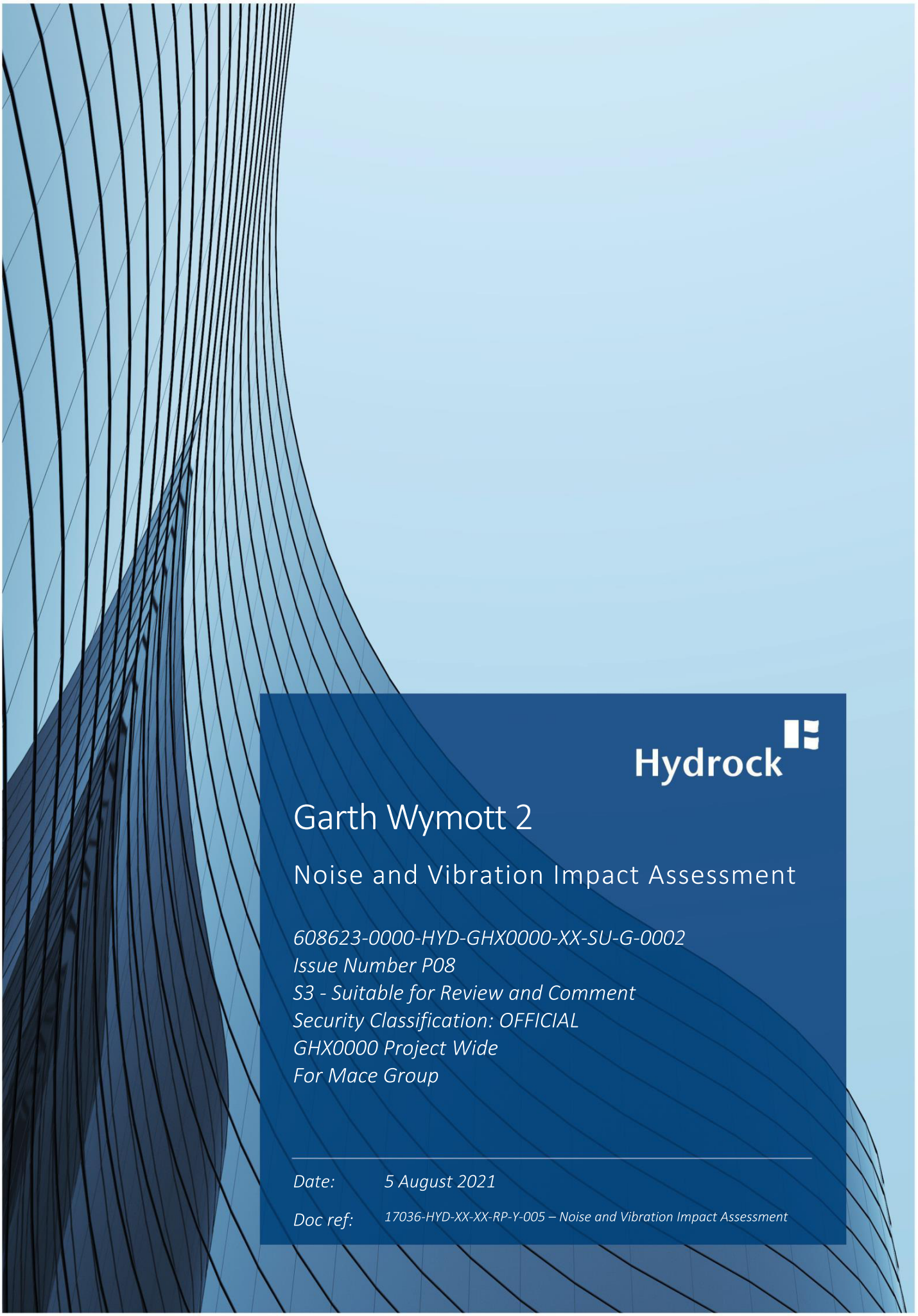


Hydrock

Garth Wymott 2

Noise and Vibration Impact Assessment

608623-0000-HYD-GHX0000-XX-SU-G-0002
Issue Number P08
S3 - Suitable for Review and Comment
Security Classification: OFFICIAL
GHX0000 Project Wide
For Mace Group

Date: *5 August 2021*

Doc ref: *17036-HYD-XX-XX-RP-Y-005 – Noise and Vibration Impact Assessment*

EXECUTIVE SUMMARY

Hydrock have been appointed by Mace Group to provide acoustic engineering services to support the proposed development of a purpose-built prison, on land adjacent to Wymott and Garth, Leyland. The Proposed Development is hereby referred to as Garth Wymott 2.

The noise assessment has been undertaken to reflect both pre-operational and post construction phases, with consideration given to the following potential impacts:

- The impact of noise and vibration on existing sensitive receptors during the construction phase of the development;
- The impact of development generated road traffic at existing sensitive receptors;
- The impact of existing noise sources on the Proposed Development;
- The impact associated with any proposed fixed plant and/or ancillary equipment at existing receptors; and,
- The impact of noise associated with the proposed car park at existing receptors;

A noise survey has been carried out in order to establish the existing noise environment at the proposed development site, during the daytime and night time periods, in accordance with current guidance.

Road traffic noise from the Moss Lane and Ulnes Walton Lane, together with the remainder of the local road network was found to be dominant throughout the daytime and night-time periods across the site. Passing train noise was found to be dominant in close proximity to north western boundaries of Garth.

Appropriate acoustic conditions can be achieved within proposed accommodation with the implementation of a standard glazing and passive ventilation scheme.

The development generated traffic at the Site indicates at the worst affected Existing Sensitive Receptor (ESR) the increase in traffic will have a minor impact in the short term and a negligible impact in the long term, according to DMRB. Therefore, no specific mitigation is required with respect to development generated road traffic.

Atmospheric plant noise emission limits have been established based on the results of the noise survey. These are likely to be achieved with appropriate consideration for selection of low-noise plant and proprietary attenuation measures as appropriate during technical design.

This noise impact assessment presents no reason why all of the BREEAM credits described above would not be available, given due design consideration during technical design.

It is considered that there is no reason for refusal of planning permission, on acoustic grounds.

DOCUMENT CONTROL SHEET

Issued by	Hydrock Consultants Limited Northern Assurance Buildings 9-21 Princess Street Albert Square Manchester M2 4DN United Kingdom	T +44 (0)161 804 5550 E manchestercentral@hydrock.com www.hydrock.com
Client	Mace Group	
Project name	Garth Wymott 2	
Title	Noise and Vibration Impact Assessment	
Doc ref	17036-HYD-XX-XX-RP-Y-005 – Noise and Vibration Impact Assessment	
Project no.	17036	
Status	S3: Suitable for Review and Comment	
Date	05/08/2021	

Document Production Record		
Issue Number	P08	Name
Prepared by		Suzy Everett
Approved by		Eddy Goldsmith

Document Revision Record			
Issue Number	Status	Date	Revision Details
P01	S1	16/11/2020	First issue.
P02	S2	17/11/2020	Minor amendments
P03	S3	16/07/2021	Updated Road Layouts.
P04	S3	19/07/2021	Minor Amendments
P05	S3	21/07/2021	Minor Amendments
P06	S3	22/07/2021	Minor Amendments
P07	S3	04/08/2021	Minor Amendments

P08	S3	05/08/2021	Minor Amendments

CONTENTS

Tables

Figures

Appendices

1. INTRODUCTION

Hydrock have been appointed by Mace Group to provide acoustic engineering services to support the proposed development of a purpose-built prison, on land adjacent to Wymott and Garth, Leyland. The Proposed Development is hereby referred to as Garth Wymott 2.

The Proposed Development Site currently comprises stables and open land. To the north, the site is bordered by open land. To the east the site is bordered by residential dwellings off Willow Road, and Moss Lane, with open land beyond. To the south and south west, the site is bordered by Wymott and Garth, respectively. To the west, the site is bordered by open land, with the Ormskirk Branch rail line beyond.

A review of relevant planning policies and current guidance documents has been undertaken to inform the assessment of potential noise impacts at the Proposed Development. This noise assessment has been prepared in support of an outline planning application.

This assessment has been prepared by Suzy Everett, Acoustic Engineer at Hydrock, who holds a bachelor's degree in Acoustics BEng (Hons) and is an associate member of the Institute of Acoustics (AMIOA).

This report is technical in nature; therefore, a glossary of acoustic terminology is provided in **Appendix A** to assist in understanding this report.

2. ASSESSMENT METHODOLOGY

2.1 Consultation

The proposed noise survey and assessment methodology was sent to Chorley Council; however, no response was received at the time of writing this report. This assessment is based on our experience with similar sites.

The assessment considers the following potential impacts:

- The effect of noise and vibration during earthworks and construction at existing receptors;
- The effect of existing road traffic noise, together with any existing commercial noise sources at proposed sensitive receptors;
- The effect of development generated road traffic noise at existing receptors;
- The effect of any proposed ancillary equipment at existing sensitive receptors; and,
- The effect of noise associated with the proposed car park at existing receptors.

2.2 Policy and Guidance

The assessment methodology is based on the following current policy and guidance documents:

- National Planning Policy Framework, 2021 (NPPF);
- Noise Policy Statement for England, 2010 (NPSE);
- Planning Practice Guidance – Noise, 2014 (PPG);
- World Health Organisation (WHO) 1999: Guidelines for Community Noise;
- BS 8233:2014 - Guidance on sound insulation and noise reduction for buildings (BS8233);
- BS 4142:2014 + A1 2019 - Methods for rating and assessing commercial and industrial sound (BS4142);
- BREEAM UK New Construction, 2018 (BREEAM);
- Department of Transport Technical Memorandum: Calculation of Road Traffic Noise, 1975 (CRTN);
- Central Lancashire Core Strategy (2012);
- Chorley Local Plan 2012-2026 (adopted 2015);
- Design Manual for Roads and Bridges, Volume 11, Section 3, Part 7, 2011 (DMRB); and,
- Bavarian State Office for the Environment: Parking Area Noise – 6. Revised Edition, 2007;

A review of the relevant planning policies and acoustics guidance is found in **Appendix B.**

3. NOISE SURVEY

3.1 Survey Overview

Noise Monitoring was undertaken at the site, between the 20th and 21st October 2020.

