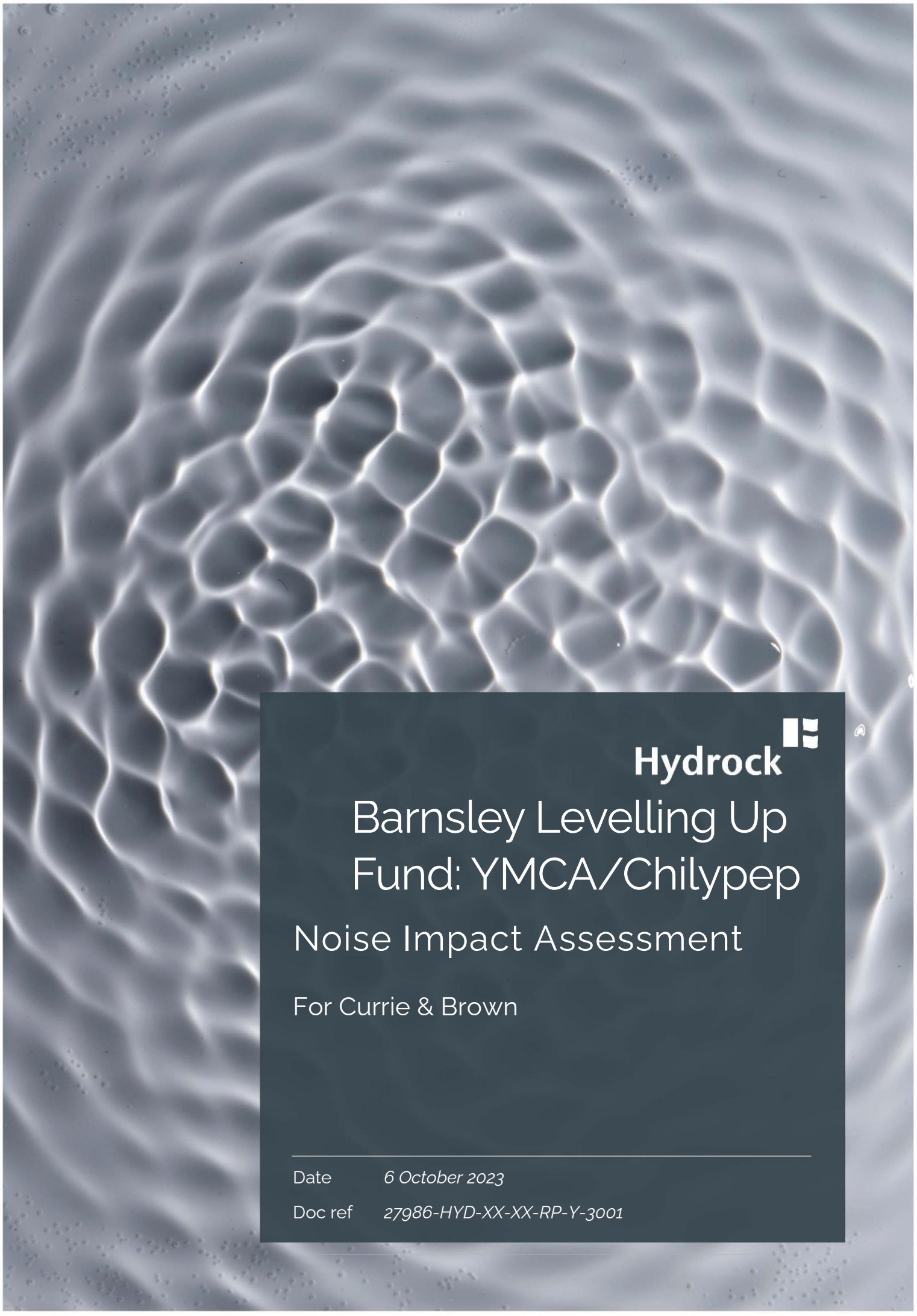

Hydrock

Barnsley Levelling Up Fund: YMCA/Chilypep

Noise Impact Assessment

For Currie & Brown

Date	*6 October 2023*
Doc ref	*27986-HYD-XX-XX-RP-Y-3001*

Document control sheet

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Contents

1. Introduction 1

2. Methodology 2

2.1 Consultation with Barnsley Metropolitan Borough Council 2

2.2 Policy and Guidance 2

3. Noise Survey 3

3.1 Survey Overview 3

3.2 Weather Conditions 3

3.3 Monitoring Locations 3

3.4 Summary of Existing Acoustic Environment 3

3.5 Summary of Measured Noise Levels 4

4. Noise Impact Assessment 5

4.1 Construction Phase Assessment 5

4.2 Operational Phase Assessment 7

5. Mitigation 10

5.1 Construction Phase 10

5.2 Operational Phase 11

6. Conclusion 12

Tables

Table 1 - Measured Daytime and Night-time Noise Levels 4
Table 2: Summary of Typical Maximum Night-time Noise Levels 4
Table 3 - Thresholds of Significant Impacts at Residential Receptors in Accordance with the 'ABC' Method of BS5228-1 5
Table 4: Appropriate Category Value for Existing Sensitive Receptors 6
Table 5: Distance at which Vibration may be Just Perceptible 6
Table 6: Recommended Internal Ambient Noise Levels at North-Eastern Facade 7
Table 7: Facade Level and Minimum Level Difference 8
Table 8: Recommended Internal Ambient Noise Levels at Southern Facade 8
Table 9: Recommendations for Plant Noise Limits at Receptor Locations 9

Figures

Figure 1 - Site Plan (New Car Park) 13
Figure 2 – Site Plan (New Entrance) 14
Figure 3 – Site Plan (Updated Changing Rooms) 15
Figure 4 - Monitoring Locations 16

Appendices

Appendix A *Glossary*

Appendix B *Policy and Guidance*

Appendix C *Noise Survey Results*

Appendix D *Noise Rating Curves*

1. Introduction

Hydrock have been commissioned to undertake a noise impact assessment in support of a planning application the construction of a new entrance and the refurbishment of parts of the existing YMCA building ('Proposed Development'), on land bound by Pitt Street and Blucher Street, S70 1AP, Barnsley (the 'Site').

The Proposed Development will include a new entrance which will facilitate access to the YMCA sports hall from the car park in the southern part of the Site. All features to be altered as part of the refurbishment are as follows:

- Sports Hall changing facilities, WC facilities and internal finishes (floors, walls, ceilings),
- HVAC, windows and doors,
- Electrical distribution to 6nr commercial units (independently metered), to enable solar PV and the installation of automatic doors,
- Heating and plumbing distribution to 6nr commercial units (independently metered) and Chilypep areas,
- Heating system,
- Car park surface,
- Car park layout,
- Kitchen facilities,
- Existing façade,
- Electrical supply to Community Hall (separate utilities for both buildings),
- Entrance ramp and entrance doors to Chilypep Blucher St. entrance.

The Site is bordered by the commercial properties the north west, with Pitt Street beyond. To the north east, the Site is bordered by commercial properties, with Blucher Street beyond. To the east the Site is bordered by Blucher Street. To the south and west, the Site is bordered by West Way (A628).

This noise impact assessment has been carried out, together with a baseline noise survey, in order to determine the noise mitigation requirements for the Proposed Development, during the construction phase and operational phase.

This report is technical in nature, therefore a glossary is provided in **Appendix A.**

2. Methodology

This assessment considers the following:

- Potential noise and vibration impacts during the demolition and construction phase, at Existing Sensitive Receptors (ESRs), in accordance with BS 5228. Threshold values are provided to be implemented via a Construction Environmental Management Plan;
- Potential impacts associated with road traffic noise at the Proposed Development, in accordance with BS8233 and WHO guidance;
- Potential noise impacts associated with existing industrial/commercial sources at the Proposed Development, in accordance with BS4142; and,
- Potential noise impacts from proposed industrial noise sources associated with the development at the nearest ESRs and proposed sensitive receptors, in accordance with BS4142;

The assessment detailed in this report has been prepared with reference to the Site's draft designs, provided by Currie & Brown in Project Management Client Brief (dated 22nd June 2023) and shown in Figure 1 to Figure 3 of this report.

