background noise level by more than 15 dB(A) over a 15 minute period

3 Site and Baseline Noise Description

3.1 The Wrexham AFC stadium is located north of Mold Road, with the specific Fan Zone site located off Crispin Lane, to the east of the stadium, an area generally urban in nature with residential dwellings situated to the south and north east of the site.

3.2 Road traffic movements on Mold Road and Crispin Lane are considered to be the usual, (i.e. outside periods the stadium is used), primary sources of noise affecting the baseline acoustic environment at the measurement position located at the nearest NSR to the Site.

3.3 During matchdays, it is considered that fans arriving, watching and leaving the stadium area would be the primary sources of noise affecting the baseline acoustic environment at the measurement position located at the nearest NSR to the Site

3.4 The nearest NSRs to the site are residential dwellings on Mold Road as well as the student accommodation block located adjacent to the football stadium.

3.5 The site and NSR locations are shown on Figure 1 at the end of this report.

Establishing Baseline Conditions

3.6 In order to establish baseline acoustic conditions at the nearest NSRs, one unattended long term sound level survey (LT1) was deployed on Wednesday 21 August and collected on Wednesday 28 August 2024. On Saturday 24 August 2024, a Wrexham AFC football match was played, with a kick off time of 15:00 hours.

3.7 The LT1 sound level meter (SLM) was installed to the east of the Site, approximately 55 m south-east from Wrexham Student Village, a location as close as practicable to the dwellings and representative of the acoustic environment at the NSRs.

3.8 The SLM was mounted on a fence at 1.5 m above ground level in a free-field position (at least 3.5 m from any reflecting surface, excluding the ground).

3.9 Sound level measurements were made using a Class 1 ‘Convergence NSRT Mk3’ sound level meter (SLM) in accordance with BS 7445-2:1991 ‘Description and measurement of environmental noise Part 2: Guide to the acquisition of data pertinent to land use’ [5]. The SLM was set up to log the A-weighted broadband sound pressure level (SPL) in 125 ms periods. Raw data were post-processed into 15-minute periods.

3.10 The equipment calibration level was checked to 94 dB prior to and after the monitoring period; no significant deviation (i.e. above 0.5 dB) was noted.

3.11 At the time of setting up and collecting the survey, the following noise sources were noted as affecting the acoustic environment at the survey location: regular road traffic movements on Mold Road and very slight wind breeze.

3.12 Meteorological conditions were monitored via a publicly accessible nearby weather station[1]. The survey period was slightly wet (some minor rain on Thursday 22nd August and Wednesday 28th August) and wind speeds were light, at approximately 2 m/s.

Measurement Results

3.13 Table 3.1 below provides a summary of the baseline sound levels measured over the 7-day survey period at LT1, for the daytime (07:00 to 23:00 hours) and night-time (23:00 to 07:00 hours) periods.

3.14 Figure 2 at the end of the report provides a graphical presentation of post processed 15-minute levels for LT1. Full 15-minute data are provided in Appendix B, along with a photo of the monitoring location.

Table 3.1 LT1 Baseline Sound Levels

Period (hours)	Background Sound Level (dB $L_{A90,15min}$)					Residual Sound Levels (dB $L_{Aeq,15min}$)				
	Min	25%[1]	50%	75%	Max	Min	25%	50%	75%	Max
Daytime (07:00 to 23:00)	39	45	47	49	61	47	58	60	61	73
Night-time (23:00 to 07:00)	33	37	39	42	60	36	45	50	53	65

Notes:
1. Percentile value, for example 25% is the value below which 25% of the data are found.

3.15 Table 3.2 below provides a summary of the baseline sound levels measured during the period between 14:00 and 17:00 hours on Saturday 24th August, i.e. the matchday period prior to and during kick off of the football match.

Table 3.2 LT1 Baseline Sound Levels (14:00 and 17:00 hours on 24/08/204)

Period	Background Sound Level $L_{A90,T}$ (dB)	Residual Sound Level $L_{Aeq,T}$ (dB)	Maximum Sound Level L_{AFmax} (dB)
24/08/2024 14:00 to 17:00	56	65	92

[1] https://www.wunderground.com/dashboard/pws/IFOLKE12

Representative Baseline Sound Levels

3.16 In this instance, the 25th percentile levels of the LT1 survey data have been used to characterise the baseline sound environment at the nearest NSRs. This is not the lowest sound level but is lower than that obtained using the average. It therefore represents somewhere in the range of lower sound levels that are likely to be encountered and provides a precautionary assessment. For 75% of the time, baseline sound levels will be higher than the 25th percentile levels. Use of the 25th percentile ensures that any periods when higher wind speeds (or other extraneous noise) could have affected the measured baseline sound levels do not unduly affect the analysis.

3.17 Similarly, representative baseline residual levels have been based on the 25th percentile level. Table 3.3 below provides a summary of representative sound levels used in the subsequent assessment.

Table 3.3 Representative Baseline Sound Levels

Period	Background Sound Level $L_{A90,T}$ (dB)	Residual Sound Level $L_{Aeq,T}$ (dB)
Daytime	45	58
Night-time	37	45

Previous Noise Survey & Assessment

3.18 In October 2022, a prior noise impact assessment was undertaken by others[2] in relation to a proposed temporary stand at the stadium. As part of that assessment, a baseline noise survey was undertaken between the 10 and 15th of September 2021, which included a Wrexham home game on 11th September 2021.

3.19 Full details of this assessment can be found in Appendix C.

3.20 With reference to Table 5.1, 'Average noise levels at nearest properties' of the previous NIA, the average noise level at the Student Accommodation building during the match was 75 dB $L_{Aeq,T}$.

[2] Ramboll, 'Wrexham AFC Kop Redevelopment' Doc ID RUK2021N00485-RAM-RP-00004 / Version 1.2

4 Calculations and Modelling

4.1 In order to calculate specific sound levels at NSR locations (both residential dwellings and educational facilities) associated with use of the Fan Zone, a 3D sound model has been built using SoundPLAN v9 noise modelling software.

4.2 The model predicts sound levels under light down-wind conditions, based on hemispherical sound propagation, with corrections for atmospheric absorption, ground effects, screening and directivity based on the procedure detailed in ISO 9613-2:1996 'Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation' [6].

Modelled Noise Sources

4.3 The only proposed activity within the model is human activity (chatter, shouting etc.) included in the Fan Zone area. Although it is recognised there is likely to be some other noise sources included within the Fan Zone (likely some small plant associated with operation of the concession stands) this would not be of a magnitude that would be audible over the main source of noise (fan noise) so has not been included.

4.4 Modelling details of the activities that will occur on the site are detailed below.

Fan/People Noise

4.5 Fan noise within the Fan Zone has been modelled as an area source that covers the entire proposed area, at 1.5 m above ground level (AGL), each assigned with an 'Spectator Area (standing area)' emission type, based on data within the SoundPLAN library[3], which has an associated sound power level of 82 dBA L_W, per unit area[4], equivalent to a total SWL of 111 dBA w

4.6 This area was assigned as 'Spectator Area (standing area)' properties, as this was deemed the most appropriate from the library database to represent the type and magnitude of noise associated with fan activity.

4.7 In addition to the above, the timber clad concession stands as well as the toilet facilities and five pop up concession stands have been modelled as 3D 'buildings' 3 m tall. The marquee has been modelled as a 'floating screen' (i.e. roof) at 3 m AGL.

[3] Probst, W.: "Geräuschentwicklung von Sportanlagen und deren Quantifizierung für immissionsschutzgerechte Prognosen", Bundesanstalt für Sportwissenschaft, 1994

[4] Based on SWL per person of 80 dBA LW, 1,500 people and an area of m2.

Model Results

4.8 Table 4.1 below provides a summary of the modelled sound levels at the NSRs in the surrounding area

4.9 Predicted sound levels are presented graphically in Figure 3 at the end of the report.

Table 4.1 Predicted Sound Levels

NSR	Sound Level (dB $L_{Aeq,T}$)
Wrexham Student Village	60
13 Mold Road	59

5 Assessment

Matchdays

5.1 With reference to Table 3.2 and paragraph 3.21, during periods before and during a football match at the stadium, noise levels at the nearest NSR (Wrexham Student Village) are in the region of 65 to 75 dB $L_{Aeq,T}$.

5.2 On the basis of the above, the inclusion of the Fan Zone would result in a minimal increase in sound level at the nearest NSRs during matchday use, as summarised below in Table 5.1.

Table 5.1 Matchday Noise Change Assessment

NSR	Existing Matchday Sound Level (dB $L_{Aeq,T}$)	Fan Zone Sound Level (dB $L_{Aeq,T}$)	Combined Sound Level (dB $L_{Aeq,T}$)	Change (dB)
Wrexham Student Village	65	60	66	+1

5.3 On the basis that use of the Fan Zone would only increase by 1 dB at NSRs compared to the current situation and that the sound would be of a similar character/nature, it is considered very likely that use of the Fan Zone specifically would not be discernible and would not affect the existing soundscape.

5.4 Consequently use of the Fan Zone on matchdays would not result in any impact.

Away Day Screenings

5.5 In addition to use of the Fan Zone on home matchdays, the area may also be to screen away day matches and host other events on an ad hoc basis. At this stage it is unknown how many away day matches may be screened, but this is considered likely to be fewer than 12 in a season.

5.6 With reference to Table 4.1, noise levels associated with the regular daytime activities undertaken Code of Practice on Environmental Noise Control at Concerts would not exceed a level of 15 dB above the background sound level, as summarised in Table 5.2 below.

Table 5.2 Screening of Awayday Matches

NSR	Background Sound Level (dB $L_{Aeq,T}$)	Fan Zone Sound Level (dB $L_{Aeq,T}$)	Difference (dB)
Wrexham Student Village	45	60	+15

5.7 On the basis of the above and with reference to Tables 2.1 and 5.2, the noise level associated with operation of the fan zone is within the level set in the guidelines of the Code of Practice on Environmental Noise Control at concerts.

5.8 It is acknowledged that the guidelines are not strictly applicable to the sound associated with the screening of football matches and congregation of fans, but it is considered that this provides a reasonable assessment methodology in the absence of more specific guidance, policy or standards, due to the similar nature and character of sound at the two types of events.

5.9 On the basis of the above, use of the Fan Zone during the screening of away day matches is acceptable from a noise perspective.

Assessment Summary

5.10 Use of the Fan Zone during match days would result in a minor increase in noise level or change in character/soundscape at NSRs, that would be imperceptible over the current soundscape of the area. As such, no major adverse effects would result.

5.11 Use of the Fan Zone to screen away day matches would result in noise levels at NSRs compliant with the Code of Practice on Environmental Noise Control at Concerts document.

5.12 Whilst some adverse effects may result, these would be limited to daytime periods only, i.e. not affecting sleep, and would be limited in terms of the number of times per year they occur. Furthermore, the character of the sound is in keeping with the general use of the site, i.e. fans of the local community congregating to watch football; an activity which provides wider cultural benefits and contributes towards the local economy.

5.13 On the basis of the above, the proposed Fan Zone would be compliant with National Planning policy (PPW & TAN 11), and Local Planning Policy.

6 Uncertainty

6.1 In all assessments, it is good practice to consider uncertainty which can arise from a number of different aspects. There are degrees of uncertainty associated with: instrumentation used for surveying; measurement technique and the variables influencing the measurement results such as transmission path and weather conditions; source terms used for modelling; calculation uncertainty; assessment uncertainty; and the subjective response of residents to noise sources.

6.2 Uncertainty due to instrumentation has been significantly reduced with the introduction of more modern instrumentation and is reduced further by undertaking field calibration checks on sound level meters before and after each measurement period and that all instrumentation is within accepted laboratory calibration intervals.

6.3 Every effort has been made to reduce the uncertainty of the baseline sound level measurements. The 7-day duration of the baseline survey is considered to significantly reduce the uncertainty associated with the baseline sound levels. Based on professional judgement including substantial experience of acquiring and analysing baseline data for numerous sites in various locations, and a desk-based review of the site and surrounding area, it is considered that the baseline data acquired during the survey is typical of the area.

6.4 Calculation uncertainty and assessment uncertainty have been reduced by peer review of all baseline data, model input data, model results and assessment calculations, and by using the appropriate level of precision at each stage of the assessment calculations.

6.5 A semi quantitative assessment has been undertaken based on information provided by the project team for the proposed development and professional judgement based on recognised and accepted empirical calculation methodologies. Where assumptions have been made, these have been informed through assessment, 3rd party peer reviewed data and assessment of similar schemes previously, allowing for a reasonable and robust assessment.

6.6 With regards to subjective response, the noise standards adopted for the assessment will have been based upon the subjective response of the majority of the population or will be based upon the most likely response of the majority of the population. This is considered to be the best that can be achieved in a population of varying subjective response which will vary dependent upon a wide range of factors.

6.7 All areas and potential consequences of uncertainty have been minimised at every stage of the assessment process. On the basis of the above, and in the context of subjective response, the effects of uncertainty on the assessment are considered minimal.

7 Summary & Conclusions

7.1 The Acoustics, Noise and Vibration Team at Savills has been appointed by Wrexham AFC to undertake a noise impact assessment in relation to a planning application for the use of land for a new Fan Zone at the STōK Cae Ras stadium. The site is located within the administrative area of Wrexham County Borough Council (WCBC)

7.2 The Fan Zone will have a capacity of circa 1,500 fans, and will be used primarily before home matches, but will also be used to put on screenings of away day matches as well as other events on an ad hoc basis.

7.3 The results of the assessment show that the operation of the proposed Fan Zone, including the ad hoc screenings of away day matches, would result in minimal adverse impact at the nearest residential dwellings, of a similar magnitude and character that currently effects the area.

7.4 Whilst some adverse effects may result these would be limited to daytime periods only, i.e. not affecting sleep, and would be limited in terms of the number of times per year these occur. Furthermore, the character of the sound is in keeping with the general use of the site, i.e. fans of the local community congregating to watch football.

7.5 Consequently, from a noise perspective, operation of the fan zone would be compliant with National Planning policy and Local Planning Policy as well as guidance set out in the Code of Practice on Environmental Noise Control at Concerts document.

1 Welsh Government. Planning Policy Wales. Edition 12. February 2024.

2 Wrexham Council. Wrexham Unitary Development Plan 1996 - 2011. Adopted 14th February 2005.

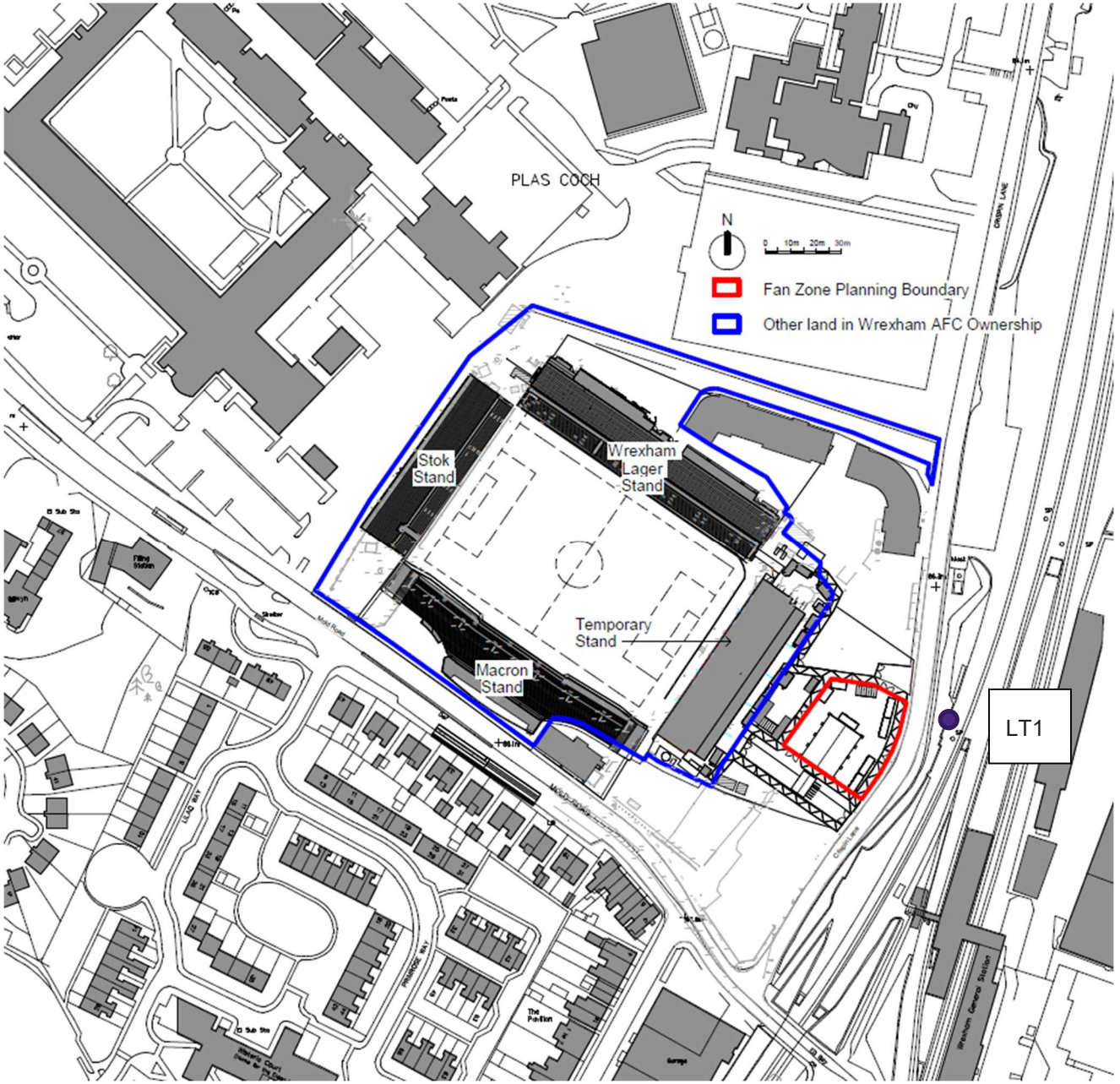
3 Welsh Government. The Noise and Soundscape Plan 2023-2028. 2024

4 The Noise Council. Code of Practice on Environmental Noise Control at Concerts. 1995

5 British Standards Institution. British Standard 7445-2:1991 'Description and measurement of environmental noise Part 2: Guide to the acquisition of data pertinent to land use.

6 ISO. International Standard ISO 9613-2:1996. Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation.

Figures



© 2024 Savills

Notes
1. This drawing has been prepared in accordance with the scope of Savills' appointment with its client and is subject to the terms and conditions of that appointment. Savills accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.
2. If received electronically it is the recipient's responsibility to print to correct scale. Only written dimensions should be used.