Noise measurements were made using Class 1, integrating sound level meters. Microphones were positioned vertically on a tripod at least 1.2m above the ground and at least 3.5m from any other reflecting surfaces. The sound level meter was 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).

Monitoring was carried out by Suzy Everett, Acoustic Engineer at Hydrock, who holds a bachelor's degree in Acoustics BEng (Hons) and is an associate member of the Institute of Acoustics (AMIOA). All measurement equipment has been laboratory calibrated within the appropriate calibration interval.

All noise monitoring took place during conducive conditions, with wind speeds less than $5ms^{-1}$ and no significant precipitation.

3.2 Survey Procedure

For the purposes of this assessment, in accordance with current guidance, daytime hours are taken to be 0700 to 2300 hours and night-time hours to be 2300 to 0700 hours

Noise monitoring was undertaken at 4 Monitoring Locations (MLs) considered to be representative of proposed and Existing Sensitive Receptors (ESRs). Noise monitoring locations are shown on **Figure 1**, and summarised as follows:

- ML1: Unattended noise monitoring to the north of the Site, adjacent to the junction of Ridley Lane and Cocker Bar Road, approximately 3m from the carriageway. This location was selected to characterise road traffic noise from the aforementioned roads and proposed receptors in the north of the Site;
- ML2: Unattended noise monitoring in the north eastern part of the site, in the vicinity of existing residential dwellings off Wray Close. This location was selected to establish existing ambient levels at ESRs to the north east of the Site;
- ML3: Unattended noise monitoring at the eastern Site boundary, adjacent to Moss Lane, approximately 5m from the carriageway. This location was selected to characterise road traffic noise associated with Moss Lane, and be representative of proposed sensitive receptors in the eastern part of the Site, closest to Moss Lane; and,
- ML4: Unattended noise monitoring adjacent to the trainline to the north west, 15m from the railway tracks. This location was selected to characterise noise from rail movements and be representative of proposed receptors in the western part of the Site.

Observations and subjective evaluation of noise sources was carried out and noted during initial site walkover and attended monitoring. Measurements were also supplemented with audio recordings to allow retrospective subjective analysis of the acoustic environment.

Unattended noise monitoring was undertaken at all MLs for approximately 23 hours, between 10:00 and 11:00 on Tuesday 20th and 09:00 and 10:00 on Wednesday 21st October 2020. This monitoring period allows for peak daytime transportation periods (0700 to 1000, and 1600 to 1900) to ensure a worst-case daytime noise levels are captured, together with a full 8 hour night time period.

3.3 Summary of Existing Noise Environment

Observations made during the survey and a review of audio recordings made during unattended measurements, identified the following significant noise sources contributing to the noise climate at the site:

Road Traffic: Road Traffic noise from Ulnes Walton Road, Moss Lane, and Cocker Bar Lane was dominant across most of the site throughout the daytime and night time period.

Train Noise: Passing train noise was regularly dominant at ML4, and occasionally at ML1 during the daytime period, and to a lesser extent during the night time period.

Other Sources: Bird song and distant aircraft movements were occasionally audible across the site.

3.4 Summary of Existing Noise Levels

Measured noise levels at each ML have been separated in to daytime (0700 to 2300 hours) and night-time (2300 to 0700 hours) categories, where appropriate.

Measured levels at all locations captured a total 15 hours during the daytime period and a full 8 hour night time period. The measured daytime $L_{Aeq,\ 15\ hour}$ has been taken as a robust representation of the $L_{Aeq,\ 16hour}$ for the purposes of this assessment.

Existing average noise levels are summarised in **Table 1**.

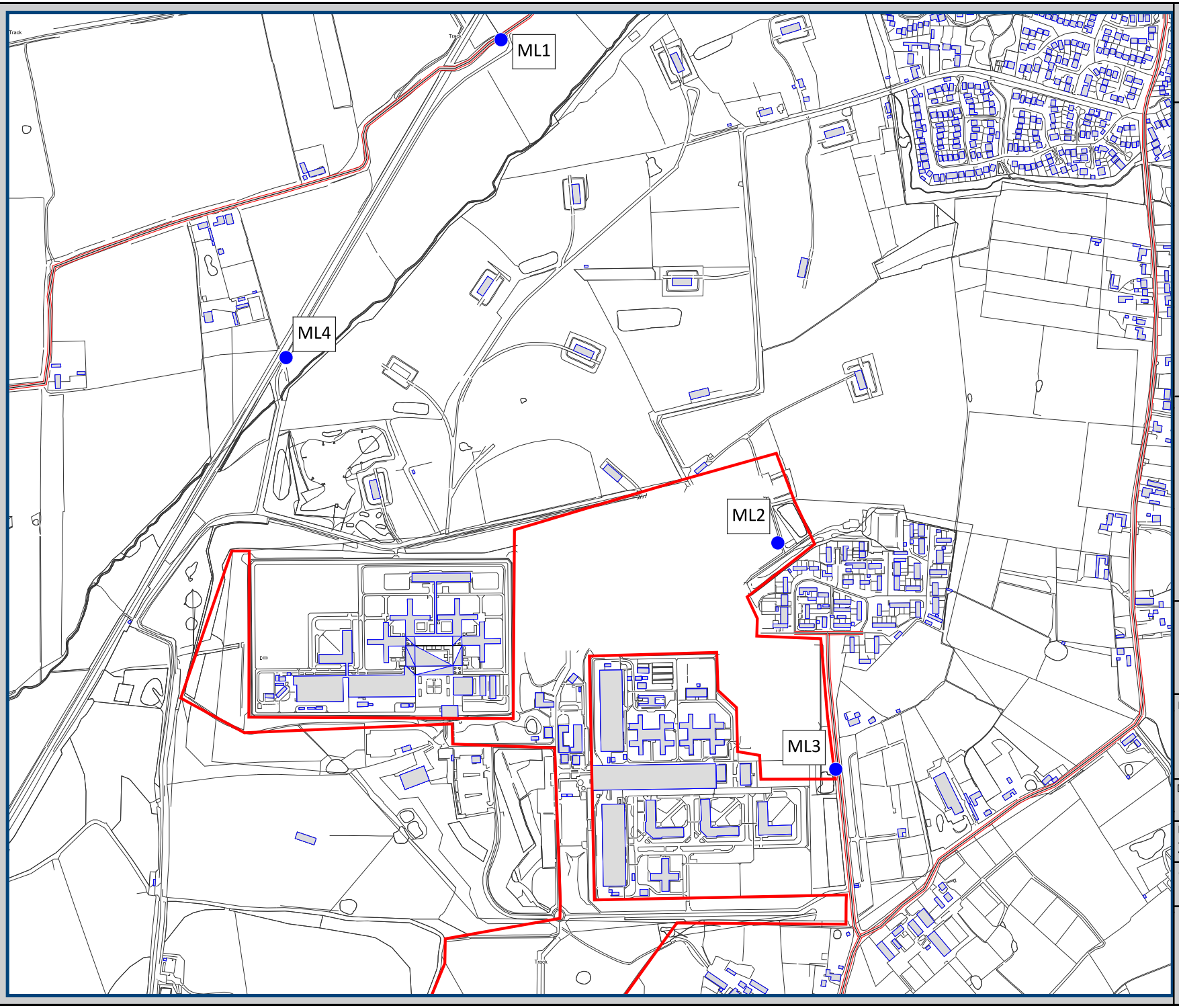
Table 1: Average Measured Daytime and Night-time Noise Levels

Monitoring Location	Time Period	Measured Noise Level, $L_{Aeq,T}$ dB
ML1	0700 - 2300 2300 - 0700	64 56
ML2	0700 - 2300 2300 - 0700	44 35
ML3	0700 - 2300 2300 - 0700	59 52
ML4	0700 - 2300 2300 - 0700	59 51

The typical measured night-time L_{AFmax} noise levels are summarised in **Table 2**. Measured maxima which are not considered representative of the typical noise environment have been eliminated from this assessment.

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

Monitoring Location	Typical Night-time L_{AFmax} dB
ML1	74
ML2	43
ML3	75
ML4	42



Hydrock

Legend

- Existing Buildings
- Roads
- Approx. Development Area
- Monitoring Locations

PROJECT:
Garth Wymott 2

DRAWING TITLE:
Noise Monitoring Locations

DRG No.	SCALE
Figure 1	1:6000

DATE:	PREPARED	APPROVED
20/07/2021	SE	EG

CLIENT:
Mace Group

mace

4. NOISE ASSESSMENT

4.1 Construction Phase Assessment

4.1.1 Noise from Earthworks and 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 earthworks 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):

- Site preparation i.e. ground excavation, levelling of ground, trenching, trench filling, unloading, levelling of hardcore and compact filling; 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 enabling and 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** below.

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 below identifies the appropriate category value in order to determine whether a significant noise impact has occurred, at ESRs, during earthworks and construction.

Table 4 Appropriate Category Value for Existing Sensitive Receptors

Description of Receptor	Representative Monitoring Location	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 $L_{Aeq,T}$
Residential dwellings to the east of the site, Moss Lane	ML3	59	60	A	65
Residential Dwellings to the north east of the site, off Willow Road	ML2	44	45	A	65

The earthworks and construction phase activities have the potential to generate short-term increases in noise levels. The levels of noise received at the receptors closest to the Proposed Development would depend on the sound power levels of equipment used, the distance to the properties, the presence of screening or reflective surfaces and the ability of the intervening ground to absorb propagating noise.

Furthermore, the nearest noise sensitive receptors to the earthworks and construction activity will vary over the course of the construction period, depending on where earthworks or construction activities are taking place within the Site. Given the potentially small distances between activities and existing residential dwellings, noise levels at the receptors may occur above those detail in **Table 5.** Therefore, it is recommended that mitigation measures be put in to place in order to avoid and/or reduce potential impacts where possible. Further, detail is provided in the Mitigation Section of this report.

