Gibbons Way

Noise Impact Assessment

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Client: HSP Consulting

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Contents

Revision History

Revision	Date	Revision Details	Author	Checked
R01	25/08/2020	Original Issue	DocuSigned by: Matt Jones 45C749F61A3B42E... Matt Jones MEng SMIOA	DocuSigned by: Susan Witterick 3E69257DCFC14C6... Susan Witterick BSc MIOA

Introduction

dBx Acoustics Ltd has been appointed by HSP Consulting Ltd to carry out a noise impact assessment for the proposed school development at Gibbons Way, North Cornelly, CF33 4ND. This site falls within district of Bridgend County Borough Council.

As current circumstances do not permit accurate noise surveys to be carried out, a desktop noise impact assessment has been carried out for this site. Available transportation data for the surrounding area, in conjunction with previous noise measurements and the Extrium Wales noise viewer, is used to undertake a noise impact assessment.

A glossary of acoustic terminology is provided in Appendix A in order to assist the reader.

Basis of Noise Assessment

Published traffic count data from the Department of Transport has been used to model the noise climate affecting the site. Full information on the sources and data used are presented in the Appendices to this report.

This assessment has been undertaken in accordance with current guidance issued by the Institute of Acoustics and Association of Noise Consultants.[1]

This report considers the Site's suitability through assessment of existing noise levels affecting the Site, which have been used to carry out the following works:

- Assessment of potential noise intrusion to school spaces and development of preliminary sound reduction requirements for the building façades with consideration of the proposed ventilation strategy.

The noise impact assessment is based on the following:

- Department for Education (2015) *'BB93 Acoustic Design of Schools'*. (BB93)
- BS 4142:2014 '*Methods for Rating and Assessing Industrial and Commercial Sound'*.

Local Authority Guidance

Bridgend County Borough Council

dBx Acoustics has reviewed the Bridgend County Borough Local Plan as well as supplementary planning guidance. We have not located any specific guidance from Bridgend County Borough Council relating to noise affecting new educational developments.

National Standards & Guidance

Building Bulletin 93

Requirement E4 from Part E of Schedule 1 to The Building Regulations 2000 (as amended) states that:

"Each room or other space in a school building shall be designed and constructed in such a way that it has the acoustic conditions and the insulation against disturbance by noise appropriate to its intended use."

These regulations came into force in July 2003.

Part E of the Building Regulations includes schools within its scope and Approved Document E gives the following guidance:

"In the Secretary of State's view the normal way of satisfying Requirement E4 will be to meet the values for sound insulation, reverberation time and internal ambient noise which are given in Section 1 of Building Bulletin 93 'The Acoustic Design of Schools', produced by DfES."

[1] https://www.association-of-noise-consultants.co.uk/wp-content/uploads/2020/03/Joint-Guidance-On-the-Impact-of-Covid.IOA-ANC-V2.pdf

The School Premises Regulations contain similar statements and apply to both new and existing school buildings.

Building Bulletin 93 (BB93) was updated in 2014 and is the current design standard applicable to compliance with the Building Regulations and the School Premises Regulations. This document includes design standards for internal ambient noise level, reverberation time, and sound insulation.

Building Bulletin 93 specifies upper limits for indoor ambient noise level for room types classified in terms of intended use.

The objective is to provide suitable indoor ambient noise levels (a) for clear communication of speech between teacher and student (b) clear communication between students and (c) learning and study activities. The indoor ambient noise level includes noise contributions from:

- external sources outside the school premises (including, but not limited to, noise from road, rail and air traffic, industrial and commercial premises);
- building services (e.g. ventilation system, plant, etc); and
- actuator and damper noise.

Where rooms are mechanically ventilated, the plant should be assumed to be running at its maximum operating duty.

The typically relevant internal ambient noise levels requirements for new build primary school spaces are summarised in Table 1 below.

Table 1 - BB93 Internal Ambient Noise Level Criteria

Room Type	Upper Limit for Internal Ambient Noise Level dB $L_{Aeq,30\ min}$	Upper Limit for Internal Ambient Noise Level (Natural Ventilation) dB $L_{Aeq,30\ min}$
General Classroom	35	40
SEN Group Room	30	35
Learning Resource	40	45
Main Hall	35	40
Staff Work Room, Office, Meeting Room, Reception	40	45
Corridor, hygiene room, WC, kitchen, foyer	50	55

Additionally, in order to protect students from regular discrete noise events, ambient noise levels should not exceed 60dB$L_{A1,30mins.}$

The indoor ambient noise level excludes noise contributions from teaching activities within the school premises, including noise from staff, students and equipment within the building or in the playground. Noise transmitted from adjacent spaces is addressed by the airborne and impact sound insulation requirements, which will be determined as the building design progresses.