Mocatta House, Trafalgar Place
Brighton, East Sussex BN1 4DU

Client: STōK Cae Ras, Wrexham AFC

Project: Noise Impact Assessment for Proposed Fan Zone at the STōK Cae Ras

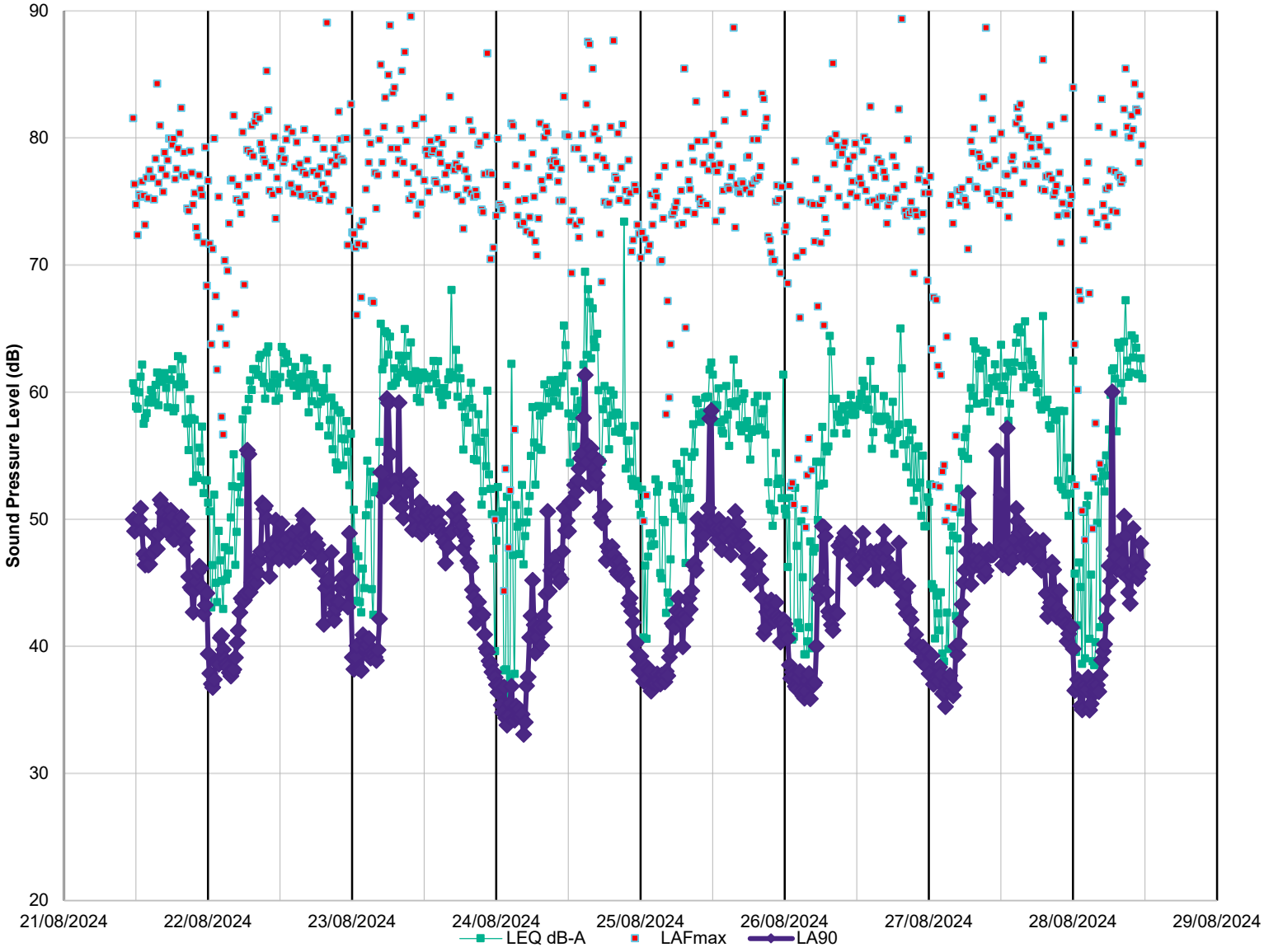
Job Ref: 687671_Report01_Rev01

File location:

Date: 03/09/2024	Rev:01
Drawn: JT	Checked: PB

Figure 1: Site & Survey Locations

Savills.co.uk



© 2022 Savills

Notes
1. This drawing has been prepared in accordance with the scope of Savills' appointment with its client and is subject to the terms and conditions of that appointment. Savills accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.
2. If received electronically it is the recipient's responsibility to print to correct scale. Only written dimensions should be used.

savills

Mocatta House, Trafalgar Place
Brighton, East Sussex BN1 4DU

Client: STōK Cae Ras, Wrexham AFC

Project: Noise Impact Assessment for Proposed Fan Zone at the STōK Cae Ras

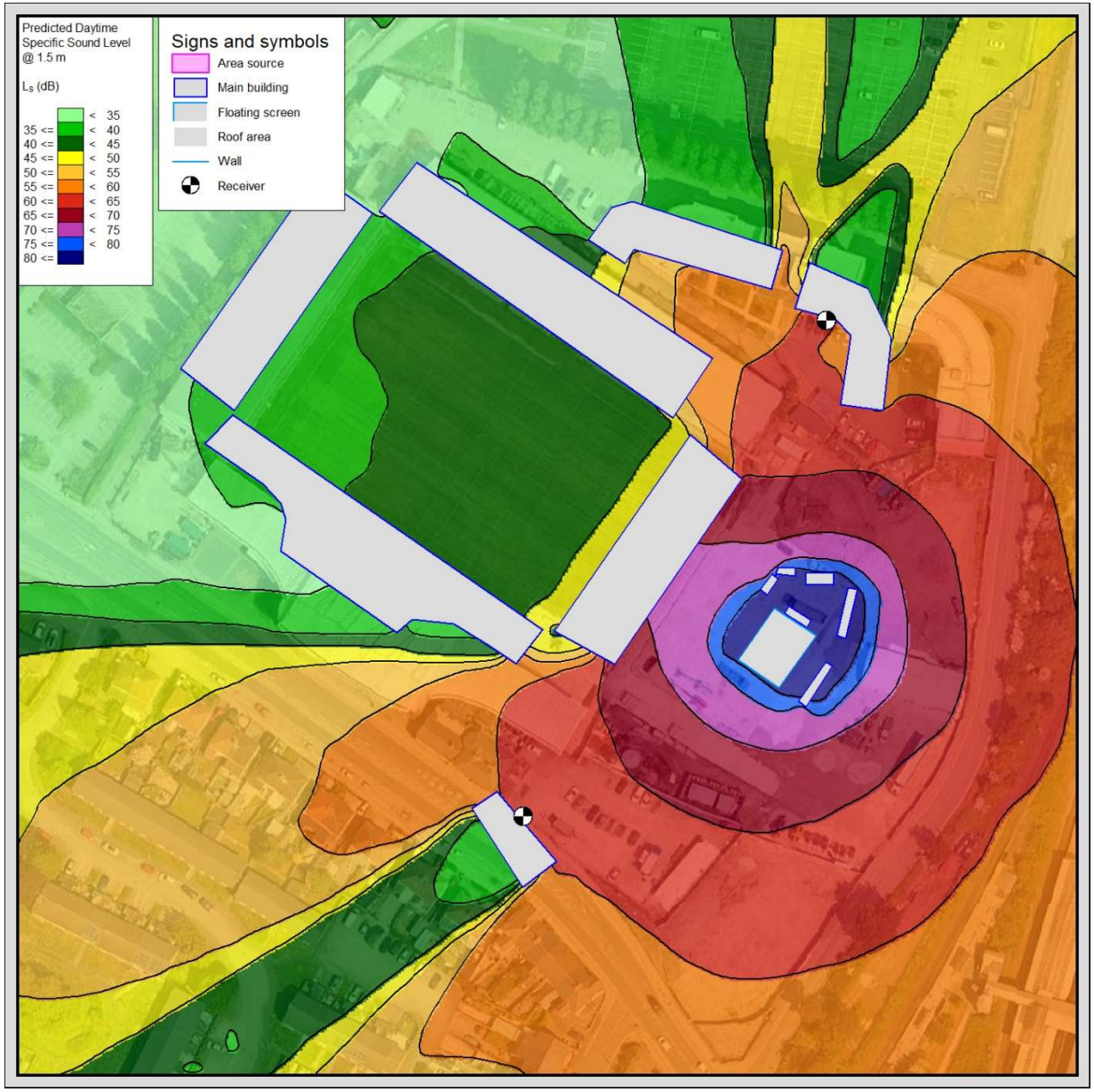
Job Ref: 687671_Report01_Rev01

File location:

Date: 03/09/2024	Rev: 02
Drawn: PB	Checked: HRL

Figure 2: LT1 Time History

Savills.co.uk



© 2022 Savills

Notes
1. This drawing has been prepared in accordance with the scope of Savills' appointment with its client and is subject to the terms and conditions of that appointment. Savills accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.
2. If received electronically it is the recipient's responsibility to print to correct scale. Only written dimensions should be used.

Mocatta House, Trafalgar Place
Brighton, East Sussex BN1 4DU

Client: STōK Cae Ras, Wrexham AFC

Project: Noise Impact Assessment for Proposed Fan Zone at the STōK Cae Ras

Job Ref: 687671_Report01_Rev01

File location:

Date: 03/09/2024	Rev: 02
Drawn: PB	Checked: HRL

Figure 3: Specific Sound Levels

Savills.co.uk

Appendices

Appendix A: Qualifications Statements

Phil Evans: Director - Acoustics

BSc (Hons) Geology; MSc Acoustics, Vibration and Noise Control; Fellow of the Geological Society; Fellow of the Institute of Acoustics; Associate Member Acoustical Society of America

A.1 Phil is a Director and leads the Savills Acoustics Team. He is a specialist in environmental acoustics and is active on a number of committees including the Association of Noise Consultants' Vibration Working Group; British Standards Institution (BSi) Committee GME/21/6/4 - BS 6472: Guide to Evaluation of Human Exposure to Vibration in Buildings; BSi Committee B/564/01 on BS 5228: Noise and Vibration Control on Construction and Open Sites which has now also revised and issued BS 8233:2014 Guidance on sound insulation and noise reduction in buildings. He has been a corporate Member of the Institute of Acoustics (MIOA) for over 20 years but has recently become a Fellow..

A.2 Phil has over 25 years' experience in the project management of, and technical input to, environmental noise and vibration impact assessments for major developments. He is an expert in the industrial/commercial, transportation and construction sectors including the measurement, calculation, evaluation and mitigation of environmental noise and vibration. Phil has significant experience in the preparation and presentation of technical evidence and reports for public inquiries and planning applications. He is experienced in consultation and liaison with government departments, local authorities and other statutory bodies. He is an experienced expert witness. He has a Continuous Professional Development Record to support this competency and experience.

A.3 For this project, Phil as taken on the role of Project Director and has been responsible for overseeing and delivering the project.

Peter Barling: Associate - Acoustics

BSc (Hons) Physics; PGDip Environmental Assessment and Management; Member of the Institute of Acoustics

A.5 Peter is an Associate Consultant in Acoustics and environmental acoustics specialist with nine years' experience. He has a Degree in Physics and also has a Post Graduate Diploma in Environmental Assessment and Management. He has been a member of the Institute of Acoustics since 2013.

A.6 Peter has project managed and undertaken noise assessments for a variety of developments, including: large scale mixed-use developments, incorporating commercial, retail, leisure and residential elements; on-shore substations for off-shore windfarms; energy from waste facilities; manufacturing facilities; distribution centres; retail units; minerals extraction and exploration; solar farms; and petrol service filling stations. He has provided input into Environmental Impact Assessments (EIAs) and undertaken noise assessments to support planning applications and discharge planning conditions. He has a Continuous Professional Development (CPD) Record to support this competency and experience.

A.7 Peter was responsible for undertaking the baseline acoustic survey and review of the assessment and report.

Appendix B: Baseline Survey Data

Time (Date hh:mm:ss.ms)	LEQ dB-A	L90 dB-A	Lmax dB-A	Lmin dB-A	L10 dB-A	L50 dB-A	L99 dB-A
21/08/2024 11:30	60.7	50.0	81.6	47.1	63.1	53.8	47.9
21/08/2024 11:45	60.1	49.1	76.4	45.6	63.7	53.0	46.6
21/08/2024 12:00	58.9	49.2	74.8	46.1	62.1	52.6	47.8
21/08/2024 12:15	58.7	49.9	72.4	47.8	62.5	52.3	48.7
21/08/2024 12:30	60.0	50.0	75.6	46.4	63.3	54.4	47.1
21/08/2024 12:45	61.2	50.9	75.4	47.8	65.3	57.0	49.3
21/08/2024 13:00	62.2	49.1	76.6	46.4	66.3	56.4	47.0
21/08/2024 13:15	57.5	47.3	75.5	44.9	60.4	50.6	46.0
21/08/2024 13:30	58.0	46.4	73.2	44.5	61.8	49.3	45.3
21/08/2024 13:45	58.4	46.9	76.9	44.8	61.4	49.8	45.7
21/08/2024 14:00	59.2	46.4	75.3	43.9	63.0	50.5	44.9
21/08/2024 14:15	59.4	46.5	77.5	43.6	62.9	49.5	44.8
21/08/2024 14:30	60.2	47.3	76.9	44.8	64.1	50.7	46.0
21/08/2024 14:45	59.7	47.4	76.9	45.4	63.1	50.8	46.1
21/08/2024 15:00	59.2	48.7	75.2	46.1	62.1	51.1	47.3
21/08/2024 15:15	60.6	47.7	78.4	45.4	63.5	51.0	46.4
21/08/2024 15:30	61.6	47.7	84.3	45.9	62.3	50.0	46.5
21/08/2024 15:45	59.0	48.8	76.5	46.4	62.8	51.5	47.3
21/08/2024 16:00	61.0	51.6	81.0	49.0	63.6	54.4	50.0
21/08/2024 16:15	60.8	51.2	77.6	47.7	64.6	54.2	49.1
21/08/2024 16:30	61.2	50.5	75.8	49.1	65.0	53.2	49.7
21/08/2024 16:45	61.5	49.5	78.9	46.5	65.0	52.1	48.3
21/08/2024 17:00	60.4	49.1	77.1	46.8	63.7	53.1	47.6
21/08/2024 17:15	58.8	50.1	78.3	47.8	60.6	52.2	48.9
21/08/2024 17:30	61.0	50.3	80.0	47.8	63.6	53.4	49.0
21/08/2024 17:45	61.0	50.7	80.0	48.6	64.3	53.6	49.5
21/08/2024 18:00	61.8	50.2	79.5	46.6	65.3	53.7	47.9
21/08/2024 18:15	58.5	48.4	80.0	46.2	59.8	50.5	47.4
21/08/2024 18:30	58.8	48.5	76.8	45.8	61.2	51.2	46.9

21/08/2024 18:45	60.6	49.5	77.6	46.8	64.2	51.9	47.6
21/08/2024 19:00	62.8	49.8	79.2	47.4	64.5	53.0	48.3
21/08/2024 19:15	60.4	49.2	80.4	46.7	63.7	52.1	48.2
21/08/2024 19:30	61.2	50.2	82.4	47.2	63.8	53.3	48.4
21/08/2024 19:45	62.6	49.3	77.1	46.7	67.3	55.0	47.5
21/08/2024 20:00	60.6	48.2	78.9	46.1	62.9	51.5	47.2
21/08/2024 20:15	57.9	47.6	77.0	45.3	59.2	50.1	46.4
21/08/2024 20:30	57.6	49.1	74.5	46.2	59.8	52.2	47.4
21/08/2024 20:45	55.4	45.5	74.3	43.1	55.8	48.0	43.6
21/08/2024 21:00	59.5	44.7	79.0	42.2	61.5	47.2	43.2
21/08/2024 21:15	58.0	44.5	77.3	42.5	59.3	46.9	43.4
21/08/2024 21:30	53.0	42.7	74.8	40.2	51.5	45.4	41.4
21/08/2024 21:45	57.8	44.4	75.7	40.8	58.7	47.2	42.0
21/08/2024 22:00	53.5	45.1	73.0	42.8	53.2	47.2	43.9
21/08/2024 22:15	53.3	45.8	72.3	43.0	55.2	48.7	44.4
21/08/2024 22:30	55.6	46.3	77.1	43.1	56.3	49.3	44.6
21/08/2024 22:45	54.6	46.2	76.0	42.6	56.5	48.8	43.8
21/08/2024 23:00	57.3	44.7	75.5	42.0	57.6	48.0	43.0
21/08/2024 23:15	52.1	42.6	71.8	40.3	51.6	45.4	41.4
21/08/2024 23:30	53.1	43.3	79.3	41.0	53.1	46.7	41.7
21/08/2024 23:45	53.1	44.2	68.4	41.1	55.9	48.3	42.3
22/08/2024 00:00	51.3	39.4	76.7	37.7	46.0	41.8	38.3
22/08/2024 00:15	50.6	37.9	71.7	35.4	49.0	41.1	36.1
22/08/2024 00:30	43.1	37.1	63.8	34.9	43.8	39.1	35.9
22/08/2024 00:45	46.4	36.8	71.3	35.0	42.9	38.2	35.7
22/08/2024 01:00	51.9	37.4	80.0	35.9	45.3	40.0	36.5
22/08/2024 01:15	45.0	38.8	67.6	37.3	44.2	40.6	37.9
22/08/2024 01:30	43.5	38.8	61.8	36.9	45.1	41.2	37.8
22/08/2024 01:45	49.1	38.6	75.4	36.2	47.6	41.0	37.1
22/08/2024 02:00	46.8	40.7	65.1	38.3	49.6	43.8	39.1
22/08/2024 02:15	45.2	40.9	58.1	39.2	47.6	42.5	39.7
22/08/2024 02:30	43.0	39.8	56.7	37.6	44.6	41.7	38.5
22/08/2024 02:45	47.8	39.0	70.4	37.8	46.4	41.3	38.4
22/08/2024 03:00	45.3	38.6	63.8	36.8	46.3	41.3	37.6
22/08/2024 03:15	45.7	38.4	69.6	36.5	45.3	40.3	37.4
22/08/2024 03:30	47.6	38.0	73.3	36.7	47.1	40.1	37.2
22/08/2024 03:45	50.2	37.7	76.7	36.1	44.9	40.1	36.9
22/08/2024 04:00	52.6	38.0	76.8	36.6	48.0	40.8	37.2
22/08/2024 04:15	55.1	38.2	81.8	35.7	45.1	40.5	36.8
22/08/2024 04:30	46.4	39.1	66.2	37.2	46.5	42.0	38.3