4.1.2 Vibration from Earthworks and Construction Activities

Damage to buildings associated with groundborne vibration is uncommon, and although vibration may be noticeable, there is little evidence to suggest that cosmetic damage can occur, such as a crack in plaster, unless the magnitude of the vibration is extremely 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; for example, that caused by transiting vehicles or piling. 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. 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.

BS5228-2 also sets out the distances (based on historical field measurements) at which certain activities could give rise to a just perceptible level of vibration. These distances are presented in **Table 5** below.

Table 5 Distance at which Vibration may be Just Perceptible

Construction Activity	Distance from Activity at which Vibration may be Just Perceptible, metres
Excavation	10 – 15
Heavy Vehicles (e.g. Dump Trucks)	5 – 10
Hydraulic Breaker	15 – 20
Rotary Piling	20 – 30

The nearest ESRs to the proposed construction works, would vary depending upon the part of the Proposed Development under construction. As a worst-case scenario, earthworks and construction works may potentially take place at a distance of 40m from residential properties to the north east of the site, off Willow Road.

At 40m, it is considered possible that vibration due to the operation of construction machinery may be perceptible, for example if piling is used, but unlikely during the majority of the earthworks and construction period. If any perceptible vibration occurs at ESRs, this would likely be transient in nature and only and for a very limited period(s), and is unlikely to exceed the maximum permitted vibration level of 1mms^{-1} PPV within occupied dwellings, as recommended by BS5228-2.

No specific vibration mitigation measures are considered to be required, unless high risk construction techniques are employed, such as percussive piling. Notwithstanding, methods of best practice should be implemented with regards to minimising potential vibration levels generated during the earthworks and construction period.

4.2 Operational Phase Assessment

4.2.1 Development Generated Road Traffic

Potential noise impacts associated with road traffic generated by the Proposed Development when operational have been assessed via comparison 'without development' and 'with development' scenarios, in accordance with DMRB. The assessment has been carried out at ESRs in the vicinity of the adjacent transport network and considered most likely to be affected by any increase in traffic as a result of the Proposed Development.

Road traffic noise predictions for each scenario have been carried out using SoundPLAN 3D noise modelling software, in accordance with current guidance.

The 'without development' scenario has been formulated using the measured baseline noise levels at the site. Nearby roads have been calibrated within the model to ensure a reliable representation of the existing environment and road traffic noise propagation across the site is replicated. CRTN predictions have been carried out to assess any potential changes in road traffic noise at existing receptor locations due to Development generated road traffic.

The 'with development' scenario incorporates predicted development generated traffic flows provided by Atkins, the appointed transport consultants for this scheme. Traffic data was provided in 18hour Annual Average Weekday Traffic format, to be robust it was assumed this includes 10% HGVs.

The traffic data has been validated by comparison to the measured levels from the noise survey, with only minor differences in resultant noise levels.

Traffic data used for this assessment, together with the trip generation assumptions used to produce this traffic data, as provided by Atkins, is included in **Appendix D**.

A summary of noise modelling assumptions, used to predict road traffic noise levels during each assessment scenario, are provided in **Appendix E**.

The assessment of development generated road traffic noise impact has been carried out at 3 ESRs, which are shown on **Figure 2**. Impacts are summarised in **Table 6** below.

Table 6 Predicted Change In Road Traffic Noise Levels

Existing Sensitive Receptors	Predicted Road Traffic Noise Level at ESRs, $L_{10\ 18hour}$ dB(A)		Change in Noise Level associated with the Proposed Development
	Without Development	With Development	
ESR1 – 5 The Maples, to the east	53	53	0
ESR2 – 7 Willow Road, at the junction with Moss Lane to the north east	54	54	0
ESR3 – Windy Harbour, Moss Lane to the east	55	56	+1
ESR4 – 2 Ulnes Walton Lane, to the south	61	62	+1

Table 6 indicates that the greatest increase in road traffic noise would be +1dB at ESR3 and ESR4, which are located within close proximity to the proposed access road. This equates to a minor impact in the short term and negligible impact in the long term, according to DMRB. Therefore, no specific mitigation is required with respect to development generated traffic.

4.2.2 Daytime Noise Levels in Outdoor Living Areas

Figure 3 shows the predicted average daytime noise levels $L_{Aeq,\ 16hour}$, across the majority of the Site and in the vicinity of proposed accommodation blocks are below upper guideline value of 55dB $L_{Aeq,\ T}$ recommended by BS8233. Therefore, no specific mitigation is required.

4.2.3 Daytime Noise Levels in Habitable Rooms

The minimum composite sound reduction required of facades, in order to achieve appropriate internal daytime noise levels, in accordance with BS8233, is summarised in **Table 7** below.

Table 7: Daytime Façade Noise Levels at the Proposed Development and Required Attenuation

Proposed Receptors	Daytime Façade Level, $L_{Aeq,T}$ dB	Minimum Composite Sound Reduction of Façade, D_w, dB
Proposed accommodation blocks in the eastern part of the Site closest to Moss Lane **Monitoring Location 3**	50	16
Proposed accommodation blocks in the northern part of the Site closest to Pump House Lane **Monitoring Location 2**	40	5

Proposed habitable rooms facing in to the Site, away from Moss Lane will be screened from off-site noise sources by the buildings themselves. Therefore, the level of attenuation required at these facades will be less than that detailed in **Table 8**.

Noise generated within the residential blocks, for example, from voices, has not been assessed within this report. There is no guidance or requirement to assess this type of noise, and any noise generated within the residential blocks is unlikely to be an issue at the nearest ESRs.

4.2.4 Night-time Noise Levels in Habitable Rooms

Figure 4 and **Figure 5** show the predicted night time average $L_{Aeq,\ 8hour}$ and L_{AFmax} noise levels, across the Proposed Development Site.

The level of façade noise attenuation required to achieve appropriate internal night-time noise levels, in accordance with BS8233, is summarised in **Table 8.**

Table 8: Night-time Façade Noise Levels at the Proposed Development and Required Attenuation

Proposed Receptors	Night-time Façade Level, $L_{Aeq,T}$ dB	Maximum Night-time Façade Noise Level, $L_{Aeq,T}$ dB	Required Composite Sound Reduction of Façades, D_w, dB
Proposed accommodation blocks in the eastern part of the Site closest to Moss Lane **Monitoring Location 3**	44	50	17
Proposed accommodation blocks in the northern part of the Site closest to Pump House Lane **Monitoring Location 2**	33	53	20

Proposed habitable rooms facing in to the Site, away from Moss Lane will be screened from off-site noise sources by the buildings themselves. Therefore, the level of attenuation required at these facades will be less than that detailed in **Table 8**.

4.2.5 *Industrial Type Noise from Proposed Ancillary Equipment*

At this stage, detailed information relating to any proposed fixed plant and/or building services is unavailable. However, annotations to the Illustrative Masterplan are presented in **Appendix F**, highlighting likely sources of industrial type noise.

Guideline noise limits have been formulated based on the existing noise environment, in accordance with current guidance. With reference to BS4142, the atmospheric noise emissions limits have been determined for any proposed ancillary equipment (with the exception of emergency plant i.e. back-up generators).

Noise associated with the development shall be controlled to the guideline levels outlined in **Table 9**, where possible, when assessed in accordance with BS4142, at the nearest sensitive receptor. The limits correspond to the average background noise levels measured at ML2.

Table 9: Guideline Atmospheric Plant Noise Emission Limits

Period	Atmospheric Plant Noise Emission Limit (dB, $L_{Ar,t}$)
Daytime (07:00 to 23:00 hrs)	39
Night-time (23:00 to 07:00 hrs)	32

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. Proposals should be reviewed by Hydrock during technical design.

As detailed information relating to fixed plant is unknown, Hydrock highlight that provisions for the selection of low noise equipment, silencers, enclosures, screens and other acoustic attenuation measures should be made where necessary.

4.2.6 *Noise from Onsite Energy Centre*

The energy centre currently located to the north Wymott is to be moved approximately 150m south to accommodate the Proposed Development.

The newly located energy is understood to be a ‘like-for-like’ in terms of construction of the building, and equipment located inside. Therefore, the noise level is unlikely to change.

Hydrock highlight that any change in construction or equipment located within the energy centre reviewed by Hydrock during technical design.

4.2.7 *Noise from the Proposed Car Park*

The Illustrative Masterplan, shown in Appendix F, indicates the Proposed Development includes a Car Park in the south eastern part of the new Prison Site, approximately 50m from the nearest existing residential dwellings, off Willow Road. Therefore, the potential noise impact associated with the car park has been assessed with respect to these dwellings.

The most comprehensive and widely accepted methodology guidance document for the prediction of car parking noise is the Parking Area Noise document published by the Bavarian State Office for the Environment in 2007. The methodology allows the prediction of average noise levels from a car park based on the number of spaces and number of parking events per hour, per space.

The car parking noise level has been predicted based on the shift pattern information provided by Atkins, included in **Appendix D**. Parking events per hour, per space has been derived from the shift change information and the total number of predicted vehicle trips at the site. This has been used for the basis of noise level predictions in accordance with the Parking Area Noise guidance, using SoundPLAN acoustic modelling software.

Predicted average noise levels associated with carparking noise levels have been assessed by comparison with health based WHO and BS8233 guideline noise levels at the nearest ESRs. **Table 10** presents the predicted average daytime noise levels associated with the car park, within external gardens at the nearest ESR.

Table 10: Predicted Noise Levels from Car Park

Receptor	Predicted External Noise Level, dB $L_{Aeq,\ 16\ hours}$	Approximate Distance from Car Park, m
Gardens of Nearest Residential Properties off Willow Road, to the North East of the Car Park	40	50

Table 13 indicates that average daytime noise levels associated with the proposed car park are 40 dB $L_{Aeq,\ 16hour}$ at the nearest outdoor living areas of existing residential properties off The Maples. This is below the desirable guideline level of 50 dB $L_{Aeq,\ 16hoour}$ recommended within BS8233. Additionally, as shown in **Table 2**, this level is below the ambient noise level measured at ML1, and so would not significantly increase the existing ambient noise level in the area.