2.1 Consultation with Barnsley Metropolitan Borough Council

The proposed noise survey and assessment methodology was agreed in principle with Adam Cattell (Environmental Health Officer – Pollution Control) of Barnsley Metropolitan Borough Council (BMBC), via email dated 20th July 2023.

2.2 Policy and Guidance

The following current policy and guidance documents are considered to be relevant for this assessment:

- National Planning Policy Framework, 2021 (NPPF);
- Noise Policy Statement for England 2010 (NPSE);
- Planning Practice Guidance – Noise, 2019 (PPG);
- World Health Organisation (WHO) Guidelines for Community Noise, 1999;
- BRE Controlling particles, vapour and noise pollution from construction sites, Parts 1 to 5, 2003;
- British Standards 5228-1 & 2: 2009 + A1:2014 Code of practice for noise and vibration control on construction and open sites (BS5228);
- British Standard 8233: 2014 Guidance on sound insulation and noise reduction for buildings (BS8233);
- British Standard 4142: 2014 Methods for rating and assessing industrial and commercial sound (BS4142); and,
- Building Bulletin 93: Acoustic Design of Schools Performance Standards, 2015 (BB93).

A summary of key policy and guidance documents is provided in **Appendix B.**

3. Noise Survey

3.1 Survey Overview

A noise survey was undertaken at the Site, between the 10th and 11th August 2023.

Noise measurements were carried out using Class 1, integrating sound level meters. Microphones were positioned outside of windows approximately 1m from the existing building façade, as stated in the relevant tables.

The sound level meters were calibrated to a reference level of 94 dB at 1kHz both prior to and on completion of the noise survey. No significant drift in calibration was noted during the survey (≤ 0.5 dB).

3.2 Weather Conditions

All noise monitoring took place during dry and calm conditions, with wind speeds less than $5ms^{-1}$ and no precipitation. Met Office data from the closest station, in conjunction with observations made during setup and decommissioning of the noise monitoring equipment, is summarised as follows:

- Temperatures ranging between 14˚C and 25˚C;
- Sunny spells and occasional cloud;
- No precipitation;
- Wind speed varying between 1 and $5ms^{-1}$; and,
- Dry ground.

3.3 Monitoring Locations

Monitoring Locations (MLs) are presented in Figure 4 and summarised as follows:

- **ML1** – Unattended 24-hour noise monitoring at north-eastern boundary of the Site, outside of an existing office window at first floor level, approximately 1m from the façade and 6m (diagonal distance) from the carriageway of Blucher Street to the east. This location was selected to capture representative road traffic noise levels incident on the eastern facade of the Proposed Development.
- **ML2** – Unattended 24-hour noise monitoring at southern boundary of the Site, outside of an existing conference room window at first floor level, approximately 1m from the façade and approximately 40m (perpendicular distance) from the carriageway of the A628. This location was selected to establish background noise levels at the nearest existing sensitive receptors on Nelson Street.

3.4 Summary of Existing Acoustic Environment

Observations made during the survey and a review of audio recordings identified the following noise sources contributing to the noise climate at the Site:

Road Traffic: Road traffic noise from Blucher Street, Pitt Street, and the surrounding road traffic network was dominant during the daytime and night-time periods at ML1.

Commercial Noise: At ML2 in the southern part of the Site, existing plant noise was present, continuous in nature, and dominant throughout the survey. Road traffic noise from the A628 was also prominent at rush hour in the daytime.

Other Sources: Birdsong was occasionally audible in the early hours of the morning and late evening across the Site.

3.5 Summary of Measured Noise Levels

Measured noise levels have been separated in to daytime (0700 to 2300 hours) and night-time (2300 to 0700 hours) categories, in accordance with current guidance, where appropriate. A summary of measured noise levels over the full monitoring period is provided in **Appendix C.**

A summary of measured baseline façade noise levels is provided in Table 1.

Table 1 - Measured Daytime and Night-time Noise Levels

Monitoring Location	Time Period	Measured Noise Level, $L_{Aeq,T}$ dB
ML1	0700 – 2300	61
	2300 – 0700	57
ML2	0700 – 2300	56
	2300 – 0700	54

The typical measured night-time L_{AFmax} noise levels are summarised in Table 2, which are representative of the 10th highest night-time $L_{AFmax,1min}$ in accordance with BS8233. The noise events were typically caused by vehicle movements on the adjacent roads.

Table 2: Summary of Typical Maximum Night-time Noise Levels

Monitoring Location	Typical Night-time L_{AFmax} dB
ML1	75
ML2	64

4. Noise Impact Assessment

4.1 Construction Phase Assessment

4.1.1 Noise from Construction Activities

During the construction phase, any works carried out at the Proposed Development has the potential to generate noise that may propagate beyond the Site boundary.

At this stage, detailed information pertaining to site specific demolition and construction activities are not known. Activities at the Site, which could give rise to potential noise impacts typically include (but are not limited to):

- Earthworks e.g. excavators, breakers, vibratory rollers; and,
- Construction of the Proposed Development including piling, construction of access roads, fabrication processes e.g., planning, sanding, routing, cutting, drilling and laying foundations.

The contractor undertaking the construction works has not yet been appointed. However, it is considered that the enabling and construction works are likely to be restricted to standard daytime working hours, i.e., between 0800 and 1700 Monday to Friday, 0900 to 1200 on a Saturday, with no work on Sundays or Bank Holidays.

The appropriate noise impact threshold category has been determined for each nearby sensitive receptor, based on measured daytime ambient noise levels, in accordance with 'The ABC Method' provided in BS5228-1 as detailed in Table 3.

Table 3 - Thresholds of Significant Impacts at Residential Receptors in Accordance with the 'ABC' Method of BS5228-1

Assessment Category Threshold Value	Threshold Value, dB		
	Category A *1	Category B *2	Category C *3
Weekday Daytime (07:00 to 19:00) and Saturdays (07:00 to 10:00)	65	70	75

1 Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than this value.

2 Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.

3 Category C: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are more than this value.

Table 4 identifies the appropriate category value in order to determine whether a significant noise impact has occurred, at existing sensitive receptors, during earthworks and construction.

Table 4: Appropriate Category Value for Existing Sensitive Receptors

Description of Receptor	Average Measured Daytime Level, dB L_{Aeq}, T	Rounded Daytime Level to the Nearest 5 dB(A)	Appropriate Category Value, according to BS5228-1	Significant Noise Impact Threshold, dB $L_{Aeq, T}$
Existing Sensitive Receptors to the South (Nelson Street)	56	55	A	65

4.1.2 Vibration from Demolition and Construction Activities

Structural damage to buildings associated with groundborne vibration is uncommon, and although vibration may be noticeable, there is little evidence to suggest that cosmetic damage (such as a crack in plaster) can occur, unless the magnitude of the vibration is high. The most likely impact, where elevated levels of vibration do occur, during the earthworks and construction phases of development, is associated with perceptibility i.e., potential annoyance.

Where groundborne vibration is of a relatively continuous nature, there is a greater likelihood of structural damage occurring, compared to transient vibration. The only current national guidance document which provides a methodology for predicting levels of vibration from construction activities is BS5228- 2. The prediction method provided relates specifically to percussive, or vibratory, rolling and piling only.

Therefore, it is not possible to accurately predict levels of vibration during the Site preparation and the construction phase of Development at this stage, due to lack of information regarding the type of piling to be used. However, vibration impacts during Site activities other than piling are uncommon. As such, to control the impact of vibration during Site preparation and construction of a Development, limits relating to the perceptibility of vibration are typically set.

As stated in BS5228-2 and as generally accepted, the threshold of vibration perception for humans is typically in the Peak Particle Velocity (PPV) range of 0.14 mms^{-1} to 0.3mms^{-1}, which forms the basis of the recommend maximum permitted vibration levels of 1 mms^{-1} PPV within occupied residential dwellings.