22/08/2024 04:45	49.0	40.3	75.2	38.2	47.6	42.9	39.2
22/08/2024 05:00	52.5	41.3	76.3	38.8	47.9	43.5	39.8
22/08/2024 05:15	51.3	42.7	75.0	41.2	48.4	45.1	42.0
22/08/2024 05:30	53.4	43.8	74.1	41.7	53.2	46.4	42.5
22/08/2024 05:45	57.9	43.5	80.5	41.3	58.8	47.4	42.4
22/08/2024 06:00	52.9	43.7	68.5	41.5	52.7	48.2	42.6
22/08/2024 06:15	58.6	44.2	75.5	41.6	60.4	51.0	42.5
22/08/2024 06:30	58.6	55.5	79.1	54.2	58.2	56.2	54.7
22/08/2024 06:45	59.5	55.1	76.9	50.7	60.8	56.2	53.3
22/08/2024 07:00	60.9	44.3	78.9	42.4	66.3	48.5	42.9
22/08/2024 07:15	60.2	45.1	81.0	43.3	62.7	47.3	44.3
22/08/2024 07:30	61.8	46.7	78.6	44.7	63.4	61.1	45.7
22/08/2024 07:45	61.8	46.1	81.3	44.4	64.2	53.1	45.0
22/08/2024 08:00	61.8	45.0	81.8	43.1	65.1	48.5	44.2
22/08/2024 08:15	61.4	45.8	77.0	42.7	65.6	49.9	43.7
22/08/2024 08:30	62.7	46.8	81.6	44.3	67.2	51.2	45.7
22/08/2024 08:45	63.0	47.5	79.6	44.8	66.9	51.3	45.7
22/08/2024 09:00	61.2	51.3	79.1	48.3	64.2	53.8	49.8
22/08/2024 09:15	60.7	50.8	78.4	48.7	63.1	53.4	49.7
22/08/2024 09:30	59.5	51.1	78.1	48.9	62.7	53.1	49.9
22/08/2024 09:45	63.1	50.1	85.3	47.1	67.3	56.5	48.6
22/08/2024 10:00	63.6	47.9	82.2	44.9	68.0	53.8	46.4
22/08/2024 10:15	60.4	45.5	75.9	43.7	64.8	49.7	44.6
22/08/2024 10:30	60.3	46.9	77.8	44.3	63.8	52.2	45.2
22/08/2024 10:45	60.8	47.2	75.6	44.5	64.7	51.5	45.3
22/08/2024 11:00	61.4	48.3	80.1	45.3	64.5	52.4	46.6
22/08/2024 11:15	59.3	50.0	73.7	47.9	62.8	52.3	49.2
22/08/2024 11:30	60.7	47.9	76.9	44.9	64.5	52.6	46.7
22/08/2024 11:45	59.5	46.9	75.9	44.7	62.4	49.4	45.7
22/08/2024 12:00	61.2	48.5	78.5	46.2	64.8	52.1	46.9
22/08/2024 12:15	63.6	49.7	79.1	47.0	67.7	54.1	48.1
22/08/2024 12:30	63.1	48.5	78.1	45.3	67.1	54.0	46.5
22/08/2024 12:45	62.3	48.0	78.4	45.6	66.7	51.6	46.7
22/08/2024 13:00	63.0	48.5	79.9	45.4	67.2	52.9	47.1
22/08/2024 13:15	62.4	47.3	80.8	45.4	66.4	53.7	46.3
22/08/2024 13:30	60.7	46.8	76.3	44.2	65.0	50.3	45.2
22/08/2024 13:45	61.4	47.8	76.4	45.4	65.4	52.1	46.6
22/08/2024 14:00	61.3	49.0	80.5	46.7	64.5	52.0	47.6
22/08/2024 14:15	60.5	48.9	75.7	46.6	64.3	52.1	47.4
22/08/2024 14:30	62.0	47.0	77.7	44.6	66.4	51.6	45.4

22/08/2024 14:45	59.7	47.5	79.7	44.3	63.0	51.4	46.1
22/08/2024 15:00	61.1	49.2	76.1	47.0	65.2	52.7	48.0
22/08/2024 15:15	60.3	47.9	78.0	44.3	63.1	50.6	45.6
22/08/2024 15:30	60.6	48.5	75.5	46.0	64.2	52.2	47.0
22/08/2024 15:45	61.2	50.3	77.4	47.3	65.6	54.2	48.5
22/08/2024 16:00	62.7	50.0	80.7	48.4	66.3	53.6	49.0
22/08/2024 16:15	60.3	48.6	77.2	46.3	63.9	51.6	47.3
22/08/2024 16:30	62.5	50.0	78.3	47.5	66.5	54.3	48.4
22/08/2024 16:45	58.4	48.2	75.6	46.7	60.7	51.1	47.4
22/08/2024 17:00	61.4	47.1	75.6	45.0	65.9	51.1	45.6
22/08/2024 17:15	59.3	47.8	75.4	45.6	62.4	50.1	46.6
22/08/2024 17:30	61.4	48.2	77.4	45.0	64.5	51.4	46.3
22/08/2024 17:45	60.7	48.5	75.6	45.6	64.6	51.8	46.7
22/08/2024 18:00	60.4	47.6	80.0	45.8	62.6	49.7	46.6
22/08/2024 18:15	59.1	48.0	77.1	45.7	60.5	50.8	46.5
22/08/2024 18:30	57.3	46.1	75.2	43.9	59.7	48.9	44.9
22/08/2024 18:45	59.3	46.1	77.7	43.9	61.3	48.8	45.1
22/08/2024 19:00	60.0	47.0	76.4	44.6	64.4	50.5	45.5
22/08/2024 19:15	60.3	41.7	79.2	39.6	62.3	45.7	40.6
22/08/2024 19:30	59.5	44.6	76.0	41.4	62.1	47.7	42.5
22/08/2024 19:45	61.9	45.2	89.1	42.0	59.9	47.5	43.8
22/08/2024 20:00	56.6	45.3	77.3	42.1	57.2	48.1	43.5
22/08/2024 20:15	57.8	43.7	75.1	39.5	61.5	47.5	40.5
22/08/2024 20:30	59.6	47.4	78.2	44.1	62.3	51.1	45.0
22/08/2024 20:45	55.5	42.5	75.5	39.4	53.4	47.6	40.7
22/08/2024 21:00	59.0	42.1	79.2	39.4	61.6	45.3	40.5
22/08/2024 21:15	54.5	43.0	77.9	40.9	51.1	44.8	41.5
22/08/2024 21:30	53.9	43.6	78.6	41.4	53.5	46.2	42.1
22/08/2024 21:45	58.6	43.5	82.1	42.0	56.4	46.3	42.8
22/08/2024 22:00	58.4	44.6	79.9	43.0	56.5	47.2	43.5
22/08/2024 22:15	56.4	45.4	78.4	43.3	53.0	48.9	44.0
22/08/2024 22:30	54.2	44.6	78.2	42.0	49.2	46.7	43.2
22/08/2024 22:45	56.3	45.0	80.0	42.5	53.2	46.9	43.5
22/08/2024 23:00	57.7	46.7	80.0	44.5	55.2	49.5	45.7
22/08/2024 23:15	55.3	43.1	71.6	39.4	57.4	46.6	40.3
22/08/2024 23:30	52.7	48.9	74.3	47.1	53.3	50.9	47.7
22/08/2024 23:45	56.7	45.3	82.7	42.5	53.2	50.4	43.7
23/08/2024 00:00	47.9	39.2	72.6	37.1	44.6	41.5	38.1
23/08/2024 00:15	50.8	38.2	72.5	36.3	51.0	40.6	37.2
23/08/2024 00:30	47.6	39.2	71.4	36.9	45.4	41.6	37.8

23/08/2024 00:45	43.6	40.1	66.1	38.3	45.8	42.1	39.1
23/08/2024 01:00	47.1	38.3	71.7	35.9	44.6	40.8	36.9
23/08/2024 01:15	43.5	38.2	73.1	36.3	45.4	41.0	37.2
23/08/2024 01:30	42.7	38.1	67.5	36.4	45.1	40.6	37.3
23/08/2024 01:45	46.1	40.9	73.5	39.2	47.9	43.5	40.0
23/08/2024 02:00	44.6	40.4	71.6	38.7	45.5	42.2	39.2
23/08/2024 02:15	50.3	39.9	76.0	38.3	45.9	41.8	39.1
23/08/2024 02:30	54.6	40.2	80.5	38.2	48.2	44.0	38.9
23/08/2024 02:45	51.2	40.6	78.1	38.9	45.3	42.2	39.9
23/08/2024 03:00	53.8	39.1	79.6	37.1	45.5	41.2	38.2
23/08/2024 03:15	44.5	39.6	67.2	37.8	47.6	42.3	38.5
23/08/2024 03:30	42.5	39.4	67.1	37.9	44.4	41.0	38.4
23/08/2024 03:45	52.1	39.2	77.3	37.4	45.6	41.2	38.0
23/08/2024 04:00	52.6	38.9	74.5	36.7	46.8	41.2	37.4
23/08/2024 04:15	52.3	39.7	77.1	37.6	48.7	42.5	39.0
23/08/2024 04:30	56.1	42.2	79.9	38.5	56.6	46.2	40.2
23/08/2024 04:45	65.4	53.7	85.8	49.6	67.8	59.1	50.8
23/08/2024 05:00	61.8	53.6	78.1	50.1	64.9	58.0	51.1
23/08/2024 05:15	62.3	51.8	80.9	48.3	64.6	56.6	49.9
23/08/2024 05:30	64.8	52.1	83.2	49.2	67.5	57.1	50.1
23/08/2024 05:45	64.6	59.5	91.4	57.7	66.5	61.5	58.2
23/08/2024 06:00	63.0	59.2	85.0	57.6	64.1	60.8	58.4
23/08/2024 06:15	64.4	55.1	88.9	52.2	65.1	60.1	53.4
23/08/2024 06:30	60.5	52.9	79.2	51.2	63.2	55.4	52.1
23/08/2024 06:45	60.5	53.0	83.6	50.7	60.5	55.0	51.7
23/08/2024 07:00	61.9	53.0	84.0	50.7	64.7	55.7	51.7
23/08/2024 07:15	60.8	52.4	77.2	50.8	64.4	55.0	51.6
23/08/2024 07:30	61.2	51.2	79.2	47.5	63.0	59.2	48.7
23/08/2024 07:45	62.9	59.2	78.3	57.8	64.6	60.2	58.6
23/08/2024 08:00	61.5	51.3	80.7	48.4	64.5	54.2	49.7
23/08/2024 08:15	62.5	51.0	85.3	48.4	64.5	53.9	49.5
23/08/2024 08:30	61.8	50.1	78.1	47.7	65.4	53.4	48.6
23/08/2024 08:45	65.0	52.1	86.8	49.4	68.9	58.3	51.0
23/08/2024 09:00	62.9	53.1	79.8	50.3	66.2	58.4	51.4
23/08/2024 09:15	61.4	53.2	76.5	50.1	62.7	58.6	51.1
23/08/2024 09:30	61.3	53.5	75.2	50.5	63.5	58.6	51.5
23/08/2024 09:45	63.9	52.9	89.6	48.7	66.7	58.8	49.8
23/08/2024 10:00	60.7	49.2	75.5	46.8	65.0	53.2	47.8
23/08/2024 10:15	61.0	50.1	77.7	47.3	64.5	52.8	48.9
23/08/2024 10:30	61.7	49.3	81.1	47.7	64.8	52.9	48.3

23/08/2024 10:45	59.6	50.5	74.0	48.6	63.0	53.7	49.5
23/08/2024 11:00	61.0	50.3	77.3	47.7	65.7	55.4	49.0
23/08/2024 11:15	59.3	51.4	74.8	49.3	62.3	53.4	50.4
23/08/2024 11:30	61.1	48.8	74.9	46.8	64.9	54.6	47.5
23/08/2024 11:45	61.6	49.1	81.6	47.4	65.4	53.6	48.0
23/08/2024 12:00	61.4	49.4	76.7	46.8	65.4	54.2	47.9
23/08/2024 12:15	61.2	50.3	79.1	47.2	65.1	54.4	48.4
23/08/2024 12:30	61.1	50.7	78.7	46.6	64.7	54.8	48.1
23/08/2024 12:45	60.2	49.8	75.8	47.4	64.3	53.2	48.7
23/08/2024 13:00	61.2	49.8	79.8	47.2	65.3	54.8	47.9
23/08/2024 13:15	61.2	49.4	78.9	47.3	64.9	53.2	47.8
23/08/2024 13:30	62.5	50.5	79.1	47.1	66.5	55.7	48.0
23/08/2024 13:45	61.4	50.2	76.7	48.0	65.2	54.3	49.1
23/08/2024 14:00	60.7	49.4	76.5	46.8	64.8	54.1	47.9
23/08/2024 14:15	62.4	50.5	80.0	47.6	66.2	56.0	48.9
23/08/2024 14:30	60.0	49.7	78.8	46.6	63.5	53.3	47.8
23/08/2024 14:45	59.6	49.1	78.1	46.8	62.0	52.2	47.8
23/08/2024 15:00	59.0	48.7	79.6	46.2	61.4	52.2	46.8
23/08/2024 15:15	60.3	48.2	76.0	45.6	64.2	52.4	46.7
23/08/2024 15:30	59.8	46.6	77.2	43.2	63.0	49.3	44.2
23/08/2024 15:45	59.8	47.8	76.1	45.8	63.7	51.1	46.6
23/08/2024 16:00	61.0	47.8	77.8	44.7	64.8	53.1	46.2
23/08/2024 16:15	61.6	49.0	83.3	46.7	65.3	53.5	47.6
23/08/2024 16:30	68.0	49.0	97.0	46.6	67.0	53.5	47.5
23/08/2024 16:45	61.4	50.5	80.7	46.6	63.4	56.2	48.1
23/08/2024 17:00	61.1	51.6	77.5	48.6	63.6	55.3	49.9
23/08/2024 17:15	63.3	51.6	78.0	48.8	68.0	56.7	50.2
23/08/2024 17:30	59.6	50.8	75.5	48.1	61.9	53.8	49.4
23/08/2024 17:45	61.9	50.0	77.7	47.5	65.5	53.6	48.4
23/08/2024 18:00	61.1	49.1	78.7	47.0	63.9	55.4	47.9
23/08/2024 18:15	58.9	49.5	75.1	46.8	61.1	52.4	47.6
23/08/2024 18:30	55.5	47.7	72.9	45.7	56.6	49.6	46.6
23/08/2024 18:45	58.0	48.7	77.5	46.4	59.9	51.1	47.4
23/08/2024 19:00	59.2	48.3	76.0	45.5	62.7	51.3	46.5
23/08/2024 19:15	57.6	46.8	76.9	43.7	58.5	49.0	45.1
23/08/2024 19:30	59.5	46.6	81.4	44.8	60.9	49.1	45.5
23/08/2024 19:45	60.7	46.2	75.7	43.1	67.5	49.1	44.6
23/08/2024 20:00	58.8	44.5	80.6	42.0	61.4	46.8	43.3
23/08/2024 20:15	54.7	43.9	75.4	41.0	52.8	46.3	42.5
23/08/2024 20:30	56.4	41.9	75.9	40.2	55.3	44.3	40.8

23/08/2024 20:45	54.6	42.8	75.5	40.3	53.3	44.5	41.4
23/08/2024 21:00	58.3	43.5	79.5	40.9	58.2	46.2	42.0
23/08/2024 21:15	56.1	42.5	79.7	40.3	53.1	44.5	41.0
23/08/2024 21:30	51.1	42.3	74.4	40.4	46.3	43.7	41.3
23/08/2024 21:45	52.2	42.5	74.2	40.9	52.5	45.1	41.6
23/08/2024 22:00	56.8	40.9	77.2	39.0	55.5	43.6	39.8
23/08/2024 22:15	54.2	39.9	80.2	37.9	44.5	41.6	39.0
23/08/2024 22:30	60.1	39.6	86.7	37.3	55.7	42.0	38.1
23/08/2024 22:45	53.5	38.9	77.3	37.4	51.1	41.6	38.1
23/08/2024 23:00	52.4	38.6	70.5	37.0	49.5	40.2	37.9
23/08/2024 23:15	50.4	38.0	77.2	36.6	44.5	39.6	37.2
23/08/2024 23:30	46.9	38.0	71.4	35.8	44.3	39.8	37.0
23/08/2024 23:45	39.6	37.6	50.0	36.1	41.6	38.7	36.8
24/08/2024 00:00	48.3	37.0	73.9	35.1	42.4	38.2	35.9
24/08/2024 00:15	52.5	36.4	80.0	35.2	47.1	37.7	35.9
24/08/2024 00:30	50.3	37.0	74.8	35.3	42.9	38.5	35.8
24/08/2024 00:45	50.1	35.4	74.6	33.7	41.5	36.6	34.6
24/08/2024 01:00	50.6	34.8	74.4	33.2	41.8	36.9	34.0
24/08/2024 01:15	38.1	36.8	44.4	35.2	39.2	37.9	35.7
24/08/2024 01:30	38.2	34.4	54.0	33.3	39.0	36.0	33.8
24/08/2024 01:45	51.8	33.8	76.3	32.2	40.9	35.6	32.9
24/08/2024 02:00	36.3	34.5	47.8	33.4	37.9	35.6	34.0
24/08/2024 02:15	37.6	35.5	52.3	33.4	39.1	36.8	34.6
24/08/2024 02:30	62.2	36.9	81.2	35.2	48.8	38.3	36.0
24/08/2024 02:45	47.2	34.3	81.0	33.5	39.7	36.1	33.8
24/08/2024 03:00	37.9	34.2	57.1	33.0	39.7	35.5	33.8
24/08/2024 03:15	51.1	35.3	77.9	33.8	40.6	36.6	34.4
24/08/2024 03:30	49.4	34.5	73.9	33.1	39.8	36.1	33.7
24/08/2024 03:45	47.3	35.1	75.1	34.3	39.1	36.3	34.7
24/08/2024 04:00	49.8	34.5	73.2	32.8	42.1	36.1	33.7
24/08/2024 04:15	52.7	34.7	80.1	32.1	40.3	36.1	32.8
24/08/2024 04:30	46.5	33.1	73.4	32.0	39.3	34.7	32.3
24/08/2024 04:45	48.7	34.1	75.2	32.5	41.7	36.6	33.2
24/08/2024 05:00	49.8	36.9	72.7	35.2	46.8	39.1	35.8
24/08/2024 05:15	50.6	37.6	77.7	36.1	47.6	41.0	36.8
24/08/2024 05:30	51.8	40.7	73.8	37.7	54.6	45.4	38.6
24/08/2024 05:45	55.0	42.4	72.5	36.7	57.0	47.0	38.5
24/08/2024 06:00	58.8	45.2	78.8	42.7	64.7	53.2	43.4
24/08/2024 06:15	56.1	41.7	75.4	38.8	56.3	47.9	39.9
24/08/2024 06:30	52.7	39.5	71.9	36.7	51.7	42.3	37.7

24/08/2024 06:45	55.7	40.7	70.8	37.4	58.3	56.7	38.7
24/08/2024 07:00	58.9	41.5	73.7	38.2	63.1	46.1	39.8
24/08/2024 07:15	58.2	41.5	81.2	38.6	60.1	46.0	39.8
24/08/2024 07:30	55.5	40.1	76.7	38.2	54.2	43.1	38.9
24/08/2024 07:45	58.4	42.4	76.0	39.5	60.9	46.0	40.9
24/08/2024 08:00	60.6	41.5	80.1	38.8	64.0	48.9	39.5
24/08/2024 08:15	58.9	44.1	80.9	42.0	59.6	50.7	42.6
24/08/2024 08:30	58.7	50.6	80.5	43.6	59.8	52.1	45.2
24/08/2024 08:45	59.9	44.4	77.0	42.4	62.6	47.8	43.3
24/08/2024 09:00	61.0	46.0	78.2	43.3	63.7	51.2	44.2
24/08/2024 09:15	60.0	46.5	77.8	43.5	63.9	49.9	44.8
24/08/2024 09:30	59.3	46.3	78.3	43.3	61.6	51.2	44.2
24/08/2024 09:45	60.5	47.0	79.0	44.1	64.4	52.3	45.3
24/08/2024 10:00	60.0	46.1	78.1	44.3	63.7	50.7	45.1
24/08/2024 10:15	61.0	45.6	76.6	43.6	65.2	51.9	44.6
24/08/2024 10:30	58.9	45.1	75.1	41.5	63.2	49.8	42.7
24/08/2024 10:45	60.8	45.3	77.6	42.3	65.4	51.5	43.2
24/08/2024 11:00	61.3	47.5	75.1	45.0	65.7	54.1	46.0
24/08/2024 11:15	65.2	50.9	83.3	48.1	68.3	57.5	48.8
24/08/2024 11:30	63.7	49.2	80.3	46.7	66.9	55.2	47.8
24/08/2024 11:45	62.1	49.9	80.2	46.2	66.1	55.0	47.9
24/08/2024 12:00	58.3	49.1	80.2	46.1	60.3	52.8	47.0
24/08/2024 12:15	54.5	51.4	73.5	48.5	55.2	52.9	49.9
24/08/2024 12:30	57.3	51.4	69.4	48.7	60.4	54.6	50.0
24/08/2024 12:45	58.1	51.3	74.3	46.8	60.9	55.3	48.9
24/08/2024 13:00	60.1	52.7	79.2	47.8	62.3	57.5	50.3
24/08/2024 13:15	55.7	52.1	73.2	46.7	57.0	54.2	50.3
24/08/2024 13:30	58.8	53.1	79.2	50.2	60.9	56.7	51.4
24/08/2024 13:45	58.6	54.0	72.2	50.8	61.3	57.4	51.8
24/08/2024 14:00	59.3	54.8	73.5	51.7	62.0	57.3	53.3
24/08/2024 14:15	61.1	55.2	80.3	52.6	64.0	57.6	53.9
24/08/2024 14:30	62.2	58.0	78.4	53.0	64.5	60.7	55.0
24/08/2024 14:45	69.5	61.4	92.3	56.4	71.5	66.1	58.7
24/08/2024 15:00	62.9	54.5	82.7	50.7	65.7	58.7	52.3
24/08/2024 15:15	68.1	55.8	87.6	51.3	71.4	62.0	52.5
24/08/2024 15:30	67.1	52.7	87.4	48.8	68.6	59.1	50.4
24/08/2024 15:45	62.7	55.6	77.6	52.2	66.2	58.9	53.6
24/08/2024 16:00	66.6	55.0	85.5	51.5	70.2	61.1	52.7
24/08/2024 16:15	64.2	54.1	80.4	49.3	68.0	59.4	51.3
24/08/2024 16:30	63.6	52.9	80.8	49.0	67.2	57.2	50.4