Therefore, no specific mitigation is required for car parking activity noise during the daytime.

While the shift pattern information indicates that all shift changes would occur during the daytime periods (0700 to 2300), the potential impact of individual car parking events has been considered during the night time period.

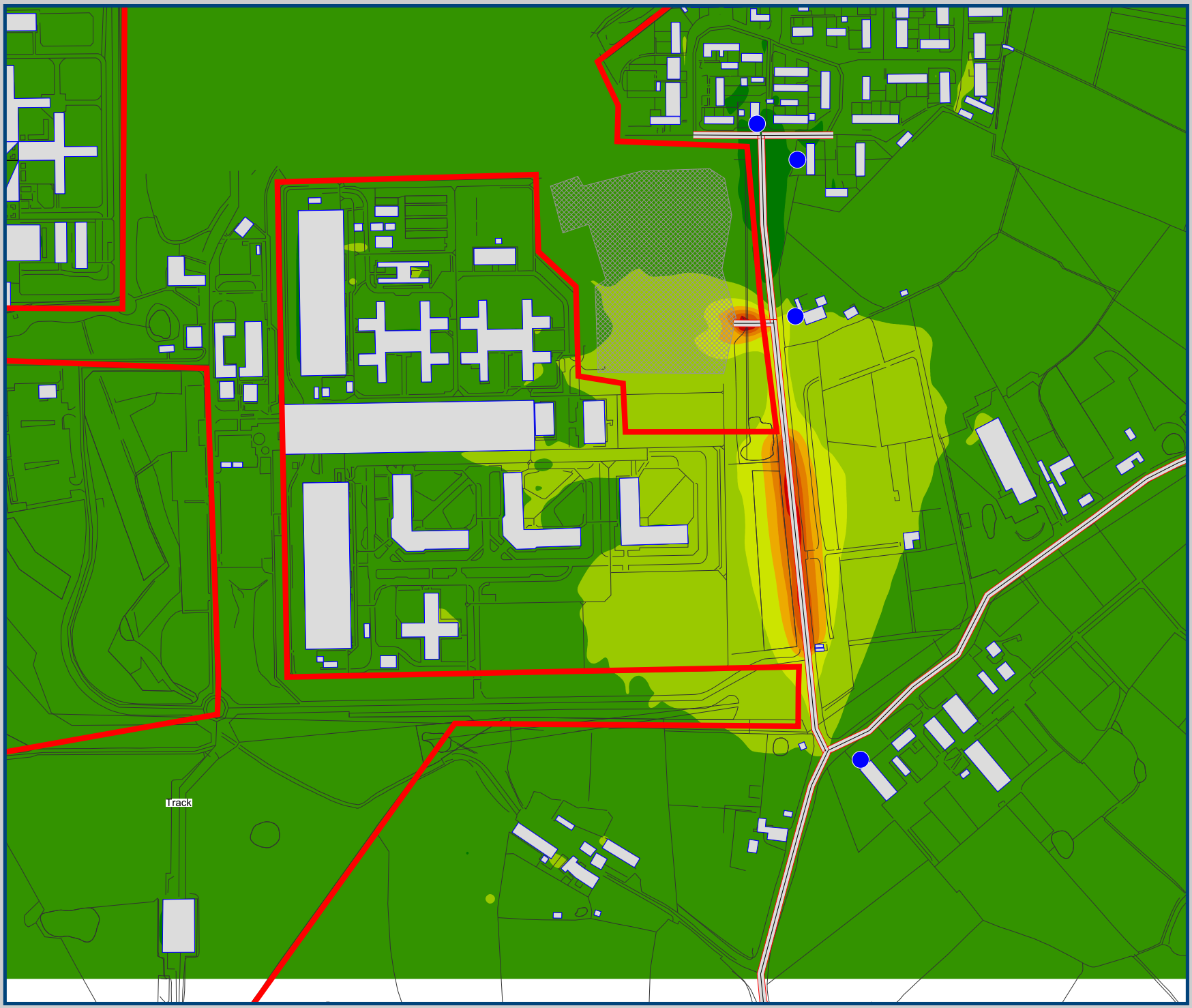
Measured noise data, taken from the Hydrock data archive, indicates that the typical free field maximum level associated with car engines starting and car doors slamming is 65 dB L_{AFmax}, measured at 10m. Maximum noise levels associated with individual parking events have been predicted based on this measured data using SoundPLAN acoustic modelling software.

Table 11 presents the predicted night time maximum noise levels associated with the car park, at the nearest ESR façade, taking in to account attenuation of 15dB through an open window.

Table 11: Predicted Noise Levels from Car Park

Receptor	Maximum Façade Noise Level, dB L_{AFmax}	Maximum Internal Noise Level, dB L_{AFmax}	Approximate Distance from Car Park, m
Gardens of Nearest Residential Properties off Willow Road, to the North East of the Car Park	52	37	50

Table 11 indicates that maximum noise levels associated with the proposed car park are 37 dB L_{AFmax} internally, assuming windows are open, at the nearest facade of existing residential properties off Willow Road. This is within the guideline level of 45 dB L_{AFmax} as recommended by BS8233. Therefore, no specific mitigation is required for the car park.



Hydrock

Legend

- Existing Buildings
- Existing Sensetive Receptors
- Roads
- Approx. Development Area
- Car Park

Noise Level $L_{Aeq, 16hour}$

	<=	0.0
0.0 <	<=	1.0
1.0 <	<=	2.0
2.0 <	<=	3.0
3.0 <	<=	4.0
4.0 <	<=	5.0
5.0 <	<=	6.0
6.0 <		

PROJECT:
Garth Wymott 2

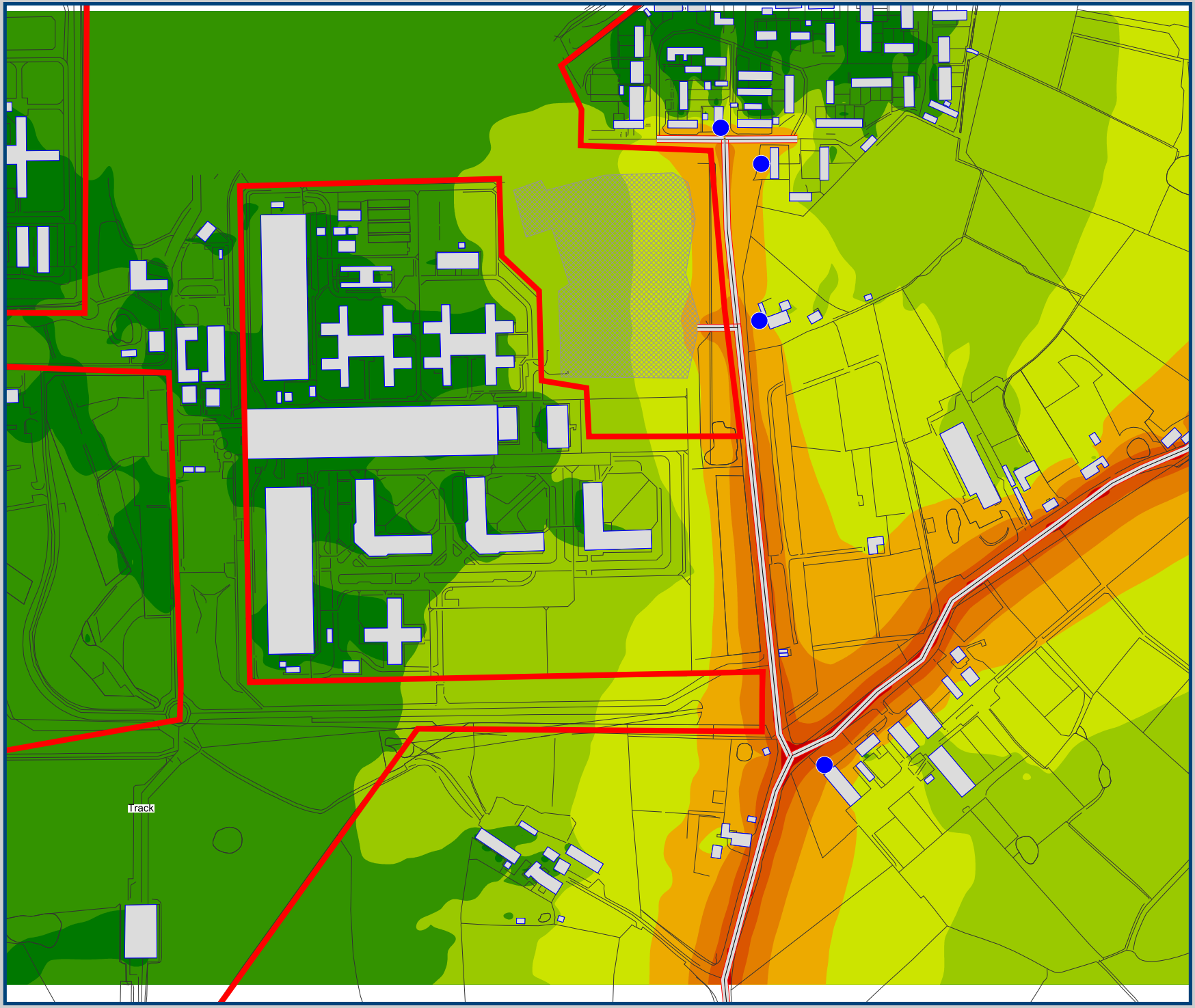
DRAWING TITLE:
Increase in Road Traffic NoiseLevels Associated with Proposed Development

DRG No.	SCALE
Figure 2	1:3000

DATE:	PREPARED	APPROVED
21/07/2021	SE	EG

CLIENT:
Mace Group

mace



Hydrock

Legend

- Existing Buildings
- Existing Sensitive Receptors
- Roads
- Approx. Development Area
- Car Park

Noise Level $L_{Aeq, 16hour}$ dB(A)

	<= 35.0
35.0 <	<= 40.0
40.0 <	<= 45.0
45.0 <	<= 50.0
50.0 <	<= 55.0
55.0 <	<= 60.0
60.0 <	<= 65.0