BS 4142:2014 – Methods for Rating and Assessing Industrial and Commercial Sound

BS 4142:2014 sets out a procedure for assessing noise impact whereby a Noise Rating is determined and compared with the existing local Background Sound Level.

The Rating Level ($dBL_{Ar,Tr}$) is evaluated from the Specific Noise Level by including several, cumulative corrections to account for factors such as distinguishable tone, impulse, intermittency or other readily distinguishable sound characteristics.

BS 4142:2014 seeks to determine a "representative" Background Sound Level, stating that "…*the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods*".

The assessment of the impact depends upon the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level. An initial estimate of the impact of the specific sound is made by subtracting the Background Sound Level from the Rating Level, while considering the following points:

a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

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

d) 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.

We are not aware of any specific requirements in relation to BS4142:2014 from Bridgend CBC.

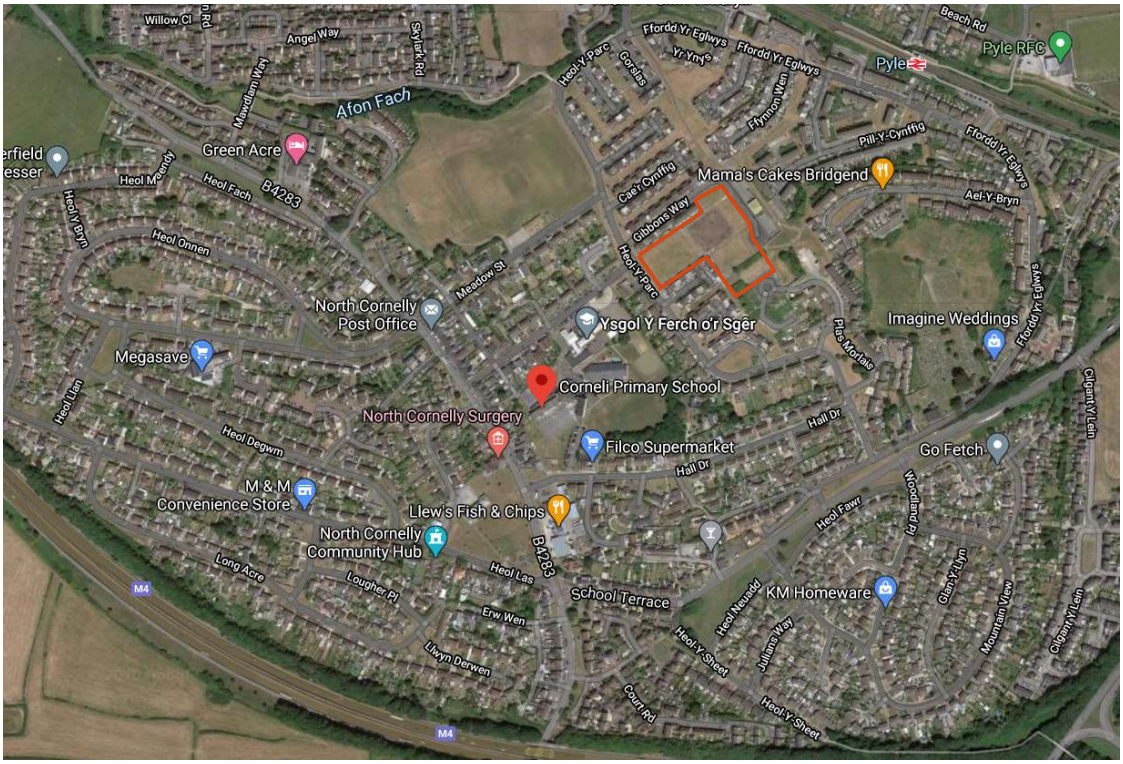
Site Description

Site Description

The site is located on an unused piece of land adjacent to Gibbons Way. The site is surrounded by residential properties, however, the M4 lies approximately 700m to the south and a railway line that serves the Marches and the Swanline train lines lies approximately 200m to the north.