24/08/2024 16:45	64.6	53.5	78.6	50.5	68.0	60.7	51.3
24/08/2024 17:00	60.2	54.6	79.9	52.0	63.2	57.7	53.3
24/08/2024 17:15	54.7	50.2	72.5	47.8	56.7	52.7	49.0
24/08/2024 17:30	54.5	49.7	68.7	47.5	57.0	52.9	48.4
24/08/2024 17:45	58.7	49.8	78.4	47.7	60.8	53.2	48.6
24/08/2024 18:00	60.5	51.0	75.0	48.5	64.4	54.1	49.7
24/08/2024 18:15	59.3	46.8	77.8	44.2	61.8	50.5	45.1
24/08/2024 18:30	57.6	47.9	74.8	45.1	59.4	53.2	46.1
24/08/2024 18:45	55.5	47.5	74.9	45.6	57.1	50.1	46.6
24/08/2024 19:00	60.1	47.3	80.9	44.3	62.6	51.2	45.9
24/08/2024 19:15	58.2	47.9	76.0	45.2	60.8	52.2	46.3
24/08/2024 19:30	59.8	47.3	87.7	44.1	54.1	49.0	45.5
24/08/2024 19:45	56.9	46.6	77.0	42.9	58.1	49.0	44.6
24/08/2024 20:00	58.4	45.9	76.8	43.1	59.7	48.6	44.6
24/08/2024 20:15	58.3	45.7	80.4	43.0	59.8	48.7	44.2
24/08/2024 20:30	57.1	46.7	75.2	44.0	58.1	49.5	45.5
24/08/2024 20:45	56.8	45.7	77.7	43.6	56.6	48.1	44.7
24/08/2024 21:00	57.3	46.1	81.1	44.5	56.0	49.8	45.0
24/08/2024 21:15	73.4	45.6	104.3	43.2	52.9	47.4	44.4
24/08/2024 21:30	54.0	45.4	75.9	43.1	51.3	47.0	44.1
24/08/2024 21:45	56.2	45.1	75.0	42.5	57.1	47.4	43.8
24/08/2024 22:00	56.2	43.4	78.3	41.1	55.3	45.2	41.9
24/08/2024 22:15	54.5	43.8	75.7	41.0	52.9	46.3	42.1
24/08/2024 22:30	53.2	42.8	71.1	40.6	55.8	44.9	41.6
24/08/2024 22:45	52.6	41.9	72.0	39.3	56.8	43.5	40.3
24/08/2024 23:00	57.4	40.2	76.3	37.9	56.6	42.9	38.6
24/08/2024 23:15	53.0	40.3	75.9	37.2	48.2	42.9	38.0
24/08/2024 23:30	52.6	39.2	73.2	35.5	48.2	42.2	37.4
24/08/2024 23:45	51.2	38.2	72.5	36.3	48.3	41.4	37.1
25/08/2024 00:00	50.3	39.2	70.6	37.2	48.9	41.2	37.9
25/08/2024 00:15	52.3	38.1	72.6	36.0	52.6	42.8	36.6
25/08/2024 00:30	40.7	37.3	49.9	35.6	43.1	40.0	36.3
25/08/2024 00:45	46.4	38.5	72.1	35.5	43.2	40.3	36.3
25/08/2024 01:00	40.6	37.4	51.9	36.0	42.9	39.5	36.6
25/08/2024 01:15	47.1	38.3	71.2	36.3	45.6	40.7	37.2
25/08/2024 01:30	48.9	38.1	71.6	34.5	44.0	40.3	35.5
25/08/2024 01:45	47.9	36.5	75.6	34.6	43.0	38.9	35.3
25/08/2024 02:00	48.9	37.2	73.2	35.6	42.7	39.4	36.4
25/08/2024 02:15	48.1	37.2	74.7	34.0	43.2	39.6	34.8
25/08/2024 02:30	53.2	37.1	75.8	35.1	43.6	39.5	35.9

25/08/2024 02:45	52.2	37.9	75.4	35.1	44.6	40.2	36.7
25/08/2024 03:00	52.7	37.4	77.0	35.0	45.3	39.9	36.1
25/08/2024 03:15	45.8	37.1	70.3	33.9	44.3	39.6	34.9
25/08/2024 03:30	45.4	37.8	70.4	35.6	44.6	40.5	36.4
25/08/2024 03:45	50.0	37.8	73.7	35.8	45.6	40.4	36.6
25/08/2024 04:00	49.8	37.2	77.8	35.6	44.7	40.1	36.4
25/08/2024 04:15	42.7	38.1	58.3	35.5	44.8	40.9	36.3
25/08/2024 04:30	44.3	37.7	67.2	35.0	44.8	40.3	35.8
25/08/2024 04:45	43.5	39.1	59.6	36.7	45.5	42.1	37.3
25/08/2024 05:00	46.9	39.7	63.8	37.9	47.4	42.2	38.7
25/08/2024 05:15	52.6	41.8	74.0	38.1	48.9	44.3	39.7
25/08/2024 05:30	51.3	41.6	74.2	38.4	52.3	45.2	39.8
25/08/2024 05:45	50.8	41.5	74.6	38.7	49.6	45.0	40.1
25/08/2024 06:00	54.4	42.8	75.0	38.8	53.4	47.2	40.6
25/08/2024 06:15	52.4	43.8	73.2	41.2	55.0	47.0	42.2
25/08/2024 06:30	53.8	42.6	78.0	39.9	50.1	46.0	41.1
25/08/2024 06:45	50.2	42.0	75.9	39.2	49.2	44.5	39.8
25/08/2024 07:00	50.0	40.0	73.3	38.1	49.0	43.5	38.9
25/08/2024 07:15	55.3	42.5	85.5	40.1	52.1	44.6	41.1
25/08/2024 07:30	46.6	42.1	65.1	40.2	48.3	44.1	41.1
25/08/2024 07:45	51.7	43.7	74.3	40.5	51.5	46.1	42.1
25/08/2024 08:00	52.9	43.8	76.7	41.9	52.1	46.2	42.7
25/08/2024 08:15	51.7	42.9	76.0	39.8	49.7	45.4	40.8
25/08/2024 08:30	54.9	44.4	79.3	42.3	54.0	47.3	42.9
25/08/2024 08:45	57.5	46.4	78.2	43.7	55.9	48.8	44.7
25/08/2024 09:00	55.3	46.6	74.1	44.3	56.0	49.2	45.4
25/08/2024 09:15	59.4	46.0	82.9	42.8	59.7	53.9	43.7
25/08/2024 09:30	59.1	50.0	79.8	46.7	60.7	55.2	48.1
25/08/2024 09:45	58.3	48.9	75.3	47.0	59.3	51.4	47.8
25/08/2024 10:00	57.7	48.0	74.8	46.1	58.7	50.6	47.2
25/08/2024 10:15	58.2	49.0	75.0	46.8	59.0	51.5	47.6
25/08/2024 10:30	58.4	48.7	78.0	46.4	58.7	51.2	47.5
25/08/2024 10:45	59.6	49.7	79.8	47.2	60.2	52.3	48.4
25/08/2024 11:00	59.6	50.0	74.8	46.4	63.3	53.4	47.7
25/08/2024 11:15	59.6	50.9	77.5	48.5	62.1	54.6	49.5
25/08/2024 11:30	61.8	57.9	78.5	56.9	63.7	58.8	57.3
25/08/2024 11:45	62.3	58.6	78.6	56.8	64.7	59.6	57.7
25/08/2024 12:00	61.4	49.8	80.3	47.6	64.2	58.0	48.5
25/08/2024 12:15	59.0	49.1	77.9	47.2	60.9	51.9	47.9
25/08/2024 12:30	57.7	49.3	73.5	47.1	59.9	51.9	48.0

25/08/2024 12:45	59.0	48.4	77.4	46.0	60.7	50.8	46.8
25/08/2024 13:00	60.3	50.0	79.5	46.7	63.1	53.3	48.7
25/08/2024 13:15	57.6	49.3	78.0	46.8	58.5	52.0	47.7
25/08/2024 13:30	57.0	47.6	74.3	45.3	57.3	50.5	46.2
25/08/2024 13:45	56.8	48.6	75.9	46.6	56.7	51.0	47.5
25/08/2024 14:00	57.9	48.6	81.4	46.2	56.3	50.4	47.2
25/08/2024 14:15	60.5	49.3	83.5	46.6	60.0	51.5	47.9
25/08/2024 14:30	58.2	49.6	76.2	48.1	60.3	51.6	48.8
25/08/2024 14:45	55.8	49.0	76.0	45.7	59.5	50.8	46.9
25/08/2024 15:00	59.1	47.2	77.0	45.0	62.1	50.1	45.7
25/08/2024 15:15	59.2	48.3	77.7	46.2	59.9	50.8	47.1
25/08/2024 15:30	62.6	48.4	88.7	46.2	59.7	51.3	47.1
25/08/2024 15:45	58.9	50.6	73.0	47.6	62.6	55.1	48.4
25/08/2024 16:00	59.3	49.6	76.4	46.0	61.9	53.8	47.8
25/08/2024 16:15	60.7	49.8	75.8	47.4	63.0	53.8	48.1
25/08/2024 16:30	57.4	48.3	75.7	45.6	59.0	51.0	46.5
25/08/2024 16:45	56.9	47.9	76.6	45.2	57.9	51.0	46.1
25/08/2024 17:00	59.5	48.7	76.5	46.2	61.5	52.0	47.4
25/08/2024 17:15	59.9	48.7	82.0	46.0	60.2	51.2	47.2
25/08/2024 17:30	57.2	47.0	76.0	44.6	58.0	49.2	45.5
25/08/2024 17:45	57.7	47.8	78.5	44.9	58.1	50.1	46.5
25/08/2024 18:00	56.4	45.7	78.6	42.6	53.1	47.8	43.9
25/08/2024 18:15	54.7	44.9	75.7	42.7	52.8	46.9	43.6
25/08/2024 18:30	56.9	45.0	76.4	42.4	56.0	47.7	43.7
25/08/2024 18:45	57.1	46.8	79.9	43.9	56.8	48.6	45.0
25/08/2024 19:00	59.2	46.6	76.7	43.6	61.6	50.2	45.3
25/08/2024 19:15	57.0	46.4	76.8	43.9	58.4	49.0	45.1
25/08/2024 19:30	59.7	46.5	79.9	43.2	62.9	49.8	44.7
25/08/2024 19:45	57.2	47.2	77.0	43.7	59.4	51.1	45.5
25/08/2024 20:00	57.0	45.3	77.8	41.8	58.5	50.6	43.1
25/08/2024 20:15	58.3	43.8	83.5	40.5	58.6	46.4	41.7
25/08/2024 20:30	58.7	41.0	83.1	39.0	57.4	43.6	40.2
25/08/2024 20:45	56.7	41.4	80.9	39.4	51.3	44.3	40.2
25/08/2024 21:00	59.7	42.7	81.6	40.5	59.1	46.0	41.5
25/08/2024 21:15	52.9	42.5	72.3	40.4	49.5	44.8	41.6
25/08/2024 21:30	51.2	43.2	72.0	41.1	50.2	45.6	41.9
25/08/2024 21:45	50.8	43.7	71.0	41.7	51.5	46.3	42.5
25/08/2024 22:00	49.5	42.7	70.3	39.8	50.5	45.7	41.1
25/08/2024 22:15	50.7	42.0	70.4	39.0	49.8	44.5	40.2
25/08/2024 22:30	55.2	43.5	75.0	39.6	53.0	50.5	40.7

25/08/2024 22:45	52.8	42.4	76.3	39.8	53.1	45.3	40.6
25/08/2024 23:00	53.2	42.1	75.2	39.0	53.6	45.7	40.3
25/08/2024 23:15	52.9	40.4	69.4	38.4	51.9	44.6	39.1
25/08/2024 23:30	51.7	42.0	76.2	40.3	50.5	44.1	40.9
25/08/2024 23:45	61.4	42.1	90.9	40.3	50.7	45.2	40.6
26/08/2024 00:00	50.8	41.8	72.7	39.4	51.3	44.7	39.8
26/08/2024 00:15	50.4	41.3	73.1	39.4	47.7	43.7	40.3
26/08/2024 00:30	46.2	40.6	68.6	38.4	46.7	42.7	39.4
26/08/2024 00:45	51.7	38.6	76.3	36.3	44.5	40.6	37.4
26/08/2024 01:00	40.7	37.5	52.6	35.6	43.3	39.7	36.4
26/08/2024 01:15	40.6	38.0	52.9	35.9	42.8	39.6	36.7
26/08/2024 01:30	40.8	37.7	51.2	36.1	42.8	40.1	36.8
26/08/2024 01:45	52.5	36.9	78.2	34.5	44.3	39.5	35.1
26/08/2024 02:00	47.9	36.7	70.7	34.9	44.5	39.5	35.6
26/08/2024 02:15	41.9	37.6	54.8	35.5	44.6	39.8	36.2
26/08/2024 02:30	41.4	38.0	65.9	36.4	43.1	40.3	36.9
26/08/2024 02:45	49.9	36.5	75.1	34.5	42.9	38.5	35.3
26/08/2024 03:00	45.5	36.1	71.1	34.5	42.0	38.3	35.4
26/08/2024 03:15	39.4	36.0	50.8	33.7	41.8	38.1	34.6
26/08/2024 03:30	39.4	36.5	49.4	33.5	41.8	38.4	34.8
26/08/2024 03:45	40.4	37.3	53.5	35.4	42.7	39.4	36.4
26/08/2024 04:00	41.5	37.9	56.4	35.5	43.4	40.4	36.3
26/08/2024 04:15	48.3	35.9	74.9	34.0	41.6	37.9	34.7
26/08/2024 04:30	39.9	37.0	53.9	34.5	41.7	38.7	35.9
26/08/2024 04:45	47.5	37.0	74.8	34.2	43.0	39.4	35.0
26/08/2024 05:00	47.7	37.2	71.9	34.7	44.9	39.4	35.7
26/08/2024 05:15	54.5	40.0	76.8	36.9	55.4	44.8	38.1
26/08/2024 05:30	50.0	44.5	66.8	42.1	52.1	46.2	43.5
26/08/2024 05:45	52.7	43.8	74.8	41.7	53.0	46.1	42.5
26/08/2024 06:00	54.5	45.3	71.8	41.9	56.2	48.8	43.2
26/08/2024 06:15	57.3	49.5	75.2	47.9	56.2	51.4	48.7
26/08/2024 06:30	52.8	49.4	65.3	47.9	53.7	51.2	48.4
26/08/2024 06:45	55.7	48.7	73.7	42.9	57.3	52.3	44.4
26/08/2024 07:00	55.3	44.3	72.6	41.9	57.0	49.1	42.7
26/08/2024 07:15	55.7	42.8	76.1	38.7	56.8	46.5	40.2
26/08/2024 07:30	64.5	42.4	79.8	39.2	67.3	58.9	40.4
26/08/2024 07:45	63.2	41.7	79.9	38.8	67.4	46.2	39.7
26/08/2024 08:00	59.5	41.3	85.9	38.6	56.8	45.0	39.9
26/08/2024 08:15	56.8	42.7	78.0	38.3	57.0	45.1	40.0
26/08/2024 08:30	59.5	42.7	80.3	39.5	61.6	47.4	40.8

26/08/2024 08:45	58.3	42.6	79.4	40.1	59.4	46.9	41.1
26/08/2024 09:00	58.1	47.9	75.4	45.1	60.9	51.8	46.1
26/08/2024 09:15	57.7	47.4	78.7	44.9	57.2	50.1	46.1
26/08/2024 09:30	58.7	48.3	78.8	44.6	60.5	52.9	45.9
26/08/2024 09:45	58.9	48.5	79.4	45.5	61.0	52.2	46.9
26/08/2024 10:00	57.8	48.9	79.7	44.9	58.2	51.3	46.5
26/08/2024 10:15	56.8	47.8	74.7	45.9	58.1	50.1	46.7
26/08/2024 10:30	58.3	47.5	77.7	45.2	60.8	50.8	46.5
26/08/2024 10:45	59.0	47.7	78.3	45.2	61.2	50.0	46.3
26/08/2024 11:00	59.8	48.2	75.7	45.3	63.9	51.8	46.4
26/08/2024 11:15	58.4	47.0	76.6	44.1	60.2	50.2	45.4
26/08/2024 11:30	58.2	46.4	78.6	44.5	60.5	49.0	45.4
26/08/2024 11:45	58.3	45.4	79.6	43.0	58.9	47.9	43.9
26/08/2024 12:00	58.9	46.7	75.4	43.6	62.2	50.5	44.8
26/08/2024 12:15	58.9	46.0	76.6	43.5	62.4	48.7	44.4
26/08/2024 12:30	59.4	46.9	76.9	43.3	63.6	50.2	45.5
26/08/2024 12:45	59.9	46.1	76.4	43.8	63.8	50.0	44.8
26/08/2024 13:00	60.9	48.9	79.0	45.7	64.8	53.2	46.9
26/08/2024 13:15	60.5	47.4	80.1	45.0	62.5	49.9	46.0
26/08/2024 13:30	58.8	46.8	75.9	44.5	62.1	49.3	45.6
26/08/2024 13:45	59.4	46.7	79.8	43.7	62.0	49.5	45.2
26/08/2024 14:00	58.6	47.2	75.0	44.4	62.1	51.1	45.6
26/08/2024 14:15	62.5	47.5	82.5	44.6	64.1	50.7	45.7
26/08/2024 14:30	55.6	47.2	77.6	44.7	54.5	48.9	46.3
26/08/2024 14:45	56.9	47.0	75.1	43.7	57.9	49.4	45.7
26/08/2024 15:00	60.3	45.3	77.0	43.2	63.8	49.3	44.3
26/08/2024 15:15	57.9	47.5	74.7	45.1	60.0	50.7	46.0
26/08/2024 15:30	58.1	45.3	78.4	43.7	57.7	47.4	44.3
26/08/2024 15:45	57.8	46.9	75.3	44.3	61.3	50.3	45.3
26/08/2024 16:00	57.8	47.6	78.1	43.9	59.1	50.7	45.3
26/08/2024 16:15	57.9	47.5	75.4	45.2	58.9	49.9	46.3
26/08/2024 16:30	59.7	49.0	77.4	46.4	62.1	52.4	47.5
26/08/2024 16:45	58.1	46.9	76.9	44.9	58.0	49.5	45.7
26/08/2024 17:00	57.9	47.7	73.3	44.9	60.6	50.5	46.0
26/08/2024 17:15	56.4	45.5	74.7	42.3	55.2	48.4	43.6
26/08/2024 17:30	57.5	46.4	75.1	43.7	58.2	48.6	45.2
26/08/2024 17:45	56.3	45.9	75.3	42.4	57.6	48.1	43.9
26/08/2024 18:00	59.2	46.2	78.6	43.2	61.9	50.0	44.8
26/08/2024 18:15	55.2	45.1	75.3	42.8	52.2	47.6	43.5
26/08/2024 18:30	56.8	45.1	77.8	42.2	57.2	47.6	43.3