PROJECT:
Garth Wymott 2

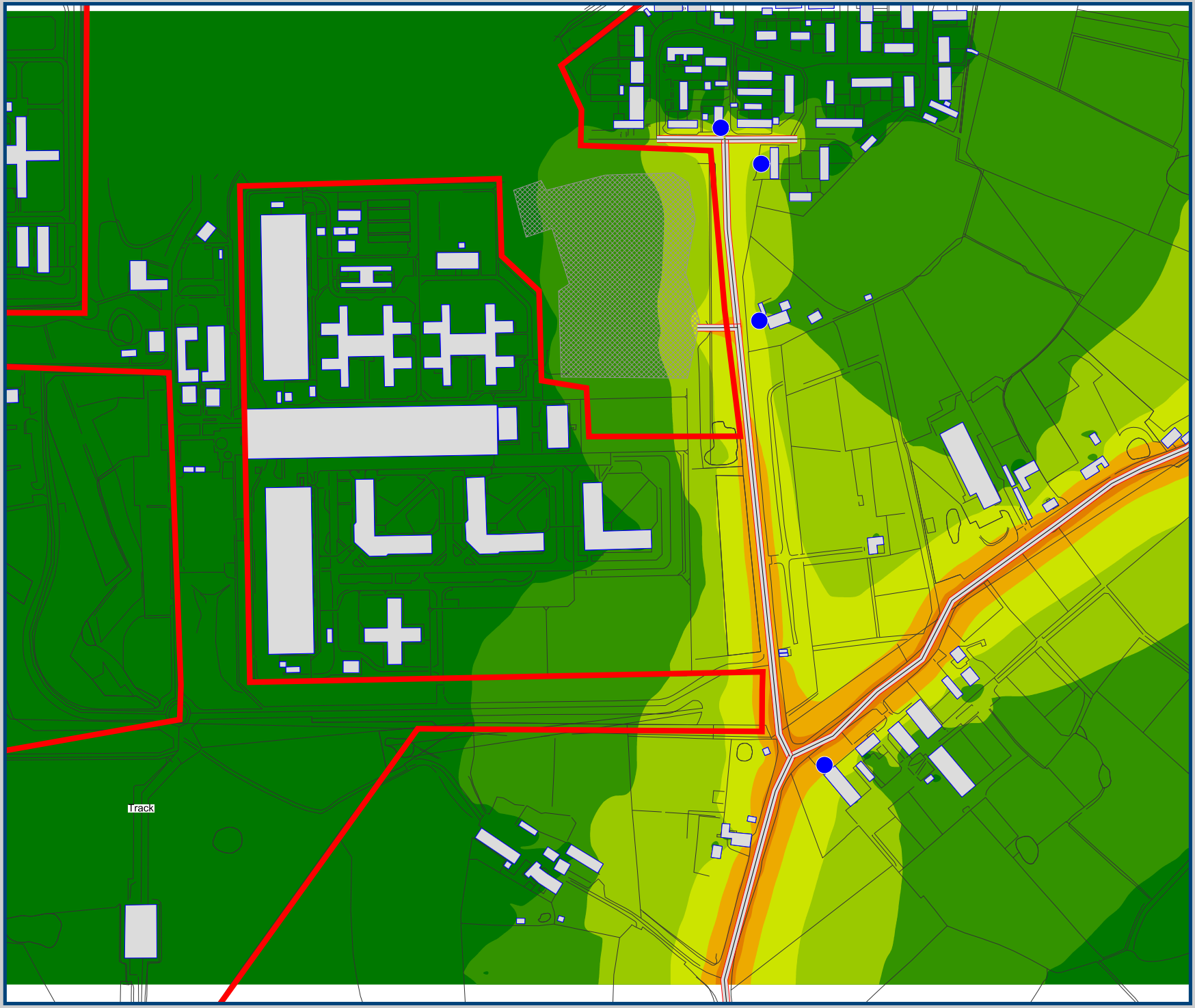
DRAWING TITLE:
Daytime Noise Levels
- With Development

DRG No.	SCALE
Figure 3	1:3000

DATE:	PREPARED	APPROVED
20/07/2021	SE	EG

CLIENT:
Mace Group

mace



Hydrock

Legend

- Existing Buildings
- Existing Sensitive Receptors
- Roads
- Approx. Development Area
- Car Park

Noise Level $L_{Aeq, 8hour}$ dB(A)

	<= 35.0
35.0 <	<= 40.0
40.0 <	<= 45.0
45.0 <	<= 50.0
50.0 <	<= 55.0
55.0 <	<= 60.0
60.0 <	<= 65.0
65.0 <	

PROJECT:
Garth Wymott 2

DRAWING TITLE:
Night-time Noise Levels
- With Development

DRG No.	SCALE
Figure 4	1:3000

DATE:	PREPARED	APPROVED
20/07/2021	SE	EG

CLIENT:
Mace Group

mace

Hydrock

Legend

- Existing Buildings
- Existing Sensitive Receptors
- Roads
- Approx. Development Area
- Car Park

Noise Level $L_{AF,Max}$ dB(A)

	<= 50.0
50.0 <	<= 55.0
55.0 <	<= 60.0
60.0 <	<= 65.0
65.0 <	<= 70.0
70.0 <	<= 75.0
75.0 <	<= 80.0
80.0 <	

PROJECT:
Garth Wymott 2

DRAWING TITLE:
Night-time Max Noise Levels - With Development

DRG No.	SCALE
Figure 5	1:3000

DATE:	PREPARED	APPROVED
20/07/2021	SE	EG

CLIENT:
Mace Group

mace

5. NOISE MITIGATION MEASURES

5.1.1 Construction Phase

Noise from Earthworks and Construction

In order to reduce the potential impact of noise generated by the construction phase of the proposed Development, at existing receptor locations in the immediate vicinity of the Site, mitigation measures would be required. Best working practice would be implemented during each phase of the earthworks and construction works at the Site. The construction works would 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 would be put in place to minimise noise emissions and implemented via a Construction Environmental Management Plan (CEMP):

- When works are taking place within close proximity to the sensitive receptors identified, the screening of noise sources via the erection of temporary screens would be employed;
- All machinery would be regularly maintained to control noise emissions, with particular emphasis on lubrication of bearings and the integrity of silencers;
- Site staff would be made aware that they are working adjacent to a sensitive area and avoid all unnecessary noise due to misuse of tools and equipment, unnecessary shouting and radios;
- 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;
- Implement set working hours during the week and at weekends;
- Ensure engines are turned off when possible; and
- Should earthworks and construction activities need to be carried out during night-time hours, the local authority may include a planning condition that requests advance notice and details of any night working to provided.

Vibration from Earthworks and Construction

BS5228-2 indicates that mitigation might include the use of alternative methods, removal of obstructions, provision of cut-off trenches, reduction of energy input per blow, reduction of resistance to penetration.

As the construction programme and methodologies become more defined, earthworks and construction vibration would be reviewed and a detailed strategy for control would be devised and implemented via the CEMP, where appropriate.

5.1.2 Operational Phase

Proposed Outdoor Living Areas

Proposed outdoor living areas at the Site require no specific acoustic mitigation.

Proposed Habitable Rooms

Good acoustic conditions can be secured within habitable rooms across the site with the inclusion of standard thermal double glazing and passive background ventilation configurations.

BREEAM UK New Construction

4 total credits are available under the BREEAM scheme. It is anticipated that up to three credits will be available under Hea 05 covering sound insulation between rooms and other occupied areas, internal ambient noise levels and room acoustics. A further credit is available under Pol 05 relating to the reduction of noise pollution from industrial type sources.

This noise impact assessment presents no reason why all of the BREEAM credits described above would not be available, given due design consideration during technical design. Acoustic commissioning would be required upon practical completion, in order to obtain these credits.

Development Generated Road Traffic

No specific mitigation is required with respect to development generated traffic.

Proposed Car Park

No specific mitigation is required with respect to the proposed car park.

6. CONCLUSIONS & SUMMARY

Hydrock have been appointed to provide acoustic engineering services to support to support the feasibility study and planning application for a purpose-built prison, hereby referred to as Garth Wymott 2.

The noise assessment has been undertaken to reflect both pre-operational and post construction phases, with consideration given to the following potential impacts:

- The impact of noise and vibration on existing sensitive receptors during the construction phase of the development;
- The impact of development generated road traffic at existing sensitive receptors;
- The impact of existing noise sources on the Proposed Development;
- The impact associated with any proposed fixed plant and/or ancillary equipment at existing receptors;
- The impact of noise associated with the proposed car park at existing receptors; and,

A noise survey has been carried out in order to establish the existing noise environment at the proposed development site, during the daytime and night time periods, in accordance with current guidance.

Road traffic noise from Ulnes Walton Lane, and Moss Lane, together with the remainder of the local road network was found to be dominant throughout the daytime and night-time periods across most of the site. Passing train noise was found to be dominant at the western site boundary along Ridley Lane during the daytime period, and to a lesser extent during the night time period.

The existing daytime noise levels across the site are below the guideline limit of 55dB $L_{Aeq,T}$ as recommended by BS8233. Therefore, no specific mitigation is required for outdoor living areas.

Calculations indicate that standard thermal double glazing and passive background ventilation would provide sufficient attenuation of existing noise sources, during the daytime and night-time periods, to ensure that guideline internal noise levels are achieved within habitable rooms in accordance with BS8233.

The development generated traffic at the Site indicates at the worst affected ESR the increase in traffic will have a minor impact in the short term and a negligible impact in the long term, according to DMRB. Therefore, no specific mitigation is required with respect to development generated road traffic.

Atmospheric plant noise emission limits have been established based on the results of the noise survey. These are likely to be achieved with appropriate consideration for selection of low-noise plant and proprietary attenuation measures as appropriate during technical design.

This noise impact assessment presents no reason why all of the BREEAM credits described above would not be available, given due design consideration during technical design.

It is considered that there is no reason for refusal of planning permission, on acoustic grounds.

Appendix A Glossary of technical terms

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_{Amax} is the maximum A - weighted sound pressure level recorded over the period stated. L_{Amax} 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 L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time, and the L_{90} 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 July 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:

> *"174. 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:

> *"185. 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

> *"187. 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 LAFmax 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 LAFmax 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.