Table 5 sets out the distances (based on historical field measurements) at which certain activities could give rise to a just perceptible level of vibration.

Table 5: Distance at which Vibration may be Just Perceptible

Construction Activity	Distance from Activity at which Vibration may be Just Perceptible, metres
Excavation	30
Heavy Vehicles (e.g. Dump Trucks)	20

Notes: Vibration source data has been taken from DM Hiller and GI Crabb ' Groundborne vibration caused by mechanised construction works' and extrapolated to provide distance bounds. It should be noted that vibration is significantly variable and therefore these should be used as a guide only.

The nearest existing sensitive receptors to the proposed construction work, would vary depending upon the part of the Proposed Development under construction. As a worst-case scenario, construction works may potentially take place directly adjacent to existing residential receptors to the west of the Site, on Nelson Street.

At this location, it is likely that vibration due to the operation of construction machinery and heavy vehicles would be perceptible and therefore existing residents of the properties may occasionally experience some level of impact during intensive processes, however, it is considered that heavy plant will be very limited for the Proposed Development given it largely comprises a refurbishment and this would also be for very limited periods of time.

Vibration levels expected to occur would be significantly less than that required to cause any structural damage to surrounding buildings. Notwithstanding, methods of best practice should be implemented with regards to minimising potential vibration levels generated during the earthworks and construction period.

Any required mitigation measures for the control of construction work noise and vibration should be implemented via a suitably worded Construction Environmental Management Plan (CEMP). Further guidance is provided in the Mitigation section.

4.2 Operational Phase Assessment

4.2.1 Assessment of Noise at Proposed Development

The existing acoustic environment is dominated by road traffic noise at ML1 in the daytime, at the north-eastern façade of the Proposed Development.

However, at ML2, at the southern facade of the Proposed Development, the existing acoustic environment is comprised of road traffic noise and existing plant noise from Morrisons to the south; where plant noise is continuous in nature and dominant between peaks in road traffic noise.

Therefore, in order to provide a robust assessment, the potential noise impacts at the Proposed Development are considered as follows:

- Existing road traffic noise within rooms on the north-eastern façade of the Proposed Development; and,
- Existing road traffic and fixed plant noise within rooms on the southern façade of the Proposed Development.

Rooms at North-Eastern Facade

For rooms at the north-eastern façade, noise levels have been compared to the guideline internal ambient noise level values provided in BB93, as shown in Table 6,

Table 6: Recommended Internal Ambient Noise Levels at North-Eastern Facade

Room in Proposed Development	Room Type	Guidance	Upper Design Limit dB $L_{Aeq, T}$
Changing Rooms	Changing Area	BB93	55
Toilets	Toilet	BB93	55

The noise levels incident upon the facades of the Proposed Development during the daytime, together with the minimum composite level difference in order to achieve appropriate internal daytime noise levels, is presented in Table 7.

Table 7: Facade Level and Minimum Level Difference

Receptor	Daytime Façade Level, $L_{Aeq,T}$ dB	Minimum Composite Level Difference of the facade, D_w, dB
North-Eastern Facade	61	6

The maximum required level difference to achieve the recommended internal noise levels is 6 dB. This level of attenuation can typically be achieved via partially open windows. Therefore, there are no specific glazing/ventilation requirements, with regards to noise ingress for rooms at the north-eastern facade.

Rooms at Southern Facade

For rooms at the southern façade, the guideline internal ambient noise level values recommended by BS8233 are summarised in Table 8.

Table 8: Recommended Internal Ambient Noise Levels at Southern Facade

Room in Proposed Development	Room Type	Guidance	Upper Design Limit dB $L_{Aeq,T}$
New Entrance	Corridor	BS8233	55
Kitchen	Kitchen	BS8233	55

The measured octave band noise level spectrum of existing road traffic and plant noise at the southern façade of the Proposed Development forms the basis of a Noise Rating (NR) assessment, in accordance with BS8233. This methodology typically applies to noise from building services only, however it is considered to provide a robust assessment of potential noise impacts in this case, as road traffic noise is dominant for some of the time.

Internal noise levels within rooms on the southern façade have been assessed assuming 15dB attenuation through partially open windows, in order to provide a robust evaluation of internal noise levels and the possibility of annoyance.

Appendix D shows the predicted internal noise levels within rooms on the southern facade achieve NR38, when considering 15dB attenuation through an open window, with an overall internal ambient noise level of 41 dB(A). This is considered to provide a very good standard for the proposed room types shown in Table 8.

Therefore, no specific mitigation is required.

4.2.2 *Proposed Car Parking Noise at Existing Sensitive Receptors*

The proposed car park is situated at the southern boundary of the Site, adjacent to residential dwellings to the west of the site, and will introduce approximately 14 additional spaces for the Proposed Development.

The existing daytime noise level in the vicinity of residential dwellings adjacent to the proposed car park is 56dB and is dominated by road traffic noise from the A628 and plant noise from Morrisons to the south, as measured at ML2. The introduction of 14 parking spaces will result in relatively low average noise levels from the car park and is considered to have a negligible impact on the acoustic environment, in terms of both character and level.

The Proposed Development will typically only be in use during the daytime, therefore noise associated with distinct noise events at the car park, i.e., closing car doors, starting engines, will have negligible impact.

Therefore, its considered that no specific mitigation measures are required, with regards to the proposed car park.

4.2.3 *Atmospheric Plant Noise at Existing Sensitive Receptors*

At this stage, specific plant provisions are not known. However, the design scope includes replacement of HVAC, installation of a new heating system and refurbishment of the kitchen. Therefore, guideline noise limits have been established based on the measured background sound levels and BS4142 guidance, to avoid any significant noise impact.

Plant noise limits have been established based on the measured daytime and night-time background levels at ML2, which are representative of the nearest ESRs. Because of the presence of existing plant noise, limits have been set at 10 dB below background level to reduce the potential for 'background creep' overtime at nearby sensitive receptors. Therefore, the plant noise limits presented in Table 9 are considered to provide a robust threshold level for plant noise at existing dwellings.

The plant noise limits presented for the daytime and night-time periods in Table 9 apply to the specific sound level of all plant and ancillary equipment associated with the Proposed Development, with the exception of emergency plant, and should not be exceeded at 1m from the nearest residential property on Nelson Street.

Table 9: Recommendations for Plant Noise Limits at Receptor Locations

Period	Existing Background Levels, dB $L_{A90,T}$ dB	Plant Noise Limit, dB $L_{Aeq,T}$
Daytime (07:00 to 23:00 hrs)	53	43
Night-time (23:00 to 07:00 hrs)	52	42

The above plant noise limits would ensure that any noise from fixed plant does not exceed the background level. However, the magnitude of impact depends upon the context and not only upon the comparison of rating and background noise levels, therefore these levels are intended to provide a guideline at this stage.

Assessment of plant noise should be carried out by a suitably qualitied engineer during Technical Design.

5. Mitigation

5.1 Construction Phase

5.1.1 Noise from Construction

To reduce the potential impact of noise levels generated by the construction phase of the Proposed Development at ESRs, mitigation measures will be required.

Best working practice will be implemented during each construction phase at the Site. The works will follow the guidelines in BS5228-1 and the guidance in BRE Controlling particles, vapour and noise pollution from construction Sites, Parts 1 to 5, 2003.

The following measures should be put in place to minimise noise emissions:

- When works are taking place within close proximity to those sensitive receptors identified, screening of noise sources by temporary screen may be employed;
- All plant and machinery should be regularly maintained to control noise emissions, with particular emphasis on lubrication of bearings and the integrity of silencers;
- Site staff should be aware that they are working adjacent to a residential area and avoid all unnecessary noise due to misuse of tools and equipment, unnecessary shouting and radios;
- A further measure to reduce noise levels at the sensitive receptors would include, as far as possible, the avoidance of two noisy operations occurring simultaneously in close proximity to the same sensitive receptor;
- Adherence to any time limits imposed on noisy works by the local authority;
- Specification of working hours during the week and at weekends;
- Ensure engines are turned off when possible;
- Should earthworks/earthworks and construction activities need to be carried out during night-time hours, the local authority could include a planning condition which requests advance notice and details of any night working to provided; and,
- A clear Site notice board should be accessible to residents with a point of contact on Site responsible for ensuring and complaints are addressed expediently.