26/08/2024 18:45	56.9	45.4	76.0	41.5	58.6	47.8	43.4
26/08/2024 19:00	57.5	48.1	82.3	43.2	55.5	50.9	44.6
26/08/2024 19:15	65.0	44.8	92.7	42.1	63.2	51.3	42.8
26/08/2024 19:30	61.9	44.3	89.4	40.5	66.7	48.1	41.9
26/08/2024 19:45	55.9	43.3	76.3	39.8	56.3	46.9	41.5
26/08/2024 20:00	55.9	44.3	74.3	41.7	55.5	47.5	42.4
26/08/2024 20:15	54.1	42.6	73.9	40.0	54.1	45.3	40.6
26/08/2024 20:30	57.6	44.8	79.9	41.9	59.4	48.9	42.5
26/08/2024 20:45	56.2	42.7	74.1	40.6	54.9	46.7	41.4
26/08/2024 21:00	52.9	42.1	75.0	40.4	56.7	44.1	41.1
26/08/2024 21:15	57.0	40.2	74.3	38.8	59.3	42.7	39.5
26/08/2024 21:30	51.5	40.3	69.4	37.2	51.8	42.5	38.7
26/08/2024 21:45	55.6	40.9	74.3	39.4	53.9	44.1	40.2
26/08/2024 22:00	52.5	40.0	73.9	38.3	48.7	42.4	38.9
26/08/2024 22:15	55.7	40.1	76.8	38.3	53.2	42.8	39.0
26/08/2024 22:30	52.9	39.8	77.5	36.2	48.0	43.0	37.3
26/08/2024 22:45	50.3	38.8	72.7	35.6	46.5	41.7	37.0
26/08/2024 23:00	55.0	40.0	74.1	38.3	53.1	42.5	38.9
26/08/2024 23:15	49.5	39.2	75.7	37.1	45.8	41.9	38.0
26/08/2024 23:30	49.5	38.5	76.6	36.3	44.9	41.3	36.9
26/08/2024 23:45	51.7	39.6	68.8	37.0	53.0	44.0	38.1
27/08/2024 00:00	51.4	37.9	75.7	35.6	45.5	40.3	36.7
27/08/2024 00:15	52.8	39.2	77.0	37.0	49.5	41.6	38.1
27/08/2024 00:30	44.9	39.3	63.4	37.6	46.5	41.3	38.3
27/08/2024 00:45	44.6	37.0	67.5	35.2	43.8	39.6	35.8
27/08/2024 01:00	40.6	37.5	52.7	35.6	42.9	39.7	36.5
27/08/2024 01:15	44.0	37.5	67.3	35.9	42.1	39.0	36.5
27/08/2024 01:30	42.6	37.3	62.1	35.2	42.7	39.2	36.2
27/08/2024 01:45	41.3	38.4	52.6	36.7	43.6	39.8	37.6
27/08/2024 02:00	44.3	37.8	61.4	36.4	46.3	40.2	37.1
27/08/2024 02:15	39.5	36.3	53.8	35.1	41.9	37.7	35.6
27/08/2024 02:30	38.8	36.4	54.3	34.2	40.4	38.1	35.3
27/08/2024 02:45	37.7	35.3	49.9	34.2	39.2	36.4	34.7
27/08/2024 03:00	42.7	37.1	64.4	35.9	41.3	38.2	36.8
27/08/2024 03:15	39.8	37.3	51.0	36.1	41.4	38.5	36.8
27/08/2024 03:30	47.6	37.7	74.8	35.9	41.2	38.9	36.6
27/08/2024 03:45	49.4	36.6	75.5	34.9	44.2	39.0	35.8
27/08/2024 04:00	48.7	36.2	73.3	34.4	43.6	37.6	35.0
27/08/2024 04:15	39.4	36.8	50.9	35.3	41.1	38.9	36.0
27/08/2024 04:30	42.4	40.0	56.6	38.2	44.1	41.7	38.9

27/08/2024 04:45	48.5	39.4	75.9	35.8	44.5	41.3	37.0
27/08/2024 05:00	52.4	40.2	75.9	36.9	47.2	42.9	38.2
27/08/2024 05:15	50.5	42.0	75.0	40.0	47.5	44.4	40.9
27/08/2024 05:30	55.3	43.3	76.1	41.0	54.1	45.4	41.9
27/08/2024 05:45	55.0	45.0	75.3	42.7	57.1	47.6	43.7
27/08/2024 06:00	56.5	46.0	75.2	43.4	58.3	48.6	44.8
27/08/2024 06:15	57.1	47.5	74.7	42.9	58.9	52.5	44.3
27/08/2024 06:30	54.8	52.1	71.3	50.2	55.2	53.1	51.2
27/08/2024 06:45	58.7	49.2	76.7	43.7	60.3	53.8	45.3
27/08/2024 07:00	60.4	44.9	79.8	43.1	65.3	48.9	43.8
27/08/2024 07:15	59.7	46.2	78.9	43.4	62.4	49.0	44.5
27/08/2024 07:30	64.0	47.5	80.8	44.8	66.4	64.9	46.1
27/08/2024 07:45	63.4	47.1	76.2	45.3	66.5	57.1	45.9
27/08/2024 08:00	59.1	46.4	76.1	44.3	61.2	49.6	45.2
27/08/2024 08:15	62.2	47.5	78.8	46.1	66.2	52.5	46.6
27/08/2024 08:30	61.9	46.8	78.5	44.4	65.4	51.6	45.8
27/08/2024 08:45	62.5	46.2	77.8	43.9	67.2	50.9	44.8
27/08/2024 09:00	63.3	46.4	83.2	43.4	67.6	59.1	44.1
27/08/2024 09:15	59.2	45.6	77.7	43.5	61.9	47.9	44.2
27/08/2024 09:30	63.1	46.0	88.7	44.0	64.3	49.1	44.6
27/08/2024 09:45	59.9	47.2	75.7	45.3	63.7	49.6	46.3
27/08/2024 10:00	60.3	47.6	77.9	45.7	64.5	50.5	46.7
27/08/2024 10:15	58.5	47.2	75.2	45.0	61.6	49.8	46.0
27/08/2024 10:30	61.1	47.2	81.5	45.1	64.2	50.7	45.8
27/08/2024 10:45	60.8	47.3	79.9	44.7	64.5	51.2	45.9
27/08/2024 11:00	62.2	47.4	78.3	44.9	66.2	56.3	45.8
27/08/2024 11:15	61.2	55.4	75.9	50.0	64.1	57.7	51.2
27/08/2024 11:30	60.5	55.4	75.9	49.6	62.5	57.7	50.6
27/08/2024 11:45	59.3	47.9	74.8	44.3	62.9	52.4	46.1
27/08/2024 12:00	63.7	51.9	80.4	47.5	67.1	60.7	50.0
27/08/2024 12:15	60.5	46.5	75.8	43.8	65.2	50.9	44.9
27/08/2024 12:30	60.2	47.3	75.6	44.6	64.3	51.9	45.8
27/08/2024 12:45	61.2	48.0	77.2	44.6	65.2	53.2	45.4
27/08/2024 13:00	62.3	57.2	77.1	51.9	65.1	58.7	53.5
27/08/2024 13:15	57.8	46.2	73.8	44.0	60.4	48.9	44.7
27/08/2024 13:30	59.1	47.1	75.6	45.0	63.1	49.6	46.2
27/08/2024 13:45	61.7	47.5	78.3	44.8	65.6	51.9	45.5
27/08/2024 14:00	61.6	46.8	78.6	44.7	65.6	51.2	45.8
27/08/2024 14:15	62.3	48.5	77.5	46.1	67.1	52.7	46.9
27/08/2024 14:30	63.9	50.9	81.2	47.8	67.3	53.5	48.6

27/08/2024 14:45	65.0	49.9	82.4	46.3	68.6	53.5	48.4
27/08/2024 15:00	65.1	49.0	81.6	45.4	68.2	55.0	46.1
27/08/2024 15:15	64.7	47.9	82.7	45.8	67.3	51.9	46.8
27/08/2024 15:30	62.1	47.8	80.7	45.4	64.6	50.9	46.7
27/08/2024 15:45	60.4	47.1	76.5	43.7	64.5	49.6	45.4
27/08/2024 16:00	65.6	49.1	92.0	45.6	67.1	54.2	47.3
27/08/2024 16:15	61.2	48.0	77.9	45.3	64.2	51.3	46.4
27/08/2024 16:30	63.2	48.1	80.2	44.4	67.7	52.7	46.0
27/08/2024 16:45	61.0	48.0	77.9	45.9	64.7	50.9	46.8
27/08/2024 17:00	62.6	47.1	79.3	44.5	67.4	53.7	45.8
27/08/2024 17:15	62.1	46.9	80.0	44.5	66.6	49.7	45.5
27/08/2024 17:30	61.4	48.0	78.3	45.9	63.8	51.5	46.4
27/08/2024 17:45	61.1	48.4	78.0	46.3	64.4	50.9	47.2
27/08/2024 18:00	60.0	47.5	77.9	44.6	63.3	51.1	45.8
27/08/2024 18:15	60.7	47.4	80.0	45.0	61.8	49.5	46.0
27/08/2024 18:30	59.0	46.1	79.4	44.0	59.4	47.5	45.4
27/08/2024 18:45	58.6	46.0	76.0	43.3	60.5	48.6	44.4
27/08/2024 19:00	66.0	48.4	86.2	45.7	65.9	51.9	47.2
27/08/2024 19:15	59.4	46.4	75.9	43.1	62.3	49.9	44.4
27/08/2024 19:30	58.8	44.2	77.0	42.1	61.8	46.9	42.8
27/08/2024 19:45	59.4	42.4	79.0	39.6	60.1	45.9	40.8
27/08/2024 20:00	57.4	43.0	77.1	41.1	58.8	46.6	42.0
27/08/2024 20:15	57.2	43.5	81.0	40.8	57.5	46.3	41.9
27/08/2024 20:30	58.4	46.6	76.8	42.7	60.4	51.0	44.3
27/08/2024 20:45	58.4	46.1	75.5	42.9	65.4	49.2	44.5
27/08/2024 21:00	57.8	44.4	75.8	41.0	60.6	46.8	41.9
27/08/2024 21:15	57.9	42.3	76.3	39.9	59.0	44.9	40.5
27/08/2024 21:30	53.0	43.1	73.9	40.3	53.0	47.0	41.7
27/08/2024 21:45	58.6	44.4	77.3	42.0	55.6	47.5	43.0
27/08/2024 22:00	52.5	42.5	71.8	39.9	49.5	45.0	41.2
27/08/2024 22:15	52.4	42.0	74.9	39.6	52.5	44.4	40.9
27/08/2024 22:30	58.5	42.4	81.6	40.5	57.1	45.3	41.2
27/08/2024 22:45	51.9	41.8	74.1	39.2	50.8	44.6	40.4
27/08/2024 23:00	54.9	40.4	74.0	38.3	57.0	43.2	39.4
27/08/2024 23:15	50.3	41.0	76.0	38.4	47.7	43.6	39.5
27/08/2024 23:30	52.0	41.7	74.8	38.8	48.5	44.5	39.9
27/08/2024 23:45	53.2	41.5	75.5	38.0	53.9	48.6	38.9
28/08/2024 00:00	62.5	39.8	84.0	37.2	53.3	42.2	38.0
28/08/2024 00:15	45.7	36.5	63.8	34.8	47.9	39.7	35.4
28/08/2024 00:30	39.6	36.6	52.7	34.9	41.7	38.6	35.7

28/08/2024 00:45	41.7	37.4	60.2	35.5	42.8	39.4	36.2
28/08/2024 01:00	46.6	37.0	68.0	34.5	43.3	39.6	35.3
28/08/2024 01:15	44.7	35.3	67.3	34.1	40.3	37.0	34.7
28/08/2024 01:30	38.6	35.0	50.7	33.7	41.3	37.2	34.4
28/08/2024 01:45	50.6	36.5	72.0	33.9	44.5	39.6	34.6
28/08/2024 02:00	39.1	36.9	48.4	35.7	40.8	38.3	36.3
28/08/2024 02:15	51.1	36.6	76.6	35.5	43.5	38.6	35.8
28/08/2024 02:30	51.9	37.6	78.1	35.5	42.7	39.3	36.3
28/08/2024 02:45	40.6	35.0	67.8	33.8	39.9	36.6	34.4
28/08/2024 03:00	45.6	35.5	74.2	34.1	40.4	37.4	34.7
28/08/2024 03:15	38.8	37.0	49.3	34.5	40.3	38.2	35.6
28/08/2024 03:30	38.5	36.4	53.3	34.7	40.2	37.9	35.3
28/08/2024 03:45	40.3	36.4	57.6	34.6	41.7	38.2	35.3
28/08/2024 04:00	49.7	37.0	73.3	35.2	42.6	38.5	36.2
28/08/2024 04:15	53.0	36.5	80.9	34.4	43.8	38.8	35.1
28/08/2024 04:30	41.5	37.8	54.4	35.6	44.0	39.7	36.3
28/08/2024 04:45	54.0	39.0	83.1	37.1	45.3	41.2	38.1
28/08/2024 05:00	53.4	39.6	74.8	37.5	46.2	41.4	38.5
28/08/2024 05:15	52.2	40.2	73.8	37.0	49.7	43.1	38.0
28/08/2024 05:30	55.0	42.2	76.0	39.4	53.9	45.1	40.8
28/08/2024 05:45	53.5	43.7	73.1	41.3	53.8	46.8	42.1
28/08/2024 06:00	57.1	46.4	76.2	43.0	59.6	49.7	44.0
28/08/2024 06:15	59.8	45.2	77.5	42.5	62.1	57.9	43.4
28/08/2024 06:30	61.7	60.0	74.3	43.4	62.5	61.3	45.8
28/08/2024 06:45	61.9	47.7	80.4	45.8	62.4	61.0	46.6
28/08/2024 07:00	61.1	47.1	77.4	44.6	65.8	50.4	45.8
28/08/2024 07:15	56.9	46.1	74.2	43.2	59.5	48.5	44.2
28/08/2024 07:30	63.9	48.3	77.1	44.1	67.3	57.5	45.0
28/08/2024 07:45	63.5	46.1	77.0	43.3	67.4	50.1	44.4
28/08/2024 08:00	60.7	45.9	76.5	44.4	64.0	48.1	45.0
28/08/2024 08:15	59.3	46.7	76.8	43.7	62.7	50.6	45.3
28/08/2024 08:30	64.0	50.3	82.3	45.4	67.1	54.3	47.3
28/08/2024 08:45	67.3	48.7	85.5	46.0	70.0	55.0	47.2
28/08/2024 09:00	62.5	45.4	80.9	42.8	65.5	50.7	43.9
28/08/2024 09:15	61.2	44.3	80.1	42.1	61.3	47.3	42.7
28/08/2024 09:30	61.6	43.4	80.1	41.1	64.0	47.2	42.2
28/08/2024 09:45	64.5	45.6	81.8	43.1	70.5	50.0	44.2
28/08/2024 10:00	62.7	49.3	80.7	46.2	66.7	53.4	47.2
28/08/2024 10:15	64.2	46.8	84.3	44.5	66.5	52.0	45.3
28/08/2024 10:30	63.5	46.0	82.3	42.9	66.1	51.5	44.1

28/08/2024 10:45	61.5	45.4	82.1	42.2	64.0	48.1	43.4
28/08/2024 11:00	61.4	45.9	78.1	42.8	64.8	50.4	44.1
28/08/2024 11:15	62.7	48.1	83.4	46.3	65.9	51.1	47.4
28/08/2024 11:30	61.1	46.4	79.5	42.7	62.4	50.8	43.9

Appendix C: Previous Nosie Assessment

Wrexham Association Football Club

Kop Development

Noise Impact Assessment

Intended for
Wrexham Association Football Club

Document type
Report

Date
October 2022

WREXHAM AFC – KOP DEVELOPMENT NOISE IMPACT ASSESSMENT

RAMBOLL Bright ideas. Sustainable change.

WREXHAM AFC – KOP DEVELOPMENT
NOISE IMPACT ASSESSMENT

Project name	**Wrexham AFC Kop Redevelopment**
Project no.	**1620012485**
Recipient	**Wrexham Association Football Club**
Document type	**Report**
Version	**Final 03**
Date	**10/10/2022**
Prepared by	**Thomas Jones, Ryan McNulty**
Checked by	**David Harbon**
Approved by	**Craig Barson**
Description	**-**

Ramboll
8 Village Way
Tongwynlais
Cardiff
CF15 7NE
United Kingdom

T +44 2920 543 550
https://uk.ramboll.com

Revision	Date	Prepared by	Checked by	Approved by	Description
DRAFT	17/09/2021	T Jones	D Harbon	To be approved	Draft issue
F01	28/09/2021	T Jones	D Harbon	C Barson	Issue for planning
DRAFT 02	24/06/2022	T Jones R McNulty	D Harbon C Barson	C Barson	Draft issue incorporating 2022 scheme revisions
F02	03/08/2022	T Jones R McNulty	D Harbon C Barson	C Barson	Issue for planning
F03	10/10/2022	T Jones R McNulty	D Harbon C Barson	C Barson	Issue for planning (minor update)

This report is produced by Ramboll at the request of the client for the purposes detailed herein. This report and accompanying documents are intended solely for the use and benefit of the client for this purpose only and may not be used by or disclosed to, in whole or in part, any other person without the express written consent of Ramboll. Ramboll neither owes nor accepts any duty to any third party and shall not be liable for any loss, damage or expense of whatsoever nature which is caused by their reliance on the information contained in this report.