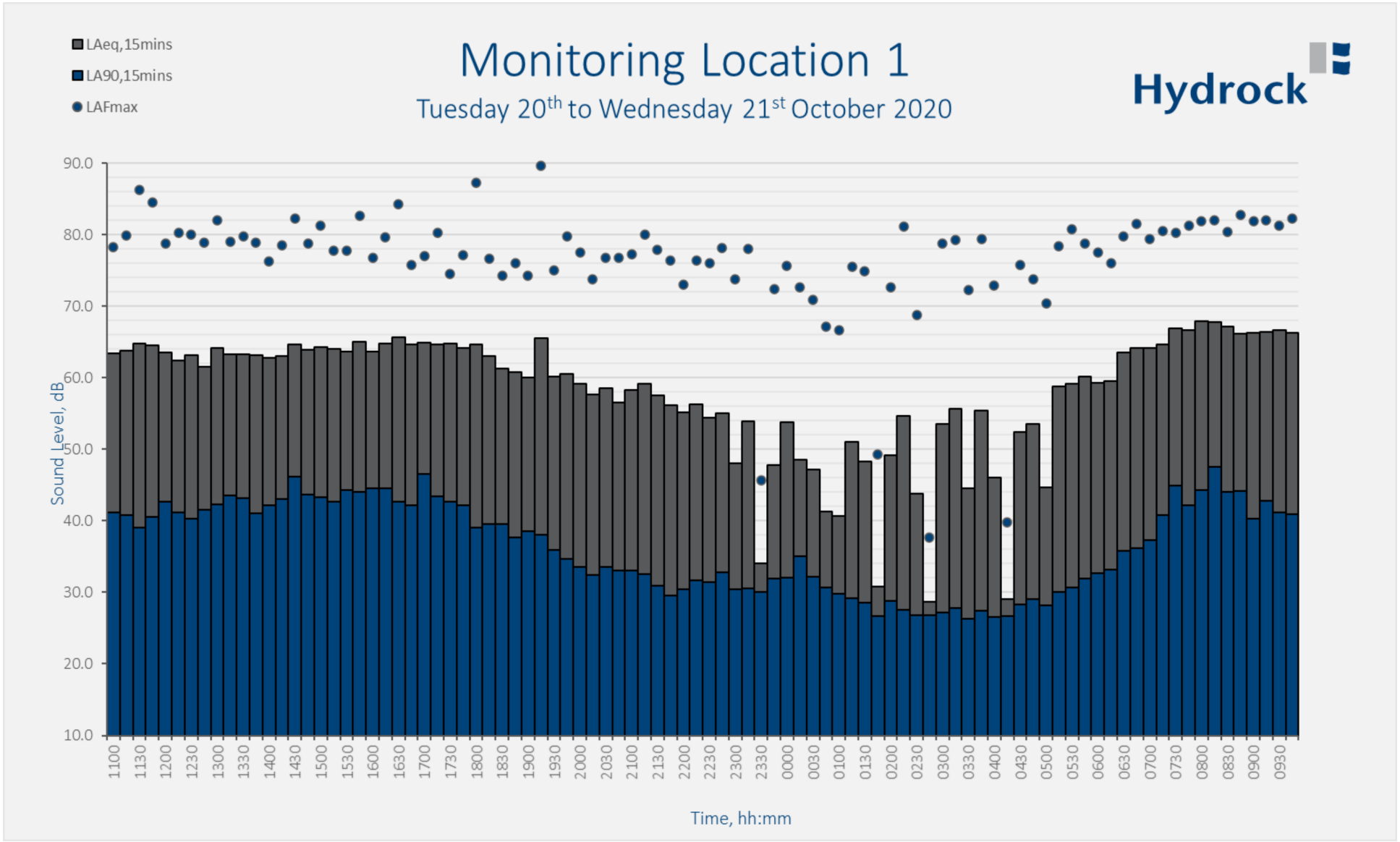
If appropriate, the specific sound level of the source ($L_{Aeq,T}$) is corrected, by the application of one or more corrections for acoustic features to give a 'rating' level ($L_{Ar,Tr}$). The Standard effectively compares and rates the difference between the rating level of the sound and the prevailing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

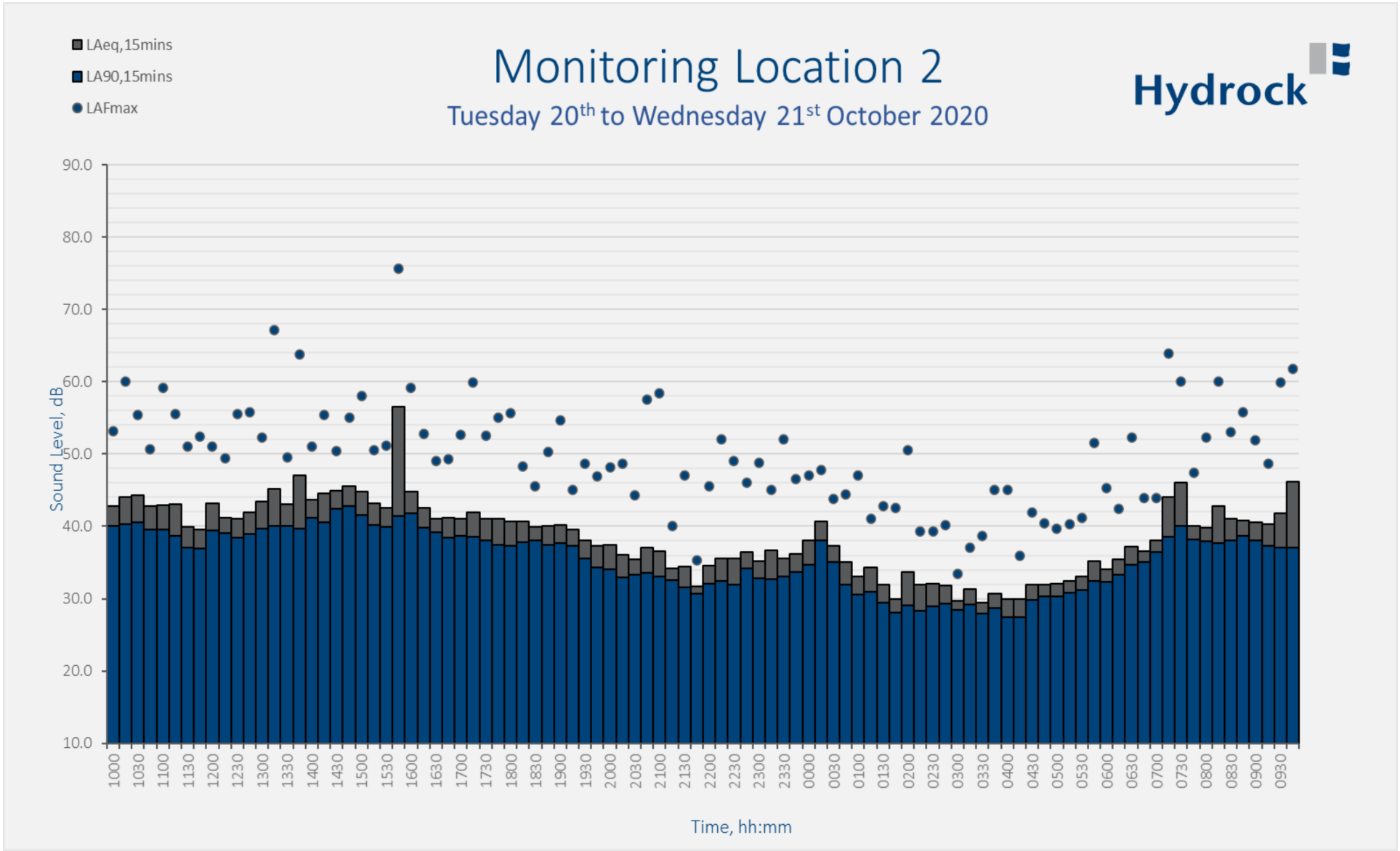
"Typically, the greater this difference, the greater the magnitude of impact. A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

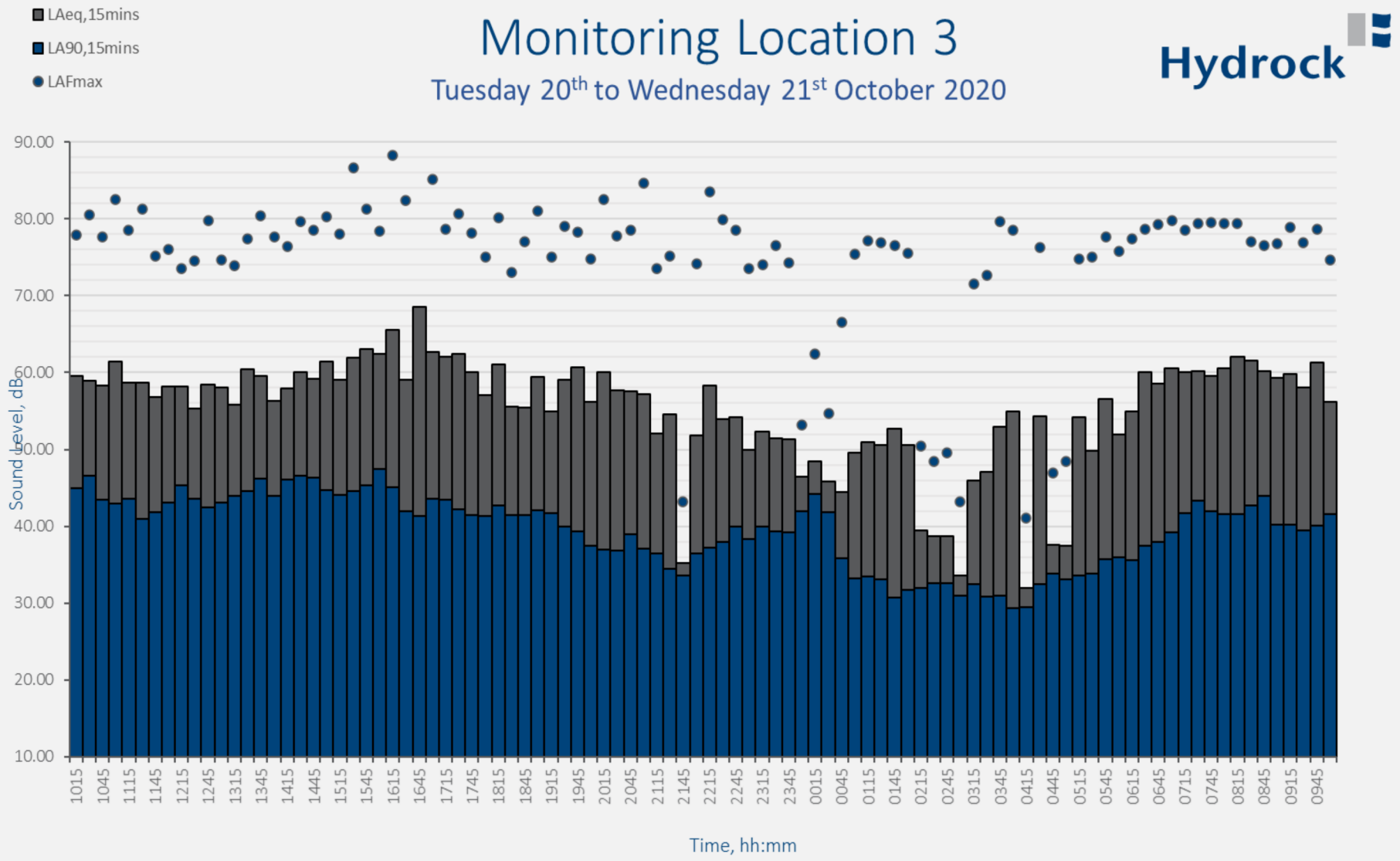
A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