A site location plan is provided as Figure 1, which illustrates the location of the Site and the surrounding area.

Figure 2 – Site location and surrounding area



Proposed Development

The footprint and location within the site of the proposed school buildings have not yet been determined.

There may be external plant associated with this development. Advice as to the location of the plant and the maximum rating level at the nearest noise sensitive property has therefore been given in this report.

Noise Model

The published rail and road data described in the Appendices to this report have been used to produce a noise model of the proposed development using noise modelling software SoundPLAN 8.2. The model uses OS Mastermap data to ensure that site terrain, including the elevation of the roads, as well as the location and height of surrounding buildings, is accurately represented within the model.

The model of the undeveloped site has been populated with noise sources including the M4, A4229 and B4283, as well as the surrounding road network. The model has been calculated as a 'worst-case' scenario and so the calculated noise levels may be higher than the on-site noise levels.

The results of the noise model have been compared against the anticipated rail and road noise levels shown by the Extrium Wales Noise Viewer[2] and found to be comparable although it should be noted that Extrium does not include traffic noise impact from minor roads.

The model has then been populated with the surrounding buildings only as the form and layout of the proposed school is not known at this design stage. The model results have been calculated at 1.5m and 4.5m to represent ground floor and first floor windows respectively.

Building Envelope Sound Insulation

The relevant internal noise criteria which have been adopted for the proposed school development using BB93 are outlined in Table 1, above, and typically vary between 35 and 50 dB $L_{Aeq,30min}$. This development may also include "teaching space intended specifically for students with special hearing and communication needs", which have the strictest requirements internal ambient noise environment of no more than 30 dB $L_{Aeq,30min}$.

An outline external noise break-in assessment has been undertaken to assess the suitability of the site for the proposed development and to specify the minimum sound insulation performance of the façades required to meet the recommended internal noise criteria. The assessment is based on the highest external noise levels predicted at each façade during the school day for each development option.

In accordance with BB93 guidance, for naturally ventilated teaching spaces, an internal noise level limit of 40 dB$L_{Aeq,30mins}$ is considered appropriate for classrooms (35dB$L_{Aeq,30mins}$ where rooms are specifically for children with hearing and communication needs). BB93 also states that where external ambient free field noise levels at the façade do not exceed the IANL figures given in Table 1 by more than 16 dB for single sided ventilated spaces and 20dB for cross ventilated or roof ventilated spaces, the criteria for natural ventilation can usually be achieved.

Therefore, natural ventilation is generally likely to be appropriate for general teaching rooms where the external noise level does not exceed 56 dB $L_{Aeq,30min}$ for spaces within single sided ventilation, or 60 dB $L_{Aeq,30min}$ for cross ventilated or roof ventilated spaces.

[2] http://extrium.co.uk/walesnoiseviewer.html

If the existing buildings are to be refurbished, then BB93 states that, for a typical classroom, an internal ambient noise level of 45 dB $L_{Aeq,30mins}$ would be appropriate. This means that natural ventilation would be appropriate for rooms where the external ambient noise level does not exceed 60 dB $L_{Aeq,30mins}$.

Noise Model Results

Figures 2 and 3 show the predicted ambient daytime noise levels across the site.

Figure 2: Calculated ambient daytime noise levels at a height of 1.5m

Figure 3: Calculated ambient daytime noise levels at a height of 4.5m

As shown by Figures 2 and 3, it can be seen that the ambient daytime noise levels across the site are anticipated to be between 50dB and 60dB $L_{Aeq,T}$. This means that ventilation by natural means **may be possible** depending on the location and form of the proposed buildings. This would need to be reviewed during detailed design.

Break-in Calculation

To determine the impact of the external noise levels on the internal ambient noise levels, an indicative break-in calculation was undertaken. Using a typical classroom of 10m x 5m x 2.5m with 33% glazing and the 'worst-case' predicted external noise level of 60 dB $L_{Aeq,30mins}$, the internal ambient noise levels can be calculated, and various mitigation methods tested.