Ramboll UK Limited
Registered in England & Wales
Company No: 03659970
Registered office:
240 Blackfriars Road
London
SE1 8NW

CONTENTS

1.	**Executive Summary**	**2**
2.	**Introduction**	**3**
3.	**Relevant Policy and Guidance**	**4**
4.	**Noise Survey**	**4**
4.1	Noise Sensitive Receptors	4
5.	**Noise Assessment Methodology**	**6**
5.1	Computer Modelling using CadnaA®	6
5.2	Noise Model Data	6
5.3	Noise Model Assumptions	7
6.	**Noise Breakout from the Stadium**	**7**
6.1	Significance Criteria	7
6.2	Prediction Models	8
6.3	Wrexham Village Student Accommodation	11
6.4	The Turf (pub)	11
6.5	Houses along Mold Road	11
6.6	Glyndwr University	11
7.	**Noise Breakout from New Kop Stand Hospitality Areas**	**11**
7.1	Façade Specification	11
8.	**Plant Noise Limits**	**12**
8.1	Existing Background Noise Levels	12
9.	**Traffic Noise Impacts**	**13**
10.	**Concerts and Infrequent Events**	**13**
11.	**PA System Design Considerations**	**13**
12.	**Noise and Vibration from Construction Activity**	**14**
12.1	Noise	14
12.2	Vibration	14
12.3	Noise and Vibration Mitigation	14

1. EXECUTIVE SUMMARY

Ramboll UK Ltd (Ramboll) has been appointed by Wrexham Association Football Club to produce a Noise Impact Assessment to inform a planning application for the Kop Development of 5,500 spectator seats, inclusive of a 500 capacity hospitality area, with a 600 capacity non-match day exhibition space, new public realm and associated workspace.

In 2021 Ramboll measured noise levels around the stadium during weekday daytime, evening and night-time periods, and also before, during and after a match day event at the current stadium. This information has been used to benchmark the current noise impacts and background noise levels in the surrounding area. Modelling of the new stand development has been undertaken using CadnaA® to determine the change in noise impact based on the new stand fabric and profiles. This has been compared with the existing conditions and relevant standards.

Toby Zorn of Wrexham Council has been consulted in relation to this noise assessment.

This report addresses the following key impacts:

- Fixed plant and equipment,
- Hospitality Facilities,
- Change in match day stadium noise,
- Traffic noise and patron noise.

Outline guidance is given on construction noise and vibration impacts.

Overall, the mode of operation of the stadium during matches is unlikely to significantly change when compared to existing operations. As a result, noise impacts during match day activities will generally be at or below the noise levels currently experienced at the nearest sensitive receptors. The same applies to road traffic and pedestrian access to the grounds.

New hospitality facilities at the grounds will be designed to control noise breakout based on the intended use. Appropriate noise limits and façade specifications have been proposed within this report and will be developed further by the design team.

Plant noise limits have been proposed at each of the nearest noise sensitive receptors (NSR) to achieve the noise limit criteria identified by the local authority.

2. INTRODUCTION

Ramboll have been commissioned to assess the impact of noise associated with the new 'Kop' stand at Wrexham Football Club. This report presents the findings of noise surveys during September 2021 and detailed noise modelling of the proposed development based on the latest 2022 proposals.

The new stand will replace a former stand on the 'Kop' that can no longer be used due to safety concerns. The new stand will accommodate 5,500 seats and take the overall capacity of the stadium up from the current figure of 10,000 to 15,500 spectators for league games. The scheme proposals also include a 500-capacity hospitality area, 600 capacity non-match day exhibition space, new public realm, and associated works. It is understood the hospitality area could accommodate up to 500 guests on a match day, with a reduced capacity on non-match days.

In addition to meeting the ambitions of Wrexham AFC, it is envisaged that the development will enable the Racecourse Ground to accommodate some Welsh national 'friendly' fixtures and become the home ground of the Welsh national ladies' team, reflecting its history as the oldest international stadium in the world. Therefore, the works are required to ensure that other parts of the stadium can be improved to meet appropriate UEFA standards.

Ramboll have liaised with Wrexham Council (Toby Zorn) to discuss and agree the methodology for noise surveys, suitable standards for assessing noise impact and general approach. As this project concerns the redevelopment of an existing long-standing use, Ramboll have concentrated on the change in impact from current operations as a means comparison. Ramboll understands from Toby Zorn that there are no existing concerns for the operations at the grounds that have previously led to complaints. Nonetheless we have provided recommendations to address concerns relating to the use of function areas, noise impact from the PA and fixed plant and equipment.

The capacity of the car parking provision has not increased therefore the volume of traffic flow on match-days is unlikely to change over that currently experienced. However, the enhanced facilities for functions and hospitality will mean that there could be more frequent traffic movements at different times of the day and night from currently.

Our recommendations are based on national policy, best practice, relevant British Standards and Wrexham Council requirements.

3. RELEVANT POLICY AND GUIDANCE

The assessment has been informed by the following legislation, policies and published guidance:

1) National Policy:
    a. Control of Pollution Act, 1974, Part III – Noise[1];
    b. The Environmental Protection Act, 1990 (as amended)[2];
    c. Planning Policy Wales (PPW), 2021, Edition 11[3]; and
    d. Noise and soundscape action plan 2018 to 2023, December 2018[4].

2) National Guidance and Industry Standards:
    a. BS5228:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites[5];
    b. BS6472-1:2008 for vibration effects on humans[6]; and
    c. BS4142:2014+A1 2019 for industrial and commercial noise[7].

4. NOISE SURVEY

A detailed noise survey was undertaken at several locations around Wrexham Football Club between 10 and 15 September 2021. Combinations of attended and unattended measurements were used. Survey locations are shown in Figure 1.

On 11 September 2021, noise levels were measured inside the grounds during a 'home game', Wrexham vs Woking (8,242 in attendance), with sample measurements undertaken at various points within the stands. Other sample measurements were undertaken outside the grounds at 1.5m above ground level, and 1.5m above roof level of the nearby Wrexham Village Student Accommodation. This information has been used to provide base information for the noise modelling.

Full details of the survey, along with the full results, are presented in Appendix 1.

4.1 Noise Sensitive Receptors

For the purposes of the assessments, several noise sensitive receptors (NSR) have been identified from site investigations, satellite imagery and the proposed development plans. These NSR are considered to represent a worst case, such that other receptors located at greater distances from the application site should not experience greater noise and vibration impacts.

The NSR which have been considered in the assessment are provided in Table 4.1 and indicated on Figure 4.1.

[1] Secretary of State, 1974, Control of Pollution Act, HMSO. Available: http://www.legislation.gov.uk/ukpga/1974/40/contents
[2] Secretary of State, 1990. Environmental Protection Act 1990, The Stationary Office. Available: http://www.legislation.gov.uk/ukpga/1990/43/contents
[3] Welsh Government, 2021, Planning Policy Wales (PPW). Available: https://gov.wales/sites/default/files/publications/2021-02/planning-policy-wales-edition-11_0.pdf
[4] Welsh Government, 2018, Noise and soundscape action plan 2018 to 2023. Available: https://gov.wales/sites/default/files/publications/2019-04/noise-and-soundscape-action-plan.pdf
[5] British Standards Institution, 2009 and 2014.British Standard 5228: 2009 +A1 2014 Code of practice for noise and vibration control on construction and open sites. BSI
[6] British Standards Institution, 2009 and 2014.British Standard 6472: 2008 Guide to evaluation of human exposure to vibration in buildings - Vibration sources other than blasting. BSI
[7] British Standards Institute, 2014 + A1 2019. British Standard BS 4142: Methods for rating and assessing industrial and commercial sound. BSI

Receptor reference	Receptor	Type of Receptor
1	Wrexham Village Student Accommodation	Residential
2	The Turf (Pub)	Residential/Commercial
3	Houses on Mold Road	Residential
4	Glyndwr University	Education

Table 4.1 **Noise Sensitive Receptors (NSR)**

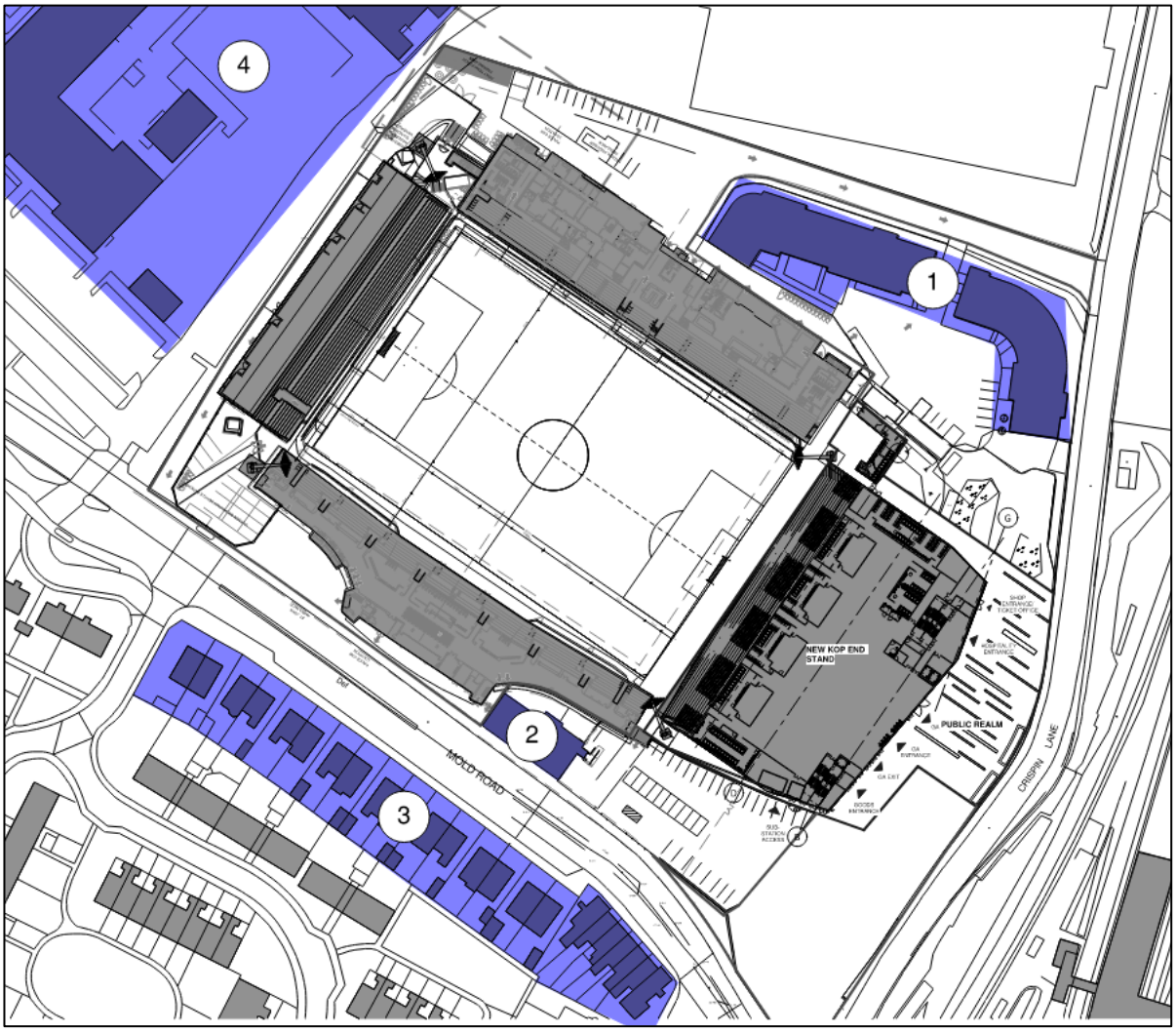


Figure 4.1 **Proposed Site Plan with Noise Sensitive Receptors (NSR)**

5. NOISE ASSESSMENT METHODOLOGY

5.1 Computer Modelling using CadnaA®

Noise levels likely to be generated from the development have been calculated using the proprietary noise modelling software CadnaA®. The noise predictions have been undertaken in accordance with the noise prediction framework set out in ISO 9613-2 *'Acoustics – Attenuation of sound during propagation outdoors – Part 2 General method of calculation'*.

The ISO 9613 noise prediction model assumes that individual sources act as point sources: the noise level reducing by 6 dB for every doubling of distance. Noise from line sources reduce by 3 dB per doubling of distance. The model considers the distance between the sources and the receptors, as well as the amount of attenuation due to atmospheric absorption and ground cover.

The acoustic ground absorbency has been modelled according to local conditions (i.e., soft ground for the pitch, and generally hard ground outside of the stadium).

5.2 Noise Model Data

Noise data from the noise surveys has been used to develop the computer model predictions.

Table 5.1 presents noise levels measured at the nearest residential property to the stadium (Wrexham Village Student Accommodation) during a typical weekday and on a Saturday during a 'home game' (see Appendix 1 for location).

Location	**Average noise level, dB $L_{Aeq,15min}$**	
	'Without' stadium noise	**'With' stadium noise**
LT1	33-50	70
Roof level (Wrexham Village Student Accommodation)	54	75

Table 5.1 Average noise levels at nearest properties

To predict noise breaking out of each stand during a game, we have used noise level data measured during a period of loud cheering, as measured within the Hays Travel stand of the stadium. The data for this period is presented below.

Overall dB $L_{Aeq,1hr}$*	**L_{eq} in each Octave Band Centre Frequency, Hz**						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
95	72	72	84	92	92	88	80

*Note that 1hr period is used for the purpose of comparison of noise levels experienced at receptors. In reality this level is achieved for much shorter durations and is therefore considered worst-case.

Table 5.2 Loud cheering as measured in the Hayes Travel stand

Due to the partial enclosure formed by the shape of the existing Hays Travel stand, the above measured level is considered 'semi-reverberant'.

This data has been used to approximate the sound power of loud cheering across the seating area of each existing and proposed stand.

5.3 Noise Model Assumptions

In order to develop computer models of the existing and future scenarios the following assumptions apply:

- Two-storey residential properties have been modelled as 7.5m in height and single storey buildings have been modelled as 4m in height. These heights are chosen to not over predict the screening offered by existing buildings;
- The surrounding student accommodation blocks have been modelled as 28-32m in height;
- The existing stands of the stadium have been modelled using the following heights (highest point of canopy):
    - Hays Travel Stand – 13.75m
    - Wrexrent Stand – 13.50m
    - BKConcepts Stand - 13.50m
    - Kop Stand - 10.87m
- The updated Kop stand has been modelled using a height (highest point of canopy) of 24.70m.
- Soft ground regions are identified as hatched areas on the models. The remaining ground regions are assumed to be hard, reflective ground;
- The models do not include any topographical data beyond the heights of buildings within the vicinity of the stadium;
- Noise from crowd activities within each stand have been approximated as sound power levels over a surface area assigned to each seating area of the existing and proposed stands;
- Noise levels breaking out of each stand have been based on the average noise levels of 95 dB L_{Aeq} as measured during a period of loud cheering in the Hays Travel stand. This is unlikely to be the case for the duration of a full game in all parts of the stadium and is therefore considered worst case. For increased capacity calculations we have increased this noise level using the worst case assumption that noise levels in every stand will increase logarithmically based on the increased capacity. This is also considered a worst case assumption.
- We have not used any traffic flow data within the noise model as we are not assessing the impact of, or changes in road traffic.

6. NOISE BREAKOUT FROM THE STADIUM

6.1 Significance Criteria

Ramboll have considered the following magnitudes of impact with respect to the change in crowd noise levels at nearby receptors.

Magnitude of Impact	**Change in noise level dB $L_{Aeq,1hr}$**
Low	≤ 0
Medium	0 - 4.9
High	≥ 5

Table 6.1 Impact Magnitude Criteria – Crowd Noise

Ramboll considers that a high magnitude of impact, i.e. an increase in crowd of 5 dB or more at receptors would be considered significant.

6.2 Prediction Models

Using the loud cheering source data shown in Table 5.2, we have produced noise models to represent the behaviour and impact of noise generated by crowd activities. We have considered the following scenarios:

1) Crowd noise during a 'home game' based on the **existing** layout of the stadium without the existing Kop Stand in use, and representative of current usage. The noise contour map for this situation is presented in Figure 6.1 based on 8,242 attendances. The model has been calibrated to the noise measurements made during the game on 11 September 2021.

2) Crowd noise during a 'home game' based on the **proposed** stadium layout (i.e. with new Kop Stand, but without this stand in use). This provides a comparable scenario to the existing conditions. The noise contour map for this situation is presented in Figure 6.2, based on 8,242 attendances.

3) Crowd noise during a 'home game' based on the **existing** layout of the stadium. The noise contour map for this situation is presented in Figure 6.3, based on the maximum 15,000 attendance (i.e. if the existing Kop Stand was in use).

4) Crowd noise during a 'home game' based on the **proposed** stadium layout and new Kop Stand in use. The noise contour map for this situation is presented in Figure 6.4 based on the maximum capacity of 15,500.

The purpose of creating the above prediction models is to demonstrate the change in noise levels at the nearest properties. The results are summarised in the following table:

Receptor Location	**8,242 Attended Home Game (dB $L_{Aeq,1hr}$)**		**15,500 Full Capacity Home Game (dB $L_{Aeq,1hr}$)**	
	Existing (Kop Stand not in use)	**Proposed (Kop Stand not in use)**	**Existing (with existing Kop Stand in use)**	**Proposed (with proposed Kop Stand in use)**
Wrexham Village Student Accommodation	81	81 (0)	82	82 (0)
The Turf (Pub)	72	72 (0)	79	76 (-3)
Houses along Mold Road*	71	70 (-1)	80	74 (-6)
Glyndwr University	73	73 (0)	73	73 (0)

Table 6.2 Comparison of stadium noise breakout for different capacities

** closest houses to Kop Stand*

Figures in brackets relate to the change relative to the existing stadium at the capacity indicated.

In each case the predictions relate to noise breakout from within the confines of the stadium during gameplay, rather than crowd noise outside of the stadium.