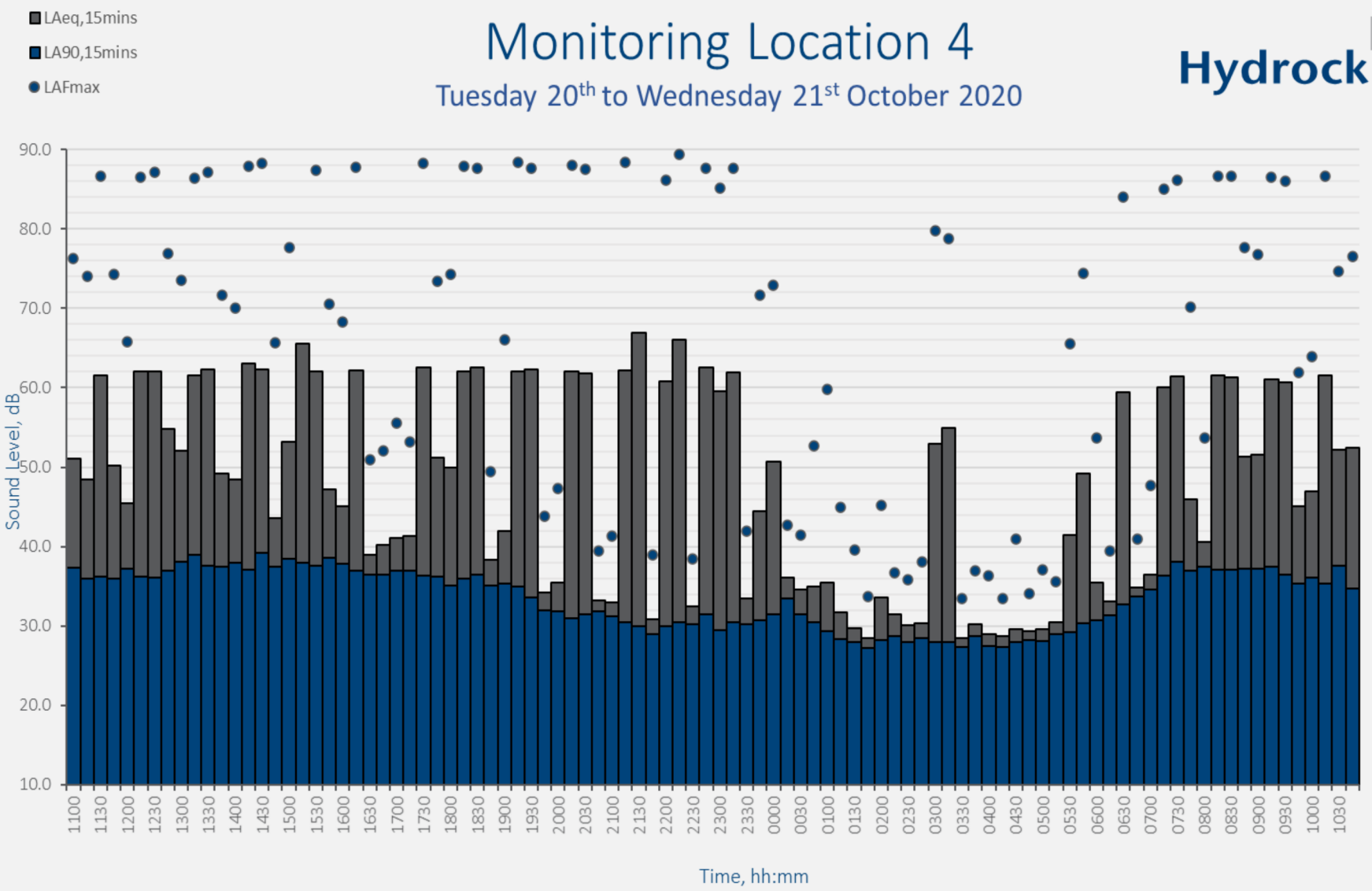
The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

Appendix C Noise Survey Results


LAeq,15mins
LA90,15mins
LAFmax
Monitoring Location 1
Tuesday 20th to Wednesday 21st October 2020
Hydrock
Sound Level, dB
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
1100
1130
1200
1230
1300
1330
1400
1430
1500
1530
1600
1630
1700
1730
1800
1830
1900
1930
2000
2030
2100
2130
2200
2230
2300
2330
0000
0030
0100
0130
0200
0230
0300
0330
0400
0430
0500
0530
0600
0630
0700
0730
0800
0830
0900
0930
Time, hh:mm


LAeq,15mins
LA90,15mins
LAFmax
Monitoring Location 2
Tuesday 20th to Wednesday 21st October 2020
Hydrock
Sound Level, dB
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
1000
1030
1100
1130
1200
1230
1300
1330
1400
1430
1500
1530
1600
1630
1700
1730
1800
1830
1900
1930
2000
2030
2100
2130
2200
2230
2300
2330
0000
0030
0100
0130
0200
0230
0300
0330
0400
0430
0500
0530
0600
0630
0700
0730
0800
0830
0900
0930
Time, hh:mm


LAeq,15mins
LA90,15mins
LAFmax
Monitoring Location 3
Tuesday 20th to Wednesday 21st October 2020
Hydrock
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
Sound Level, dB
1015
1045
1115
1145
1215
1245
1315
1345
1415
1445
1515
1545
1615
1645
1715
1745
1815
1845
1915
1945
2015
2045
2115
2145
2215
2245
2315
2345
0015
0045
0115
0145
0215
0245
0315
0345
0415
0445
0515
0545
0615
0645
0715
0745
0815
0845
0915
0945
Time, hh:mm


LAeq,15mins
LA90,15mins
LAFmax
Monitoring Location 4
Tuesday 20th to Wednesday 21st October 2020
Hydrock
Sound Level, dB
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
1100
1130
1200
1230
1300
1330
1400
1430
1500
1530
1600
1630
1700
1730
1800
1830
1900
1930
2000
2030
2100
2130
2200
2230
2300
2330
0000
0030
0100
0130
0200
0230
0300
0330
0400
0430
0500
0530
0600
0630
0700
0730
0800
0830
0900
0930
1000
1030
Time, hh:mm

Appendix D Traffic Information

Technical Note

Project:	Prison Sites
Subject:	Trip Generation Assumptions – Category C Prisons
Author:	Atkins
Date:	21/08/2020

Given the nature of the land use, there is limited publicly available information about trip generation at prison sites. This technical note summarises the proposed trip generation assumptions for Category C prisons. It is based on the information previously used for planning applications at HMP Berwyn in Wrexham, HMP Full Sutton in York and HMP Glen Parva in Leicester.

Staff Numbers

- The prisoner to staff ratio is assumed to be 0.50.
- It is understood that 74% of the staff will be on site.
- Staff types would be split using the following proportions:
  - Uniform / Operational 60%; and
  - Non-uniform 40%.

Table 1 presents the proposed staff patterns.

Table 1 Staff Shift Patterns

Title	Time Period	Proportion of Staff (%)
Uniformed Staff		
Early Shift	07:00 to 12:30	22%
Main Shift	08:00 to 17:30	48%
Late Shift	13:30 to 20:30	23%
Nights	20:00 to 07:00	6%
Non-uniformed Staff (Flexible Working		
Early Shift	08:30 to 16:30	48%
Main Shift	09:30 to 17:00	52%

- It is assumed that staff arrive throughout the hour prior to the start of their shift and leave throughout the hour after a shift finishing.
- Due to operational processes, staff usually have a longer lead in time to allow them to go through security and hand-over shifts.
- Therefore, it is estimated that staff will arrive between 07:00-08:00 and leave between 17:30-18:30 for 'Main' uniform shift, and arrive between 07:30-08:30, and leave between 16:30-17:30 for the 'Early' non-uniform shift.

Staff Modal Split

- Journey to Work data from the 2011 Census for the area within which the prison development is proposed is used to understand likely travel modes of staff.
- Journey to Work modal splits from the 2011 Census can be applied to daytime staff but are amended for those working late shifts as it is considered that these staff are not likely to walk, cycle, or use public transport.

Visitor Numbers

The following sets out the methodology used to estimate the visitor numbers at the proposed prison.