The above methods of best practice should be implemented, together with specification of the threshold level limit outlined in the construction phase assessment, via a suitably worded CEMP, to be provided by the contractor.

5.1.2 Vibration from Construction

It is considered that mitigation will not be required to control vibration from construction work however to keep ground borne vibration to a minimum the following measures, as referred to in BS5228-2, should be put in place:

- Substitution: Where reasonably practicable, plant and or methods of work likely to cause significant levels of vibration at the receptors identified, should be replaced by less intrusive plant/methods of working; and
- Vibration Isolation of plant at source: This may prove a viable option where the plant is stationary (e.g. a compressor, generator) and located close to a receptor.

Should piling be required, where possible, CFA piling method should be selected. CFA piling is a relatively low risk compared to traditional percussive piling, in terms of vibration levels. BS 5228-2

does not contain empirical predictors for CFA piling in Table E.1, or any case study data. Section F.3.2.4 of B2 5228-2 states the following:

> *"F.3.2.4. Continuous flight auger injected piling and pressed-in piling*
>
> *The levels of vibration associated with continuous flight auger injected piling and pressed-in piling are minimal, as the processes do not involve rapid acceleration or deceleration of tools in contact with the ground but rely to a large extent on steady motions. Continuous vibrations at a low level could be expected from the prime movers."*

Detail of the above measures and any other recommendations for the control of vibration, should be included within the CEMP, to be provided by the contractor.

5.2 Operational Phase

5.2.1 Noise at Proposed Development

No specific mitigation is required to achieve suitable internal noise levels within the Proposed Development, in accordance with BB93 and BS8233 guidance. A satisfactory level of attenuation can be achieved with any practical form of construction methodology, with partially open windows used as the primary form of background ventilation.

5.2.2 Noise from Proposed Car Park

No specific mitigation measures are required, as the likelihood of adverse impacts at the nearest ESRs is low.

5.2.3 Noise from any Proposed Fixed Plant

Plant noise limits have been set at 10 dB below the background levels at ML1 during the daytime and night time period; 43 dB and 42 dB respectively. These levels are intended to provide a guideline at this stage.

Further review of atmospheric noise emissions from plant/ancillary equipment should be conducted by a suitably qualitied engineer during Technical Design.

6. Conclusion

Hydrock have carried out a Noise Impact Assessment to support of a planning application for the refurbishment of the YMCA/Chilypep, Barnsley.

A survey has been carried out at the Site to support the assessment, which considers the potential for impact during the construction and operational phase.

Based on the results of the survey, Existing Sensitive Receptors (ESRs) in the vicinity of the Site are classified as 'Category A' in accordance with BS5228-1. Therefore, the level above which construction phase noise may cause significant impact at is 65 dB L_{Aeq}.

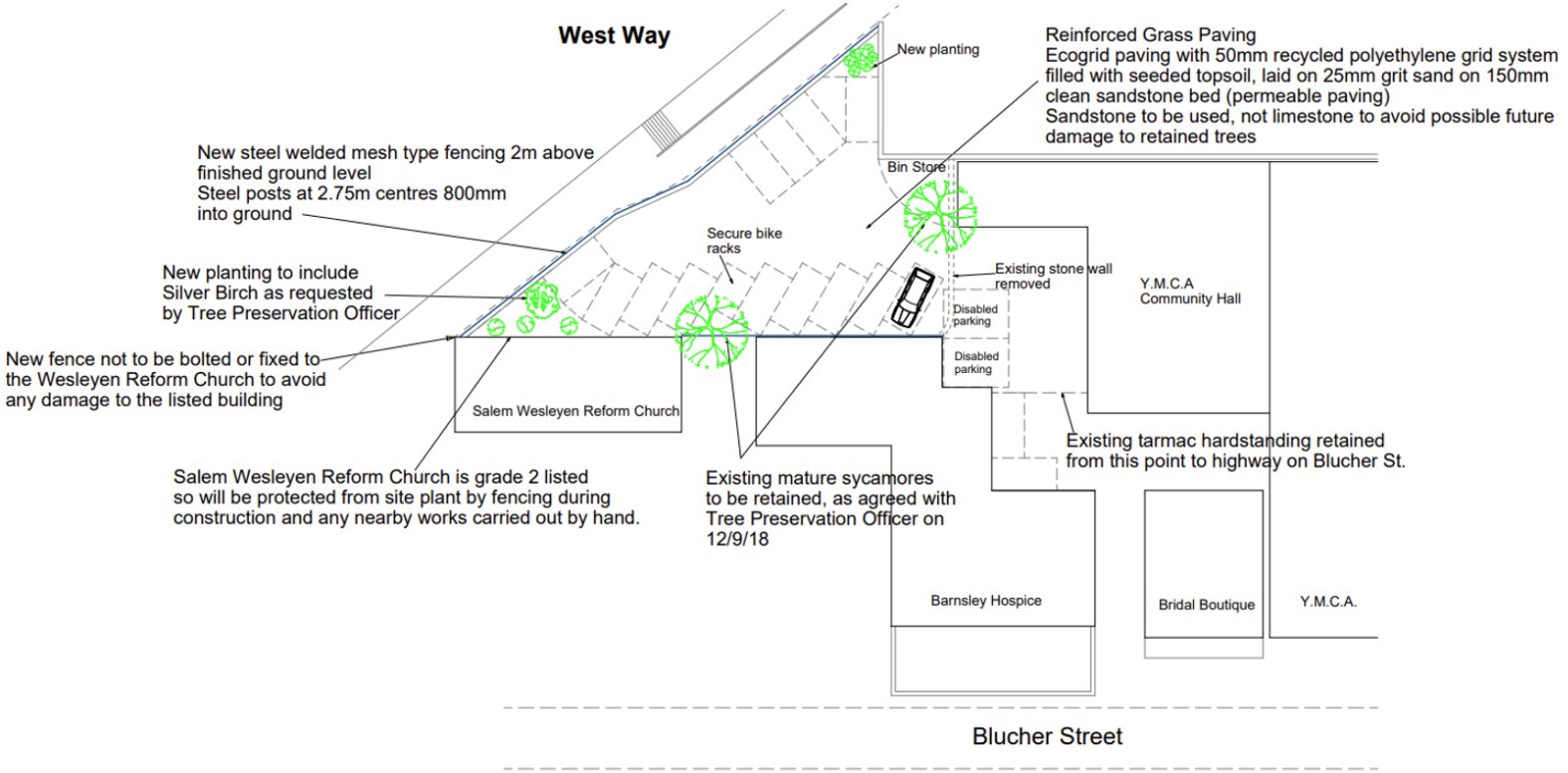
An appraisal of the potential for construction phase vibration impacts has been carried out in accordance with BS5228-2, and, if excavation or heavy machinery is used, vibration is likely to be perceptible at receptors. However, if suitable substitutions to plant are made, this not likely to generate an unacceptable response at ESRs.

Methods to mitigate construction noise and vibration have been set out to reduce the potential for impacts in this report. The recommendations should be adhered to and implemented via a suitably worded Construction Environmental Management Plan (CEMP).

All of the features of the Proposed Development and their potential for noise impact on ESRs have been considered. The new car park has been identified as a potential noise source which could impact adjacent receptors to the west. However, it has been determined that the car park will have a negligible impact on the acoustic environment both in terms of character and level, therefore no mitigation is required.