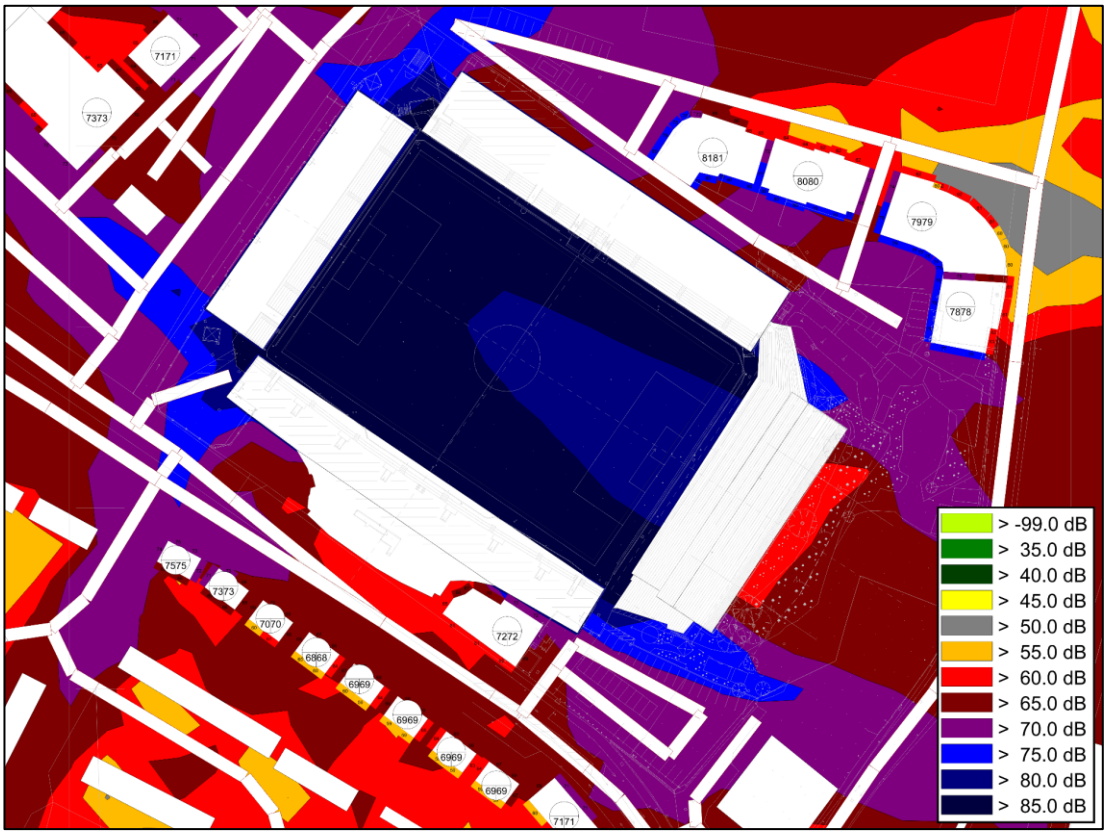


Figure 6.1 Predicted noise levels ($L_{Aeq,1hr}$) based on the existing layout during a home game (8,242 attendance)

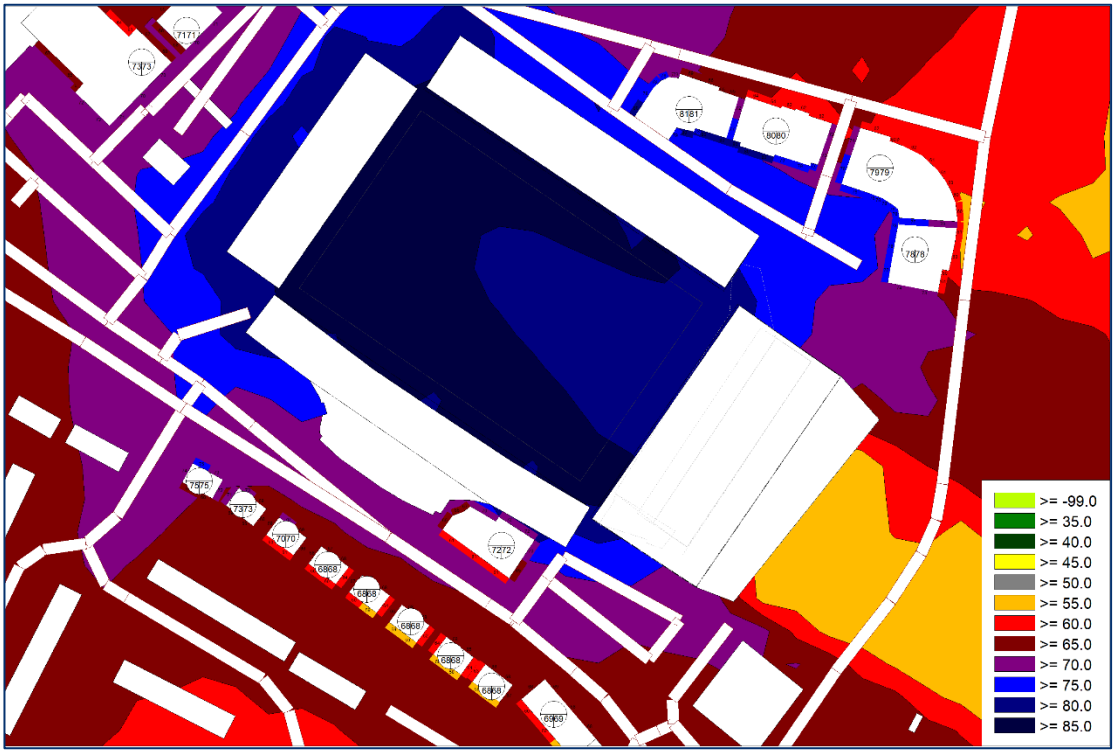


Figure 6.2 Predicted noise levels ($L_{Aeq,1hr}$) based on the proposed layout during a home game (8,242 attendance)

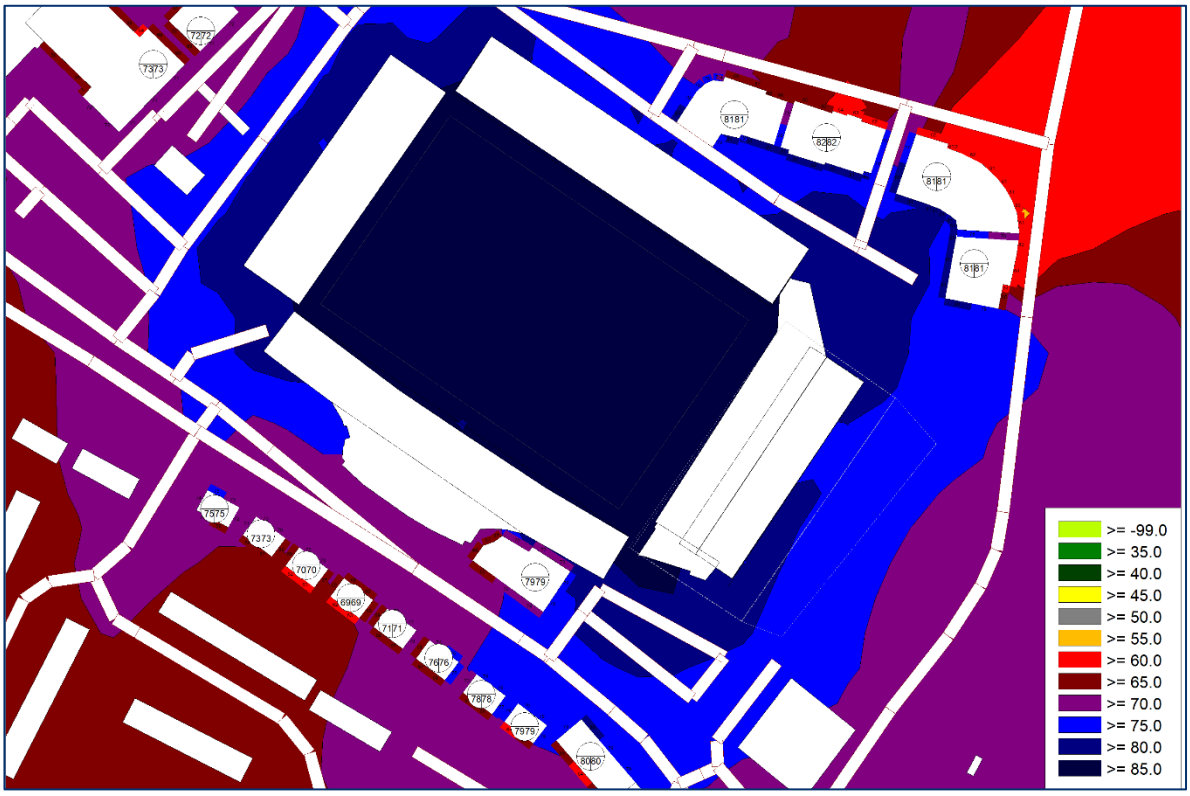


Figure 6.3 Predicted noise levels ($L_{Aeq,1hr}$) based on the existing layout during a home game (10,000 attendance)

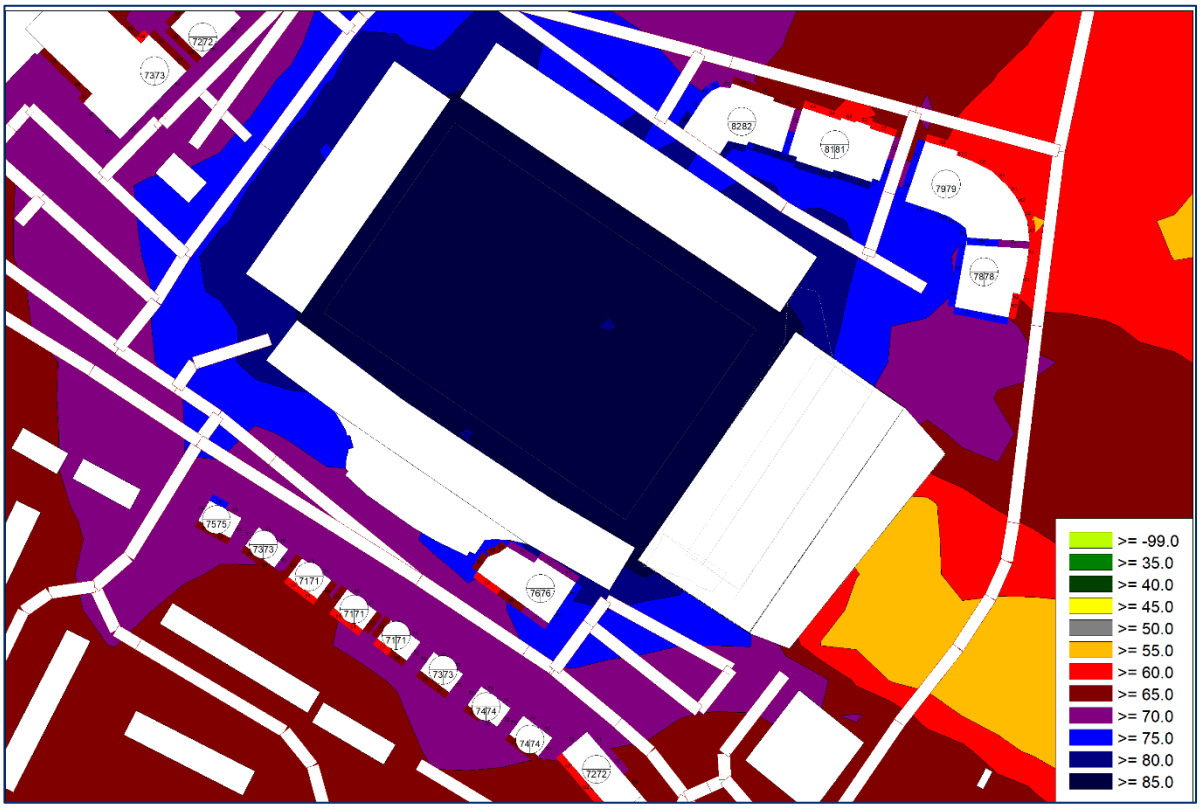


Figure 6.4 Predicted noise levels ($L_{Aeq,1hr}$) based on the proposed layout during a home game (15,500 attendance)

6.3 Wrexham Village Student Accommodation

At Wrexham Village Student Accommodation, noise levels are not expected to change as a result of the redevelopment.

There is therefore no expected change in noise levels at this receptor.

6.4 The Turf (pub)

Noise levels have the potential to decrease at The Turf pub, by around 3 dB, which is a result of the sides of the Stand offering some screening compared to the existing Kop Stand.

There is therefore no expected change in noise levels at this receptor.

6.5 Houses along Mold Road

Predictions indicate that noise levels could decrease by up to 6 dB at the houses along Mold Road, again due to the sides of the new stand offering additional screening.

There is therefore no expected change in noise levels at this receptor.

6.6 Glyndwr University

At Glyndwr University, noise levels are not expected to change as a result of the redevelopment.

7. NOISE BREAKOUT FROM NEW KOP STAND HOSPITALITY AREAS

A new Hospitality Lounge is proposed in the new Kop stand as part of the development. It is expected that these new facilities will replace the area currently used in the BKConcepts Stand. The new facilities in the Kop stand will be designed to control noise breakout to the nearest residential premises.

7.1 Façade Specification

The plans for the second floor of the stadium are shown in AFL drawing 'WRX-AFL-Z4-02-DR-A-20112 - GA, Level 2, Plan, Hospitality'.

We have used archive data for bar/hospitality activities to calculate the outline requirements of the external façade, as presented in Table 7.1 below. This spectrum would be typical of a busy venue that also plays amplified music, with some live band capability and would be subjectively 'very loud'. Such high noise levels represent worst case levels, and typical levels would be lower.

Overall dB $L_{Aeq,1hr}$	**L_{Aeq} in each Octave Band Centre Frequency, Hz**						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
101	97	101	97	97	96	93	86

Table 7.1 Assumed internal noise level used for hospitality breakout calculations

As can be seen from the long-term measurements shown on Figure A.2 (in Appendix 1), evening background levels are typically around 38-40dB L_{A90} before 11pm.

Using the table above, we have calculated the outline façade and roof requirements needed to control noise breakout from the hospitality areas so that they equal existing background levels, during evening periods at the nearest properties to the stadium. These are shown in Table 7.2

below. Note, these outline performances are subject to ongoing review with the Architect and design team for the project which will be fully developed during RIBA stages 3 and 4.

Location	Overall dB R_w	Sound reduction, R, in each Octave Band Centre Frequency, Hz						
		63	125	250	500	1k	2k	4k
2nd floor Hospitality Lounge Façades	45	22	27	35	43	53	53	63
2nd floor Hospitality Lounge Roof	53	25	36	41	50	57	64	65

Table 7.2 Outline sound insulation requirements of hospitality area façades and roof

The above requirements could be achieved using most masonry or cladding solutions including glazed elements if required. Ramboll will check the proposed construction(s) once developed.

8. PLANT NOISE LIMITS

8.1 Existing Background Noise Levels

We have used data from the noise survey (see Appendix 1) to establish the representative background levels at the nearest properties to the proposed plant decks of the stadium.

We understand that Wrexham Council (WC) require noise from proposed plant to be controlled such that the 'rating' level is no greater than the representative measured background noise levels.

The proposed plant is not expected to have any tonal or intermittent qualities. However, to allow for flexibility in the design, specific noise limits have been set 5 dB below the measured background levels.

Table 8.1 identifies the representative background levels at each of the NSR, along with the allowance plant noise limits 1m from the façade at each location in order to comply with Wrexham Council's requirements.

Receptor Location	Existing representative background noise levels (dB L_{A90})		Plant noise limit (dB L_{Aeq})	
	Daytime (07:00-23:00)	Night-time (23:00-07:00)	Daytime (dB $L_{Aeq, 1hour}$)	Night-time (dB $L_{Aeq,15mins}$)
Wrexham Village Student Accommodation	44	37	39	32
The Turf (Pub)	45	33	40	28
Houses along Mold Road	45	33	40	28
Glyndwr University	49	n/a	44	n/a

Table 8.1 Background noise levels in vicinity of the proposed plant decks of the stadium and plant limits

9. TRAFFIC NOISE IMPACTS

As part of the redevelopment of the Wrexham Football Club, the amount of parking at the ground and therefore traffic entering and leaving the grounds is not expected to increase. There is expected to be no significant change in noise from traffic movements on match days.

It is expected that the extended function capability for the ground (i.e. Hospitality Lounge) will mean more frequent use of the facilities. It is unlikely that such events would put a strain on the current car parking provision at the grounds of anything like approaching the current match day activity. The impact as a result of the operation of the facilities at the stadium is not expected to have any significant impact on the local area.

10. CONCERTS AND INFREQUENT EVENTS

It is understood that the grounds host occasional concerts. These are subject to individual licence applications, requiring the submission of an Event Management Plan. The same arrangement is likely to continue in the future and no further assessment is considered as part of this application.

11. PA SYSTEM DESIGN CONSIDERATIONS

As part of the scope of this project, some new PA equipment will be provided to the new Kop stand. Crowd safety requirements will take priority but practical steps can be taken to reduce the noise breakout to the wider areas. These include:

1) Level adjustment based on feedback monitoring of noise in the stands

2) Directional speaker arrays that focus the signal where it is needed – this could reduce noise breakout from the stadium by several decibels.

3) Speaker location and zoning.

Within the scope of the works in this project, Ramboll will take steps to mitigate noise from this source and will assist in selection and commissioning the PA system with the selected sub-contractor to help mitigate the noise breakout. We would expect the new stadium layout to provide similar or greater reductions in PA noise audibility over the current stand configuration.

12. NOISE AND VIBRATION FROM CONSTRUCTION ACTIVITY

12.1 Noise

We have considered, in outline terms, the impact of construction noise and vibration in accordance with BS5228:2009+A1 2014 'Code of practice for noise and vibration control on construction and open sites' (BS5228). At this stage, detailed proposals of site operations are not known. It is expected that the chosen contractor will have significant experience in constructing new buildings in residential areas. They will work with the local community to agree when potentially noisy activities can take place so that the impact is minimised.

It is desirable to keep daytime (07:30 hours to 19:00 hours) noise levels from construction activities to below 65 dB $L_{Aeq,1hr}$ at residential properties (based on the ABC method of BS5228). This applies to weekdays and Saturday mornings (07:30 hours to 13:00 hours), but excludes Saturday afternoons and Sundays, which should be taken as periods of rest. This is a threshold above which significant effects may occur, but not a limit.

12.2 Vibration

Piling is normally the most significant source of vibration on a construction site. Table 12.1 details the distances at which certain construction activities are likely to give rise to a just perceptible level of vibration. These figures are based on historical field measurements to inform BS5228.

Construction Activity	Distance from Activity (m)
Heavy vehicles (e.g. dump trucks)	5-10
Excavation	10-15
Hydraulic breaker	15-20
Rotary bored piling	20-30
Driven piling	50-100
Continuous flight auger (CFA) piling	10-20

Table 12.1 Distances at which vibration may just be perceptible

Should vibration be perceived to be a problem, it will be assessed using BS6472-1: 2008 'Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting'.

12.3 Noise and Vibration Mitigation

Although the detailed site layout of construction apparatus has not yet been determined, the following measures should be incorporated as best practice to minimise the potential for

disturbance of local residents. These will form part of the contractor's Construction Environmental Management Plan (CEMP).

- Works should only be carried out Mondays to Fridays 07:30 hours to 19:00 hours, and Saturdays 07:30 to 13:00 hours. No work (except emergency) should be done on Saturday afternoons, Sundays or Bank Holidays, unless otherwise agreed with Wrexham Council.
- Audits of site activities should be done at regular and frequent intervals during the construction programme to check that noise mitigation is being done.
- Where possible, site all noisy equipment away from noise-sensitive receptors.
- Machinery should be regularly and effectively maintained.
- Intermittently used machinery should be shut down between work periods.
- Where periods of noise levels above the desired target are anticipated, the residents should be informed and given timescales over which the activities will occur.
- Where possible, do loading and unloading away from noise-sensitive receptors.
- Materials should be lowered and not dropped.
- Use compressors that have effective acoustic enclosures and are designed to operate when their access panels are closed. Packaged generators, where provided, should have sufficient silencing such that they do not exceed the threshold at the nearest residential property.
- Acoustic covers to engines should be kept closed when the engines are in use and idling.
- Acoustic fencing, where required.
- Nominated person as point of contact for local residents.

APPENDIX 1
NOISE SURVEY DETAILS

A1.1 Personnel

Match-day survey and assessment by:	Thomas Jones, MIOA Principal Acoustics Consultant at Ramboll
Baseline survey by:	Michael Fort, MIOA Acoustics Consultant at Ramboll
	Dominic Young, AMIOA Graduate Acoustics Consultant at Ramboll

Ramboll is a member of the Association of Noise Consultants (ANC).

A1.2 Site Surveys/Monitoring

A1.2.1 Noise Measurements

Long-term

Environmental noise measurements were taken between 15:00 on 10 September 2021 and 13:00 on 13 September 2021 by long-term unattended noise monitoring equipment (denoted at LT1 in Figure A.1).

This location was chosen to be representative of background noise levels at the nearest noise sensitive receptor (NSR), Wrexham Village Student Accommodation.

The noise climate at this location is generally dominated by distant road traffic noise, pedestrian and vehicle movements within the Wrexham Village car park and railway movements at Wrexham Railway Station. Measured noise levels at LT1 were inclusive of contributions from the existing site operations, including the home game played on 11 September 2021.

Short-term

Short-term attended measurements were taken on 11 September 2021, comprising short sample measurements undertaken around the football grounds, within the stands, and on the roof of the Wrexham Village Student Accommodation (ST4), immediately before, during and after the home game was played.