- Assume prisoners receive two visits per month- this has been determined from prison visitation rates from other similar prisons.
- Assume visits are spread evenly across the month.
- There are morning visiting periods Monday to Thursday, 09:30-12:30 (2 x 90 minute slots), one afternoon period 14:30-16:30, and one visiting period on Friday and Saturday between the hours of 09:30-12:30.
- Evening visits take place twice a week between the hours of 17:00-19:00.
- For a typical weekday, this results in four visiting periods each day.
- It is assumed daily visits are spread evenly across these visiting periods.
- Each prisoner can be visited by a maximum of three people. It is assumed that the visitors of each individual prisoner will all travel together. Therefore, each prisoner will only generate a single 'Visiting Trip'.
- We have assumed visitors will arrive in the hour before the start time of the visiting period.
- In addition to the social visits, there will also be ad-hoc legal visits utilising five legal visit rooms. In reality, these trips are unlikely to generate material traffic volumes or occur during the peak hour. For robustness these trips have been added to the social visits.

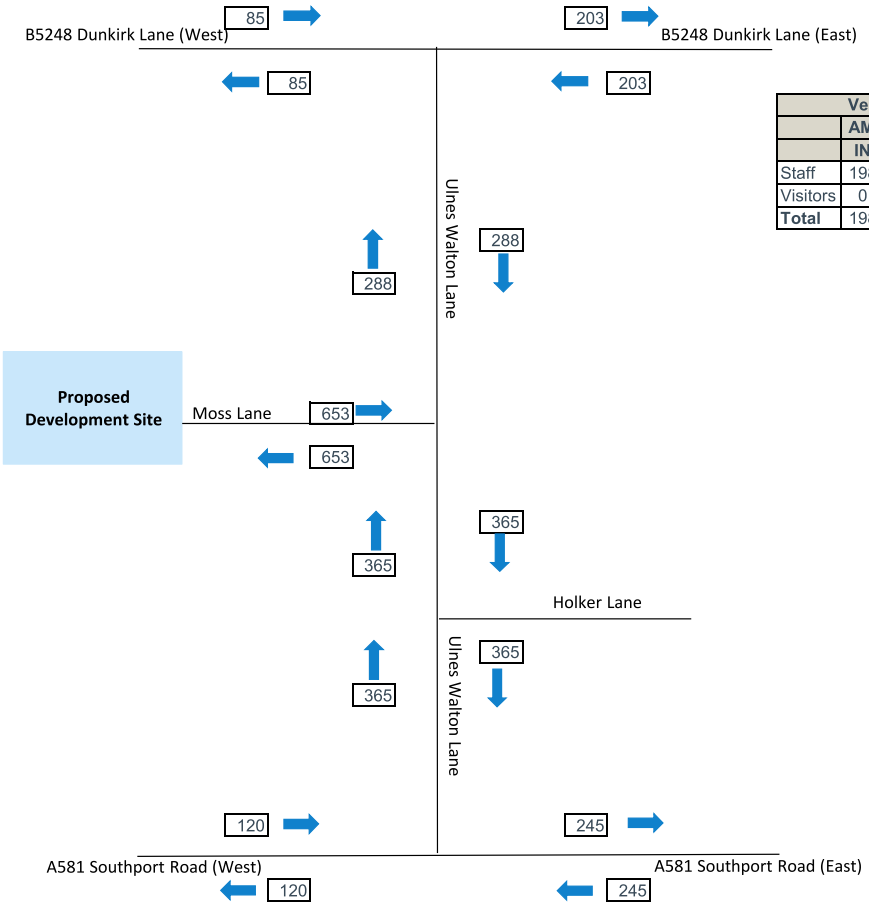
Visitor Modal Split

- It is considered that all visitor trips and legal visits will be made by private car, given the limited choices for other transport modes.
- If sites are located in areas of good existing sustainable transport provision, there might be a case to include a proportion of sustainable travel for visitor trips.
- However, legal visits are always assumed to be undertaken by private car.

Table 2 - Modal Split for Visitors and Legal Visits

Mode	Visitor Trips	Legal Visits
Car	100%	100%
Taxi/ Public Transport	0%	0%

Project: Albatross & Razorbill
Scenario: Development Trips
Time Period: Daily



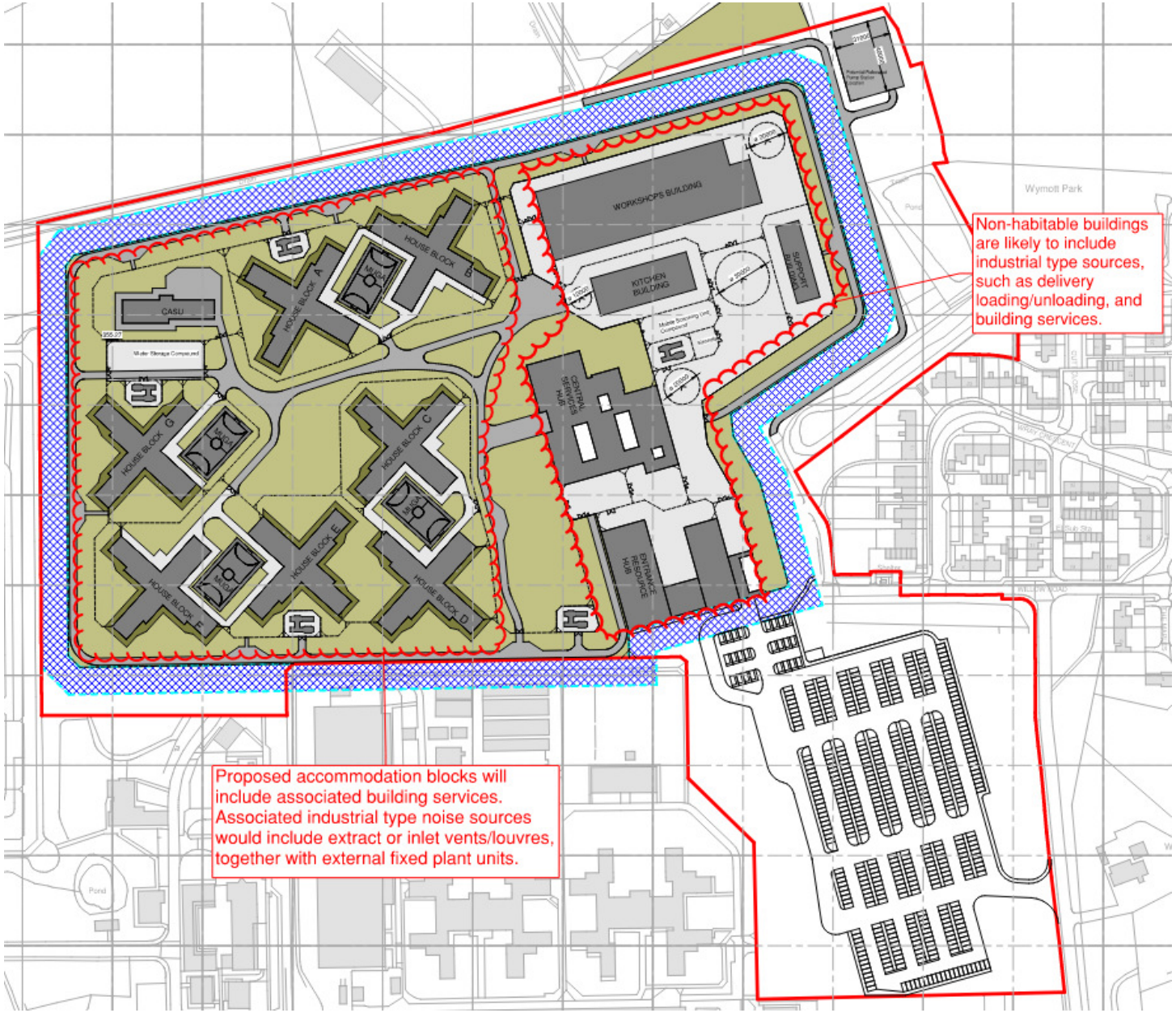
Vehicle Trips per hour						
	AM Peak		PM Peak		Daily	
	IN	OUT	IN	OUT	IN	OUT
Staff	198	20	0	231	**521**	**521**
Visitors	0	0	0	17	**132**	**132**
Total	198	20	0	248	**653**	**653**

Appendix E Noise Modelling Assumptions

The following prediction methodologies and assumptions were adopted and implemented in to the acoustic model:

- The base map of the acoustic model is based on scale mapping of the site, provided by Mace, together with Ordinance Survey vector mapping of the surrounding areas;
- A Digital Terrain Model (DTM) has been created within the acoustic model based on OS Terrain 5m resolution topographical data of the Site and surrounding area;
- Existing buildings, that will not be demolished as part of the proposed development, are incorporated within the acoustic model, to allow prediction of screening effects across the Site. Buildings are assumed to have fully reflective facades;
- No specific mitigation has been included within the acoustic model;
- Noise propagation is predicted in accordance with ISO 9613-2:1996 *'Acoustics – Attenuation of sound during propagation outdoors – Part 2: General Method of calculation'* (ISO9613);
- To reflect the local ground cover, ground absorption was set to G = 0.5 for majority soft ground (50% acoustically absorptive ground);
- Road traffic is assumed to travel at the known speed limits on each road;
- Proposed new roads are assumed to have 10mph speed limits;
- 10% HGV assumed on each road; and,
- 1st order reflections included in predictions.

Appendix F Potential Industrial Noise Sources


Non-habitable buildings are likely to include industrial type sources, such as delivery loading/unloading, and building services.
Proposed accommodation blocks will include associated building services. Associated industrial type noise sources would include extract or inlet vents/louvres, together with external fixed plant units.
WORKSHOPS BUILDING
KITCHEN BUILDING
SUPPORT BUILDING
CENTRAL SERVICES HUB
ENTRANCE RESOURCE HUB
CASU
HOUSE BLOCK A
HOUSE BLOCK B
HOUSE BLOCK C
HOUSE BLOCK D
HOUSE BLOCK E
HOUSE BLOCK F
HOUSE BLOCK G
Wymott Park
Pond