Assessment of façade noise levels from both existing road traffic and existing plant noise, at the north-eastern and southern facades respectively, showed that internal ambient noise levels in all new, or refurbished, rooms would be below the recommended criteria in BB93 and BS8233 with windows open and with any practical form of construction. This indicates a low potential for noise impact, and therefore there are no specific requirements for insulation in the external building fabric.

Specific noise limits for ancillary plant have been established in order to reduce the potential for an adverse noise impact at existing and proposed sensitive areas around the Site in accordance with BS4142. Plant noise should be reviewed by a suitably qualified acoustic engineer during Technical Design, to ensure suitable noise control measures are implemented as and where appropriate.



Proposed Site Plan

Scale 1:500

N

KEY

N/A

NOTES

DRAFT DESIGN FROM CURRIE & BROWN PROJECT MANAGEMENT DESIGN BRIEF

REVISIONS

FIRST ISSUE

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CLIENT

CURRIE & BROWN

PROJECT

BARNSLEY LEVELLING UP: YMCA/CHILYPEP

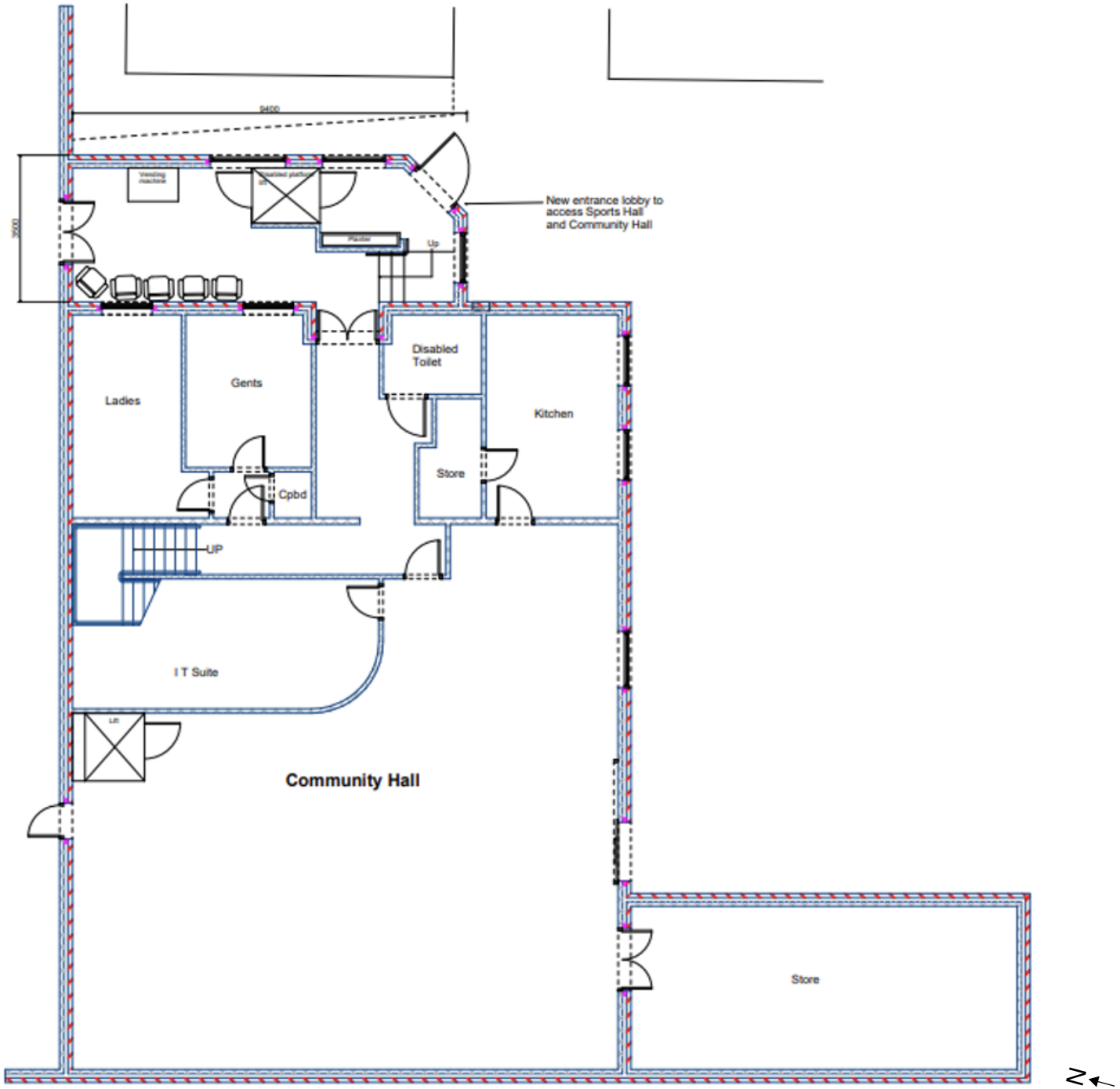
TITLE

FIGURE 1 -
SITE PLAN (NEW CAR PARK)

HYDROCK PROJECT NUMBER	SCALE
27986	N/A

PURPOSE	STATUS
FOR INFORMATION	S2

DRAWING NO.	
27986-HYD-XX-XX-Y-DR-3001	P01



Proposed Ground Floor Plan

KEY

N/A

NOTES

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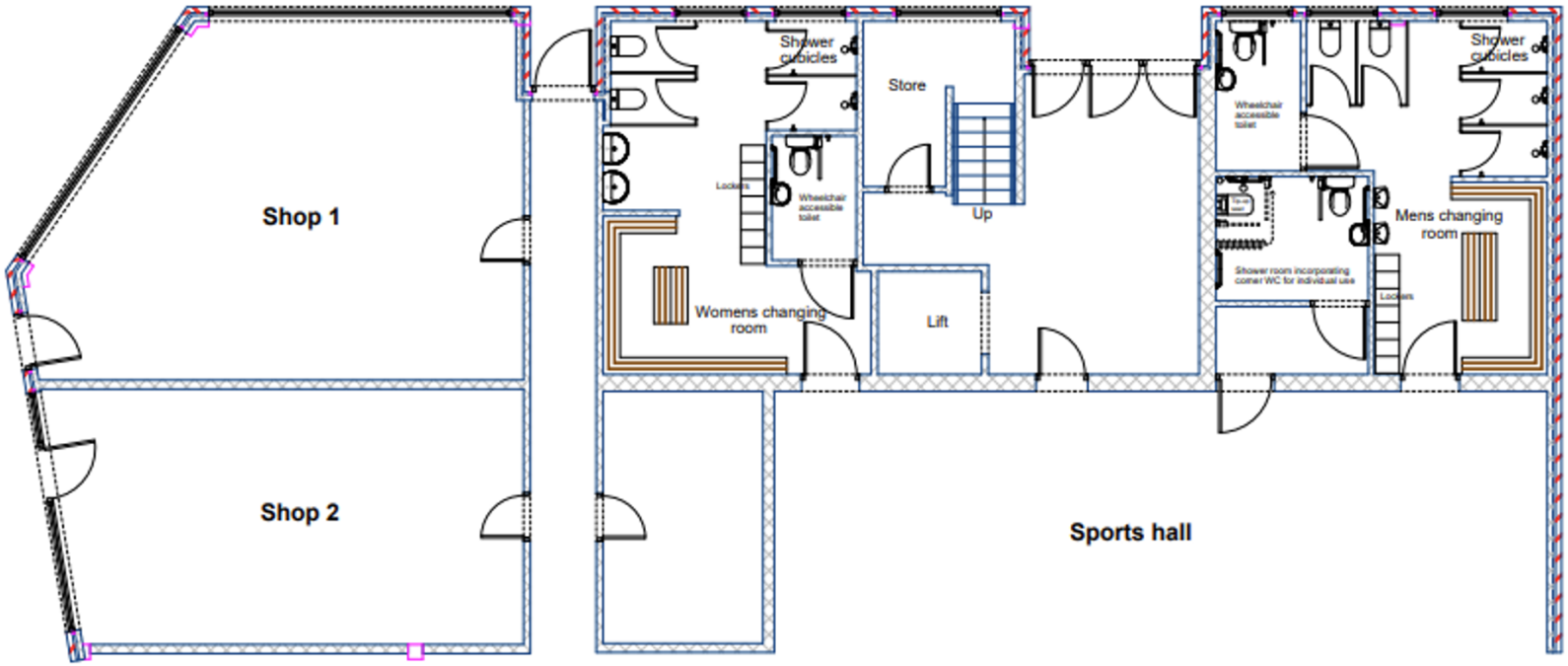
TITLE