Additional attended measurements were undertaken externally at locations ST1-ST4 on 14-15 September 2021 (see Figure A.1) to measure typical daytime, evening and night time noise levels at locations representative of other NSR:

- Wrexham Village Student Accommodation;
- The Turf (pub);
- Houses along Mold Road; and
- Glyndwr University.

A1.2.2 Measurement Equipment

The following equipment was used to conduct the surveys:

Equipment Type	Model Number	Serial Number(s)	Calibration Due
Sound Level Meter	Brüel and Kjær 2250 (Class 1)	3002075	24 April 2022
Microphone	Brüel and Kjær 4189 (Class 1)	2839798	24 April 2022
Calibrator	Brüel and Kjær 4231	2642788	29 July 2022
Sound Level Meter	01 dB FUSION	12079	11 February 2022
Microphone	GRAS 40CD	367009	11 February 2022
Calibrator	01 dB CAL31	82830	11 February 2022
Sound Level Meter	NTi XL2-TA	A2A-09209-EO	29 July 2022
Microphone	NTi MC230	8072	29 July 2022
Calibrator	NTi CAL200	16089	29 July 2022

Table A.1 Measurement equipment

Noise measurements were taken at approximately 1.5 metres above local ground level, at a distance of at least 3.5 metres from the façades of buildings and are considered representative of free field measurements. The calibration of the sound level meter was checked before and after the measurements were taken, and no significant drift was observed.

A1.2.3 Weather Conditions

Weather conditions were ideal for noise measurements for the majority of the survey period, with no wind speeds above 5 m/s recorded at any of the attended measurement locations during the survey.

There were some brief periods of rain noted on Sunday 12 and Monday 13 September, but these are not considered to have significantly affected noise measurements at LT1 as there were no roads located near to this position.

A1.2.4 Measurement Parameters

At each measurement location, a comprehensive suite of noise level metrics was recorded. The following noise level indices are relevant to this assessment:

i. $L_{Aeq,T}$ The A-weighted equivalent continuous noise level over the measurement period,

ii. $L_{A90,T}$ The A-weighted noise level exceeded for 90% of the measurement period. This parameter is often used to describe background noise, and

Other metrics were measured and are available for further analysis, if required.

A1.2.5 Measurement Positions

Figure A1 shows the positions of attended and unattended measurement positions ("ST" denotes short-term attended measurement positions, "LT" denotes long-term unattended measurement positions).

Location LT1 – located in the north east of the football grounds between the existing Kop stand and BK Concepts (Yale) stand. This position was selected to have similar screening as experienced by Wrexham Student Village, whilst also maintaining line-of-sight to the football pitch. The noise climate is generally dominated by distant road traffic noise, pedestrian and vehicle movements

within the Wrexham Village car park and railway movements at Wrexham Railway Station. This position is also highly influenced by noise from the stadium during matches.

Location ST1 – located in the car park of The Turf pub. This location was selected to represent The Turf and Mold Road NSR. The noise climate during the daytime was dominated by traffic Noise on Mold Road and activity from Pub and car park. During the evening and night-time, plant noise from the stadium became more dominant, with some distant construction noise from Wrexham Railway Station also audible.
Location ST2 – located along Crispin Lane. The noise climate was influenced by traffic Noise on Crispin Lane and noise from slow trains entering station. Frequent pedestrians were also located along this road. During the night-time, construction works within the railway station were being undertaken (changing of scaffolding, etc.), however these are not considered to have affected the background noise measurements.

Location ST3 – located near the University's Health Centre. The noise climate was dominated by plant noise from vents in the rear of North Stand. Some operational noise from within the football grounds (e.g. maintenance)and cars occasionally moving around car park were also noted. The plant was switched off for the last daytime measurement.

Location ST4 – located on the roof of Wrexham Village Student Accommodation. The noise climate (outside of match-days) was dominated by road traffic noise from Mold road, train noise, and activity from Jewsons and ATS industrial.

Sample measurements within grounds - for details of sample measurements, please refer to Table A.1.2.

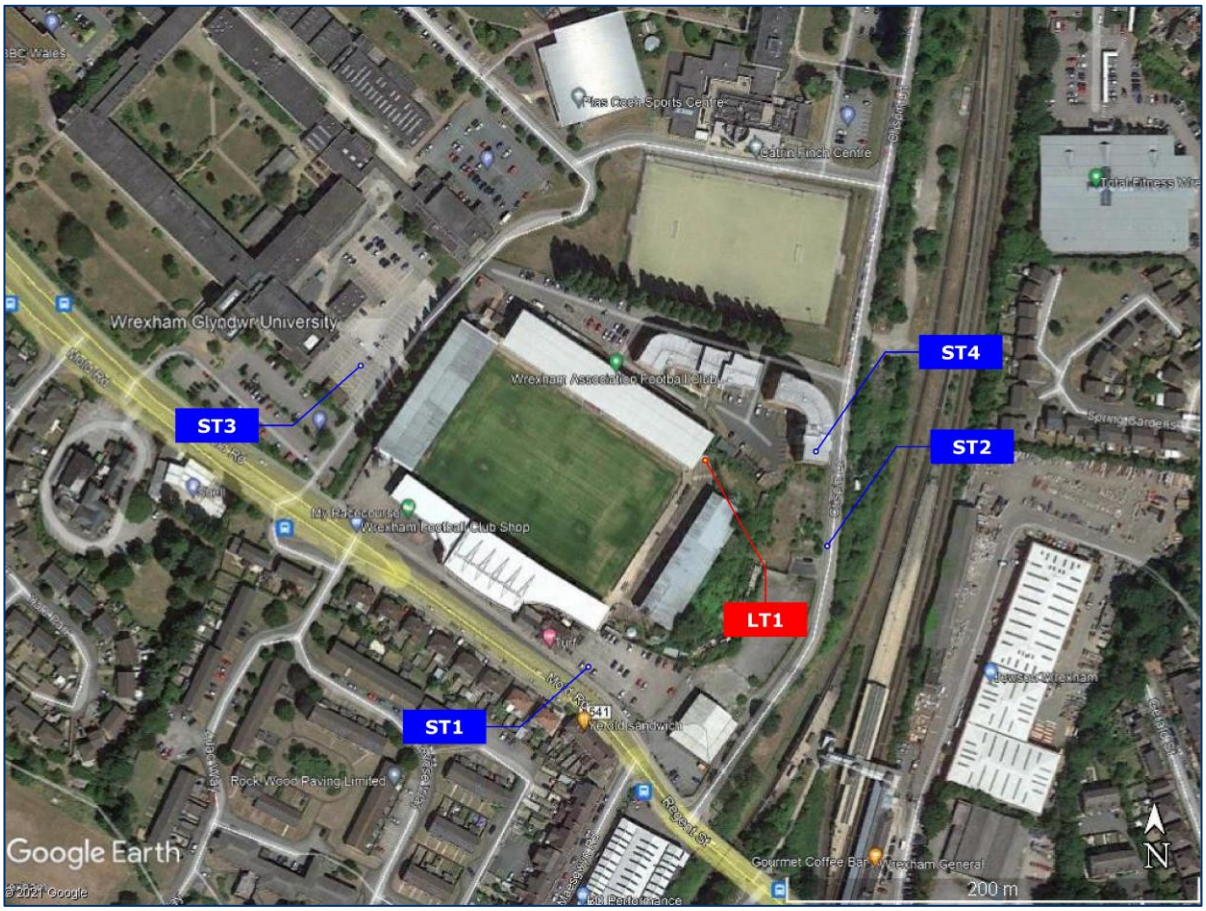


Figure A.1 Unattended and Attended Measurement Positions

A2.5 Summary of Results

A2.5.1 Attended

A summary of the results of the attended measurements at positions ST1-ST4 is provided in Table A.2.

Location	Date	Start	Duration	Noise Level (dB)	
				L_{Aeq}	L_{A90}
Daytime (07:00-19:00)					
ST1 - The Turf Pub	14/09/2021	13:53:50	15 Mins	62	55
	14/09/2021	14:56:00	15 Mins	61	54
	14/09/2021	15:59:38	15 Mins	62	54
ST2 - Crispin Lane	14/09/2021	13:33:02	15 Mins	64	43
	14/09/2021	14:36:32	15 Mins	62	42
	14/09/2021	15:38:02	15 Mins	65	44
ST3 - Health Centre	14/09/2021	14:15:08	15 Mins	53	50
	14/09/2021	15:17:06	15 Mins	53	51
	14/09/2021	16:19:44	15 Mins	51	45
ST4 - Rooftop	15/09/2021	11:03:18	15 Mins	54	51
	15/09/2021	11:20:26	15 Mins	54	52
Evening (19:00-23:00)					
ST1 - The Turf Pub	14/09/2021	22:22:26	15 Mins	58	45
	14/09/2021	23:03:48	15 Mins	55	45
	14/09/2021	23:44:10	15 Mins	53	44
ST2 - Crispin Lane	14/09/2021	22:03:48	15 Mins	57	39
	14/09/2021	22:43:12	15 Mins	51	38
	14/09/2021	23:24:44	15 Mins	52	36
	14/09/2021	23:23:02	15 Mins	61	52
Night-time (23:00-07:00)					
ST1 - The Turf Pub	15/09/2021	02:02:26	15 Mins	55	34
	15/09/2021	02:40:50	15 Mins	42	32
	15/09/2021	03:23:12	15 Mins	46	33
ST2 - Crispin Lane	15/09/2021	02:21:44	15 Mins	53	44
	15/09/2021	03:01:54	15 Mins	48	41
	15/09/2021	03:43:18	15 Mins	48	43

Table A.2 Summary of attended measured noise levels at ST1-ST4

A2.5.2 Unattended

An overview of the unattended measurements taken at LT1 between 10 and 13 September 2021 (excluding the home game match) is presented in Table A.3 below:

Measurement Position and Period	Time Period (T)	Log Average $L_{Aeq,T}$ (dB)	Mode Background Daytime/Evening $L_{A90,1hr}$, Night-time $L_{A90,15mins}$ (dB)	Arithmetic Average Background Daytime/Evening $L_{A90,1hr}$, Night-time $L_{A90,15mins}$ (dB)	Lowest Individual Background Daytime/Evening $L_{A90,1hr}$, Night-time $L_{A90,15mins}$ (dB)
LT1 10 September 2021 to 13 September 2021	Daytime (07:00-19:00)	54	44	44	32
	Evening (19:00-23:00)	44	42	42	39
	Night-time (23:00-07:00)	43	37	38	33

Table A.3 Summary of unattended measurements at LT1

The continuous noise measurements are represented graphically in Figure A.2.

With reference to Figure A.2, the modal L_{A90} values presented in Table A.3 are considered to be typical of the prevailing background noise levels at the NSRs.

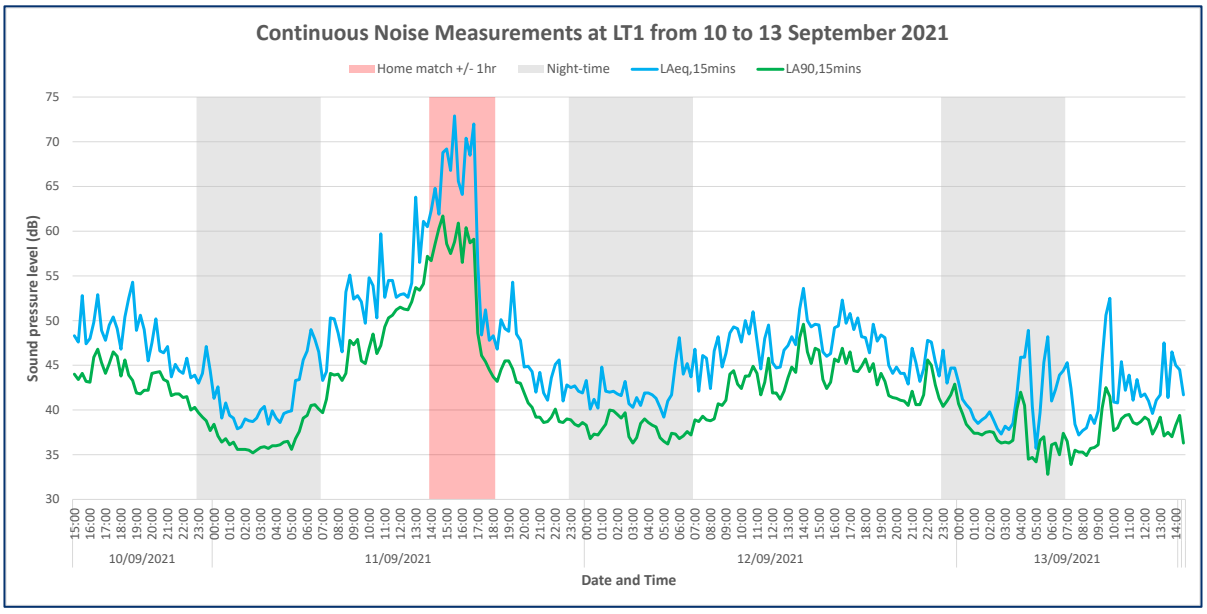


Figure A.2 Unattended measurement results at LT1

A2.5.3 Sample measurements

An overview of the sample noise measurements is presented in Table A.4.

Measurement Position/Description	Start time (Date, hh:ss)	Duration (hh:mm:ss)	Measurement noise level, L_{Aeq} (dB)
1m from temporary generator in SE of grounds	11/09/2021 13:26	00:01:00	77
Wrexrent SW stand music tests	11/09/2021 13:36	00:00:31	84
Wrexrent centre music tests (volume turned down)	11/09/2021 13:38	00:00:30	73
BK Concepts centre music tests	11/09/2021 13:40	00:00:31	85
As above	11/09/2021 13:42	00:00:31	70
BK Concepts concourse music tests	11/09/2021 13:43	00:00:30	80
Kop NE corner music tests	11/09/2021 13:45	00:00:31	70
Kop centre music tests	11/09/2021 13:46	00:00:24	68
Kop centre music tests	11/09/2021 13:46	00:00:31	67
Kop SE generator and music tests	11/09/2021 13:48	00:00:30	70
Hays Travel centre music	11/09/2021 13:49	00:00:30	78
As above at access points with some spectators starting to fill seats	11/09/2021 13:50	00:00:30	81
As above	11/09/2021 13:51	00:00:30	80
As above	11/09/2021 13:52	00:00:30	81
As above	11/09/2021 13:53	00:00:31	80
As above at access points with some spectators starting to fill seats	11/09/2021 13:54	00:01:00	72
SW outside football grounds	11/09/2021 14:02	00:01:00	69
SE outside football grounds	11/09/2021 14:05	00:01:01	73
Wrexham Village car park - noise from hospitality audible	11/09/2021 14:10	00:01:00	55
NW corner between stands, announcements on PA	11/09/2021 14:15	00:00:34	87
Wrexrent NW team announcements, lower seats approx. row E	11/09/2021 14:22	00:00:31	88
As above at access points with some spectators starting to fill seats	11/09/2021 14:24	00:00:31	92
NE corner between stands, Woking warming up, stands filling up	11/09/2021 14:30	00:03:00	73
Wrexrent NW chanting for players returning to tunnel	11/09/2021 14:47	00:00:17	90
Wrexrent NW fans cheering teams coming on, supporters singing	11/09/2021 14:57	00:00:33	99
As above	11/09/2021 14:58	00:00:37	95

Measurement Position/Description	Start time (Date, hh:ss)	Duration (hh:mm:ss)	Measurement noise level, L_{Aeq} (dB)
Wrexrent NW general gameplay, singing, cheering	11/09/2021 14:59	00:00:47	98
As above	11/09/2021 15:01	00:00:16	93
As above	11/09/2021 15:02	00:01:00	91
As above	11/09/2021 15:03	00:00:20	95
As above	11/09/2021 15:04	00:00:44	93
Wrexrent NW corner won for Wrexham	11/09/2021 15:09	00:00:20	95
Wrexrent NW lull in noise with just Away fans singing in BKConcepts stand	11/09/2021 15:12	00:00:32	82
As above	11/09/2021 15:13	00:00:13	85
Wrexrent NW missed attempt at goal for Wrexham	11/09/2021 15:15	00:00:05	96
Wrexrent NW Banging and stamping and clapping	11/09/2021 15:21	00:00:11	92
As above	11/09/2021 15:21	00:00:06	90
Hays Travel Stand centre, general gameplay	11/09/2021 15:33	00:00:12	84
Hays Travel Stand centre, Wrexham Offside	11/09/2021 15:35	00:00:08	93
As above, aftermath	11/09/2021 15:37	00:00:22	79
Hays Travel Stand centre, Goal for Wrexham!	11/09/2021 15:40	00:00:23	111
As above, aftermath	11/09/2021 15:40	00:00:09	95
Halftime in Wrexham Village Car Park	11/09/2021 15:50	00:01:03	58
ST4 halftime - announcements, crowd chatter, some road noise but not dominant	11/09/2021 15:57	00:02:16	64
As above	11/09/2021 15:59	00:01:00	62
ST4 - clapping players back on	11/09/2021 16:01	00:00:09	68
As above	11/09/2021 16:02	00:00:10	70
ST4 - general gameplay	11/09/2021 16:04	00:00:08	66
ST4 - general gameplay with train arrival and departure and pause in gameplay for injury, clapping off for injury (Hays Travel Stand dominant, but Wrexrent and away fans still audible (singing))	11/09/2021 16:06	00:05:00	66
ST4 - cheering for momentum	11/09/2021 16:11	00:00:05	72
ST4 - clapping	11/09/2021 16:12	00:00:17	72

Measurement Position/Description	Start time (Date, hh:ss)	Duration (hh:mm:ss)	Measurement noise level, L_{Aeq} (dB)
ST4 - missed goal	11/09/2021 16:15	00:00:07	77
ST4 - aftermath of above	11/09/2021 16:16	00:00:12	71
ST4 - booing	11/09/2021 16:16	00:00:19	78
ST4 - foul	11/09/2021 16:17	00:00:16	82
ST4 - corner won? west end of pitch not visible	11/09/2021 16:18	00:00:19	82
ST4 - general gameplay	11/09/2021 16:19	00:00:11	70
As above	11/09/2021 16:20	00:00:16	73
As above	11/09/2021 16:20	00:00:10	79
As above	11/09/2021 16:25	00:00:11	76
As above	11/09/2021 16:27	00:00:17	71
ST4 - announcement of capacity (8,242)	11/09/2021 16:29	00:00:17	74
ST4 - general gameplay	11/09/2021 16:30	00:00:12	65
As above	11/09/2021 16:32	00:00:09	72
As above	11/09/2021 16:34	00:00:14	63
ST4 - goal saved by Wrexham	11/09/2021 16:35	00:00:04	77
ST4 - general gameplay	11/09/2021 16:35	00:01:00	74
As above	11/09/2021 16:43	00:00:12	66
As above	11/09/2021 16:46	00:00:21	60
As above	11/09/2021 16:48	00:00:10	79
As above	11/09/2021 16:50	00:00:11	75
As above	11/09/2021 16:50	00:00:09	74
ST4 - Full time cheering	11/09/2021 16:52	00:00:03	80
As above	11/09/2021 16:52	00:00:12	83
As above	11/09/2021 16:52	00:00:25	80
Inside stairwell of Wrexham Village student accommodation with window open	11/09/2021 16:54	00:00:16	61
As above	11/09/2021 16:54	00:00:14	64
SW outside football grounds, crowd leaving	11/09/2021 17:01	00:00:21	66

Table A.4 Sample measurements on match day