FIGURE 2 -
SITE PLAN (NEW ENTRANCE)

HYDROCK PROJECT NUMBER	SCALE
27986	N/A

PURPOSE	STATUS
FOR INFORMATION	S2

DRAWING NO.	
27986-HYD-XX-XX-Y-DR-3002	P01



Proposed Ground Floor Changing Rooms Layout

N

KEY

N/A

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TITLE

FIGURE 3 - SITE PLAN (UPDATED CHANGING ROOMS)

HYDROCK PROJECT NUMBER	SCALE
27986	N/A

PURPOSE	STATUS
FOR INFORMATION	S2

DRAWING NO.	
27986-HYD-XX-XX-Y-DR-3003	P01

KEY

APPROXIMATE SITE BOUNDARY

MONITORING LOCATION

EXISTING SENSITIVE RECEPTOR

NOTES

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BARNSLEY LEVELLING UP: YMCA/CHILYPEP

TITLE

FIGURE 4 - MONITORING LOCATIONS AND EXISTING SENSITIVE RECEPTORS

HYDROCK PROJECT NUMBER	SCALE
27986	N/A

N

PURPOSE	STATUS
FOR INFORMATION	S2

DRAWING NO.	
27986-HYD-XX-XX-Y-DR-3004	P01

Appendix A Glossary

Term	Description
dB (decibel)	The scale on which sound pressure level is expressed. Sound pressure level is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ($2x10^{-5}$Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' - weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq,T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L_{Amax}	L_{AFmax} is the maximum A - weighted sound pressure level recorded over the period stated. L_{AFmax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L_{10} and L_{90}	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The Ln indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L10 is the level exceeded for 10% of the time, and the L90 is the level exceeded for 90% of the time.
R_w	R_w is the single-number quantity which characterizes the sound insulating properties of a given material over a range of frequencies. This is typically measured in a laboratory in accordance with BS EN ISO 717-1.
$D_{n,e,w}$	$D_{n,e,w}$ is the single number quantity which characterizes the airborne sound insulation performance across a given 'element' and is typically used to describe the acoustic performance of trickle ventilators etc.
C_{tr}	C_{tr} is a correction term applied to single-number sound insulation values (R_w, $D_{n,e,w}$ etc.) to afford additional weighting against low frequency performance.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally, as measured outside and at least 3m from buildings.

Appendix B Policy and Guidance

National Planning Policy Framework (NPPF)

Published in February 2021, this document sets out the Government's planning policies for England and supersedes the previous version of the NPPF published in 2019. It makes the following reference to noise in the section entitled Conserving and enhancing the natural environment:

> *"170. Planning policies and decisions should contribute to and enhance the natural and local environment by:*
>
> *[…]*
>
> *e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans."*

It also makes the following references to noise in the Section entitled Ground conditions and pollution:

> *"180. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*
>
> *a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life60;*
>
> *b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*
>
> *60 See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010)."*

And

> *"182. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."*

Noise Policy Statement for England (NPSE)

Published in March 2010, the Noise Policy Statement for England (NPSE) sets out the long-term vision of Government noise policy as follows:

> *"Promote good health and good quality of life through the effective management of noise within the context of Government policy on sustainable development."*

The NPSE identifies three observed effect levels, names "No Observed Effect Level" (NOEL), "Lowest Observed Adverse Effect Level" (LOAEL) and "Significant Observed Adverse Effect Level" (SOAEL).

The NPSE contains little detail on assessment methodologies and specific parameters at which the varying observed effect levels would occur in the context of a residential development.

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

As discussed above, there is no specific guidance contained within the Planning Condition and the NPSE. In lieu of this, the approach that is generally adopted when assessing environmental noise sources on residential developments is to undertake an assessment in accordance with BS 8233: 2014.

BS 8233 provides guidance for the control of noise in and around buildings. The guidance provided within the document is applicable to the design of new buildings, or refurbished buildings undergoing a change of use, but does not provide guidance on assessing the effects of changes in the external noise levels to occupants of an existing building. The guidance provided includes appropriate internal and external noise level criteria which are applicable to dwellings for steady external noise sources. It is stated that it is desirable that the internal ambient noise level does not exceed the following criteria set out in the table below:

Activity	Location	Period	
		Daytime (07:00 to 23:00 hrs)	Night-time (23:00 to 07:00 hrs)
Resting	Living room	$L_{Aeq,16hrs}$ 35 dB	-
Dining	Dining room/area	$L_{Aeq,16hrs}$ 40 dB	-
Sleeping (Daytime resting)	Bedroom	$L_{Aeq,16hrs}$ 35 dB	$L_{Aeq,8hrs}$ 30 dB

Whilst BS 8233:2014 recognises that a guideline value may be set in terms of SEL or L_{AFmax} for the assessment of regular individual noise events that can cause sleep disturbance during the night-time, a specific criterion is not stipulated. Accordingly, reference has been made in this assessment to the World Health Organisation (WHO) 1999: Guidelines for Community Noise below.

With respect to external amenity space such as gardens and patios it is stated that it is desirable that the noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. It is then confirmed that higher external noise criteria may be appropriate under certain circumstances such as within city centres urban areas, and locations adjoining the strategic transportation network, where it may be necessary to compromise between elevated noise levels and other factors such as convenience of living, and efficient use of land resource.

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

As with the 'good' and 'reasonable' criteria in BS 8233, the L_{AFmax} criterion in BS8233 is largely concordant with the World Health Organisation (WHO) guidance 1999: Guidelines for community noise. This document draws upon guidance from Vallet and Vernay, which states:

> *"For good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10-15 times per night"*

BS 4142:2014 - Methods for rating and assessing commercial and industrial sound

BS 4142 describes methods for rating and assessing sound from industrial and manufacturing processes, fixed installations which comprise mechanical and electrical plant and equipment, the loading and unloading of goods and materials at industrial and/or commercial premises and mobile plant and vehicles that are an intrinsic part of the overall sound emanating from premises or processes.

The methods use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

If appropriate, the specific sound level of the source ($L_{Aeq,T}$) is corrected, by the application of one or more corrections for acoustic features to give a 'rating' level ($L_{Ar,Tr}$). The Standard effectively compares and rates the difference between the rating level of the sound and the prevailing background sound level ($L_{A90,T}$). Comparing the rating level with the background sound level, BS 4142 states:

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

BB 93: 2015 – Acoustic Design of Schools: Performance Standards

BB 93 establishes the minimum performance standards for the acoustics of school buildings. The information provided includes appropriate upper limits for indoor ambient noise levels for different types of rooms, whether they are new or refurbished, in terms of LAeq,30mins.

British Standard 5228: 2014 - Code of Practice for noise and vibration control on construction and open sites

Noise from Construction Plant and Vehicles

Guidance on the assessment of noise from development sites is given in British Standard 5228-1:2009+A1:2014 "Code of Practice for noise and vibration control on construction and open Sites – Part 1: Noise" (BS5228-1), and BRE Controlling particles, vapour and noise pollution from construction Sites, Parts 1 to 5, 2003.

In addition to the guidance from the local authority, the Control of Pollution Act 1974 (COPA 1974) gives the local authority power to serve a notice under Section 60 imposing requirements as to the

way in which works are to be carried out. This could specify times of operation, maximum levels of noise which may be emitted and the type of plant which should or should not be used.

However, it might be preferable for the chosen contractor to obtain prior consent under Section 61 of COPA 1974. Section 61 enables anyone who intends to carry out works to apply to the local authority for consent. Under Section 61 the local authorities and those responsible for construction work, have an opportunity to settle any problems, relating to the potential noise, before work starts.

The threshold of potential significant effect at a nearby noise sensitive receptor in accordance with BS5228-1, Annex E, is set out in the table below. The level is based on the ambient noise level at the site, when rounded to the nearest 5dB. The limit value is then compared to the site noise level to determine the potential for effect.

Example threshold of potential significant effect at dwellings			
Assessment Category and Threshold Value Period (LAeq,T)	Threshold Value, in decibels (dB)		
	Category A A)	Category B B)	Category C C)
Night-time (23:00- 07:00)	45	50	55
Evening and weekends D)	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75

Note 1: A potential significant effect is indicated if the LAeq,T noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise levels.

Note 2: if the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total LAeq,T noise level for the period increases by more than 3dB due to site noise.

Note 3: Applied to residential receptors only.

A) Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than this value.

B) Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.

C) Category C: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are more than this value.

D) 19:00 – 23:00 weekdays, 13:00-23:00 Saturdays and 07:00 – 23:00 Sundays.

Vibration from Construction Plant and Vehicles

Human Response to Vibration

Guidance on the assessment of vibration from development sites is given in British Standard 5228-2:2009+A1:2014 "Code of Practice for noise and vibration control on construction and open sites – Part 2: Vibration" (BS5228-2).

For construction, it is considered more appropriate to provide guidance in terms of the PPV, since this parameter is likely to be more routinely measured based on the concern for potential building damage, however, human beings are known to be very sensitive to vibration, with the threshold values of perception being significantly less than those applicable to the potential for structural damage.

The threshold of perception being typically in the peak particle velocity (PPV) range of 0.14 mms^{-1} to 0.3 mms^{-1}. As vibration increase above these values, they can disturb, startle, cause annoyance or interfere with work activities.

BS6472 provides guidance on human response to vibration in buildings. However, BS6472 is based on VDV and weighted acceleration. Furthermore, since many of the empirical vibration predicted yield a result in terms of PPV, it is necessary to understand what the consequences might be of any predicted levels in terms of human perception and disturbance. The BS5228-2 guideline construction PPV values, as measured at receptor locations, are set out in the table below.

Vibration Level A),B),C)	Effect
0.14 mms^{-1}	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mms^{-1}	Vibration might be just perceptible in residential environments.
1.0 mms^{-1}	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10 mms^{-1}	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.

The magnitude of the values presented apply to a measurement position that is representative of the point of entry into the recipient.

A transfer function (which relates to an external level to an internal level) needs to be applied if only external measurements are available.

Single of infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. The values are provided to give an initial indication of potential effects, and where these values are routinely measure or expected then an assessment in accordance with BS6472-1 or -2, and/or other available guidance, might be appropriate to determine whether the time varying exposure is likely to give rise to any degree of adverse comment.

Structure Response to Vibration

Cases where damage to a building has been attributed to the effects of vibration alone are extremely rare; even when vibration has been considered to be intolerable by the occupants. People can detect and be annoyed by vibration before there is any risk of structural damage.

Guidance on the assessment of groundborne vibration on building structures is set out in BS7385-2 and BS ISO 4866:201.

The likelihood of vibration induced damage or nuisance will depend upon the nature of the source, the characteristics of the intervening solid and drift geology and the response pattern of the structures around the site.

Limits for transient vibration, above which cosmetic damage could occur, are given in terms of PPV, in the table below.

Transient vibration guide values for cosmetic damage			
Line (see Figure B.1)	**Type of building**	**Peak component particle velocity in frequency range of predominant pulse**	
		4Hz to 15Hz	**15Hz and above**
1	Reinforced or framed structures Industrial and heavy commercial building	50mm/s at 4Hz and above	50mm/s at 4Hz and above
2	Unreinforced or light framed structures Residential or light commercial buildings	15mm/s at 4Hz increasing to 20 mm/s at 15Hz	20mm/s at 15Hz increasing to 50mm/s at 40Hz and above

Note 1: Values referred to are at the base of the building
Note 2: For line 2, at frequencies below 4Hz, a maximum displacement of 0.6mm (zero to peak) is not to be exceeded.

Minor damage is possible at vibration magnitudes which are greater than twice those in the table, and major damage can to a building structure can occur at values greater than four times the values.

The values in the table are for transient vibration which does not give rise to resonant response in structures. Where the dynamic loading caused by continuous vibration gives rise to dynamic magnification due to resonance, especially in the lower frequencies, then the guideline values may be reduced by up to 50%.

Vibration Dose Value

BS6472-1 provides guidance on human response to vibration in buildings. The assessment of the response to vibration in BS6472-1 is based on Vibration Dose Value (VDV) and weighted acceleration. Human perception to vibration is extremely sensitive. People can detect and be annoyed by vibration long before there is any risk of cosmetic or structural damage.

BS6472-1 provides guidance regarding the significance of VDV within buildings, and at the point of entry to the human body, as summarised in the table below.

Vibration dose value ranges which might results in various probabilities for adverse comment within residential buildings			
Place and Time	**Low Probability of Adverse Comment** $ms^{-1.75}$ [1]	**Adverse Comment Possible** $ms^{-1.75}$	**Adverse Comment Probable** $ms^{-1.75}$ [2]
Residential buildings 16h day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8h night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

[1] Below these ranges adverse comment is not expected

[2] Above these ranges adverse comment is very likely

Re-radiated Noise from Ground-borne Vibration

There are currently no British or international standards setting criteria for the assessment of noise from ground-borne vibration. In the absence of such standards, assessments of noise from ground-borne vibration are based on early proposals for maximum acceptable levels of ground-borne noise published in the USA by the American Public Transit Association (APTA) in the 1880s, which were later developed by The Federal Transit Administration (FTA).

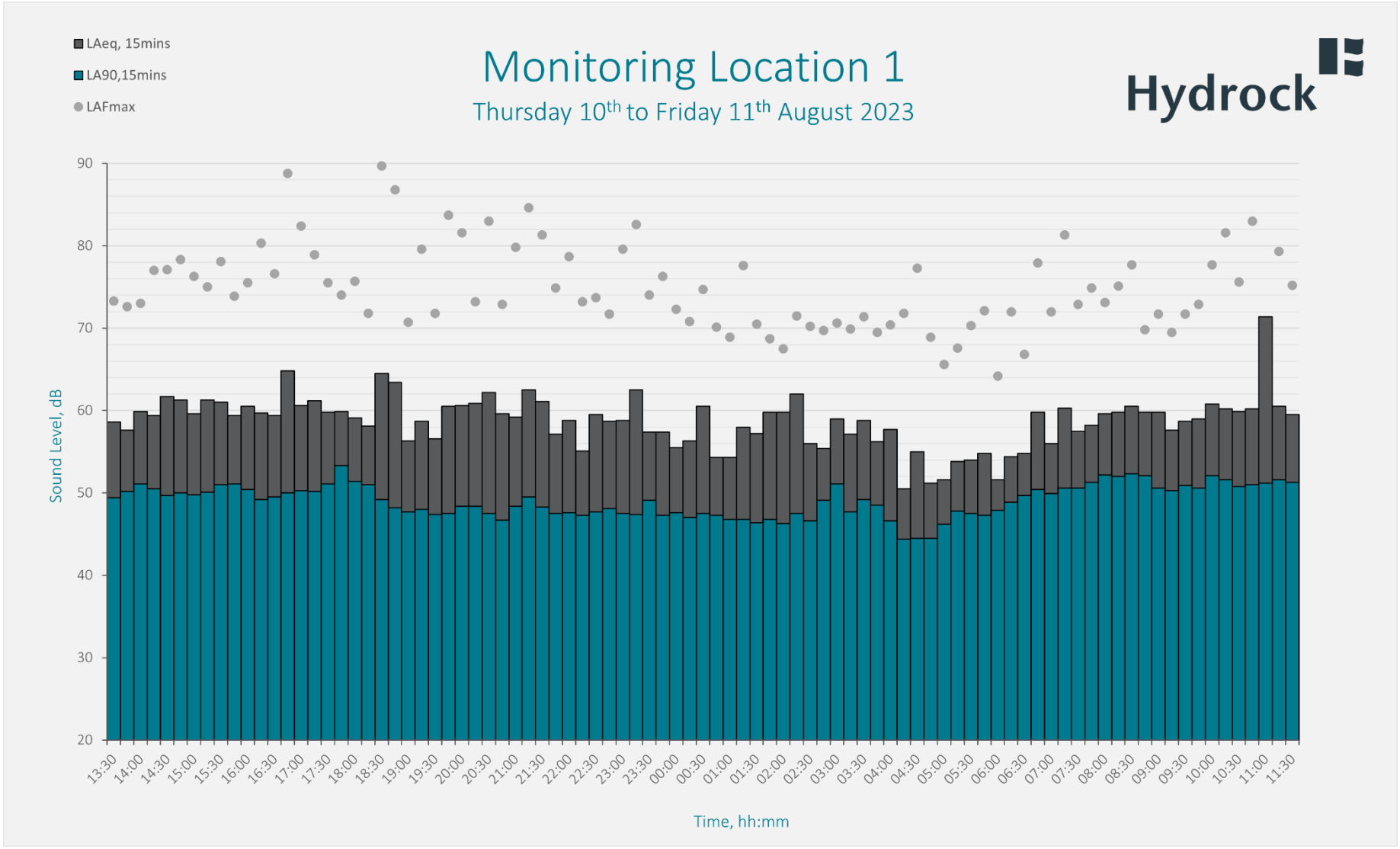
The recommended ground-borne noise impact thresholds for residential environments are provided in the table below. These impact thresholds are based on the early research papers, as adopted for HS2 and similar schemes.

Impact Threshold	dB L_{pASMax}
Lower Threshold	35
Upper Threshold	45

It is generally considered that 40 dB represents a good standard level of reradiated noise, however, in some cases local authorities request a lower limit of 35dB. Where there is no view to the source of vibration, the lower threshold of 35 dB is usually considered applicable (adopted by Crossrail and others). However, where there is a view to the source, a higher criterion is usually applied as occupants will have a visual cue, and airborne noise ingress is likely to take aural precedence over the level of noise arising from structure-borne vibration.

45 dB L_{pASMax} is considered to represent the upper noise level limit for reradiated noise from vibration within a residential setting. This value also corresponds to the guideline night time maximum noise levels permitted with bedrooms, as recommended by health-based guidance BS8233 and WHO Guidelines for community noise. Noise levels above 45 dB should be mitigated and reduced to a minimum.

Appendix C Noise Survey Results


LAeq, 15mins
LA90,15mins
LAFmax
Monitoring Location 1
Thursday 10th to Friday 11th August 2023
Hydrock
Sound Level, dB
90
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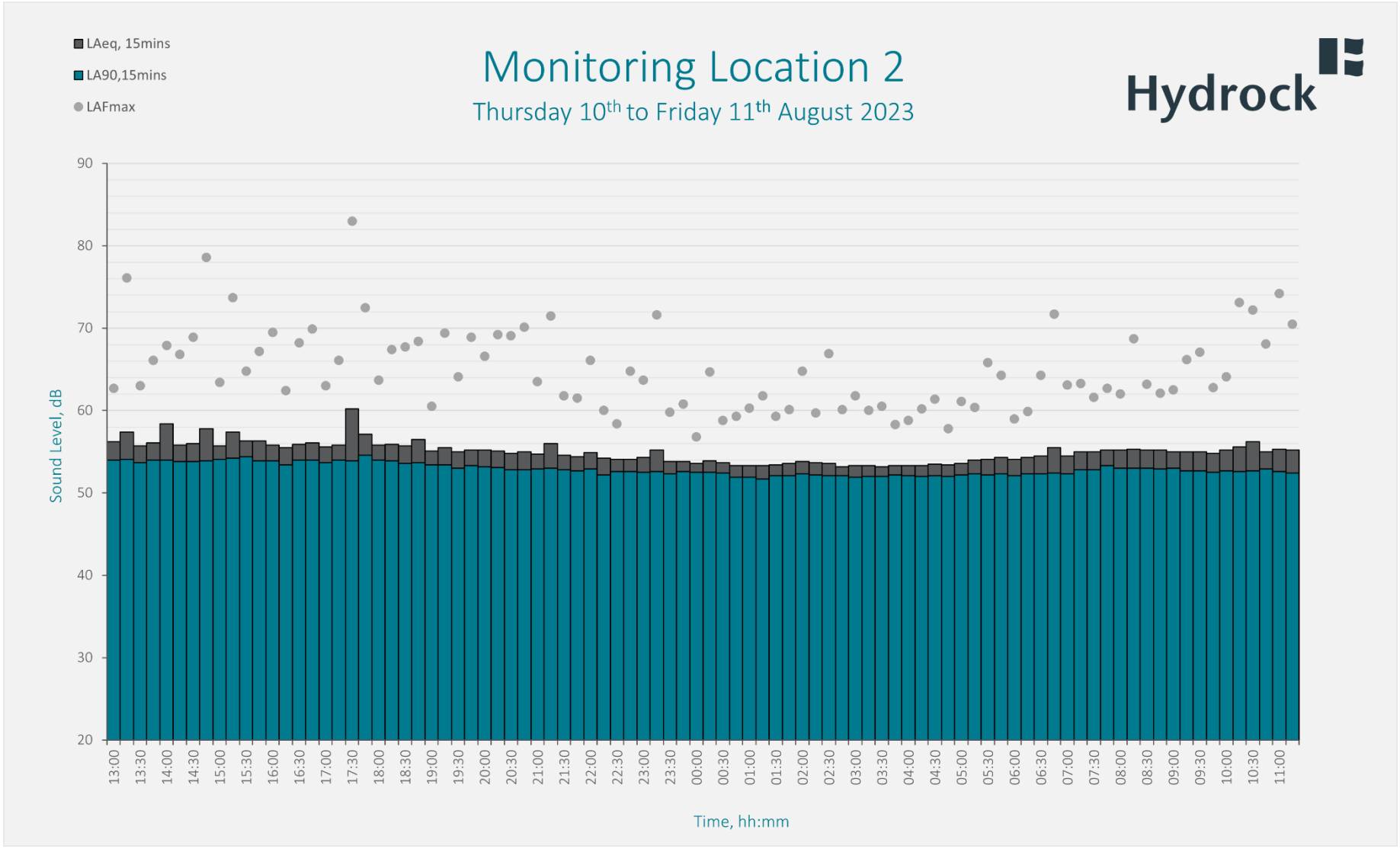
LAeq, 15mins
LA90,15mins
LAFmax
Monitoring Location 2
Thursday 10th to Friday 11th August 2023
Hydrock
Sound Level, dB
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Appendix D Noise Rating Curves

Noise Rating (NR) Curve Assessment

Hydrock

Predicted Internal Noise Impact at Proposed Development

Frequency, Hz	Calculated Noise Level at Receptor Point (1m from Southern Façade of Proposed Development)	Noise Attenuation from Open Window	Resultant Internal Noise Level, dB	NR38	A-Weighted Internal Noise Level, dB(A)
63 Hz	62.8	15.0	47.8	65.4	21.6
125 Hz	57.8	15.0	42.8	55.1	26.7
250 Hz	53.2	15.0	38.2	47.3	29.6
500 Hz	53.8	15.0	38.8	41.4	35.6
1 kHz	52.0	15.0	37.0	38.0	37.0
2 kHz	43.9	15.0	28.9	35.1	30.1
4 kHz	35.9	15.0	20.9	32.9	21.9
				Overall A-weighted Level	40.5

Comparison of Internal Noise Level and NR38