To achieve the internal ambient noise level criterion of 40 dB $L_{Aeq,30min}$ for a naturally ventilated typical classroom, the minimum sound insulation requirements for glazing for classrooms exposed to 60dB$L_{Aeq,30min}$ are **30 dB R_w and 26 dB $R_w + C_{tr}$.** An example of the glazing that would meet these performance requirements would be standard 4mm/20mm thermal cavity/4mm double glazing.

In conjunction with the glazing, the minimum ventilator requirements are **26 dB $D_{n,e,w}$ and 22 dB $D_{n,e,w} + C_{tr}$** when ventilators are open. This performance should be achievable with a standard trickle vent.

In this situation, windows would need to be kept closed to achieve the required internal noise levels. Windows can be openable, but must be well sealed when closed. The frame should not downgrade the performance of the glazing. We anticipate that the external wall and roof will achieve a sound insulation performance at least 10dB greater than the glazing.

It should be stressed that this is an anticipated 'worst case' for acoustic glazing and ventilation requirements for development on this site. At this design stage, the results of the break-in calculation are only formative and should be revisited at a later stage, when the position and layout of the proposed school is known. At that point, specific advice to the minimum sound insulation requirements of glazing and ventilators can be given per classroom.

Building Services Noise Emissions

Based on a comparison between the ambient and background noise levels measured in the reference surveys described, and using the typical predicted daytime ambient noise level at the properties around the site of 60 dB $L_{Aeq,16hours,}$, the lowest daytime background noise level is conservatively anticipated to be around 55 dB $L_{A90,16hours.}$

In the absence of any specific requirements from the Local Planning Authority, it is recommended that the rating level $L_{Ar,T}$ from all items of building services plant when assessed in accordance with BS4142:2014 at the nearest sensitive receptor should be at least 5dB below the prevailing background sound level.

Therefore the rating noise level when assessed at the nearest residential façade to the school buildings should be no more than 50 dB $L_{Ar,Tr}$ during the day.

Conclusions

dBx Acoustics Ltd has been appointed by HSP Consulting Ltd to carry out a noise survey and noise impact assessment for the proposed at Gibbons Way, North Cornelly.

Due to Covid-19 restrictions and ongoing construction works affecting environmental noise levels for the foreseeable future, a desktop noise impact assessment has been submitted for this site. A noise model has been created using published data for the surrounding road network, which allows an assessment of noise levels affecting the proposed development during the daytime period.

Using the predicted noise levels, it is identified that there is potential for teaching spaces to be naturally ventilated although this will be dependent upon the location and form of the new buildings.

An outline assessment has been made of the potential worst-case required building envelope sound insulation in order to meet internal noise levels set out in Building Bulletin 93 for educational use and indicative worst-case sound insulation requirements for glazing and ventilators have been provided.

Whilst a more detailed assessment of façade requirements will be required as the scheme develops, taking the above into account, noise should not be a limiting factor in any planning application.

Appendix A – Glossary of Acoustic Terminology

Decibel, dB	A unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. For sound pressure level (L_p) the reference quantity is $2x10^{-5}$ N/m^2. The sound pressure level existing when microphone measured pressure is $2x10^{-5}$ N/m^2 is 0 dB, the threshold of hearing.
L	Instantaneous value of Sound Pressure Level (L_p) or Sound Power Level (L_w).
Frequency	Number of cycles per second, measured in hertz (Hz), related to sound pitch.
A weighting	Arithmetic corrections applied to values of L_p according to frequency. When logarithmically summed for all frequencies, the resulting single "A weighted value" becomes comparable with other such values from which a comparative loudness judgement can be made, then, without knowledge of frequency content of the source.
$L_{eq,T}$	Equivalent continuous level of sound pressure which, if it actually existed for the integration time period T of the measurement, would possess the same energy as the constantly varying values of L_p actually measured.
$L_{Aeq,T}$	Equivalent continuous level of A weighted sound pressure which, if it actually existed for the integration time period, T, of the measurement would possess the same energy as the constantly varying values of L_p actually measured.
$L_{n,T}$	L_p which was exceeded for n% of time, T.
$L_{An,T}$	Level in dBA which was exceeded for n% of time, T.
$L_{max,T}$	The instantaneous maximum sound pressure level which occurred during time, T.
$L_{Amax,T}$	The instantaneous maximum A weighted sound pressure level which occurred during time, T.

Appendix B – Traffic Count Data

The primary roads around the site have been modelled based on traffic data from the Department of Transport as indicated in the table below.

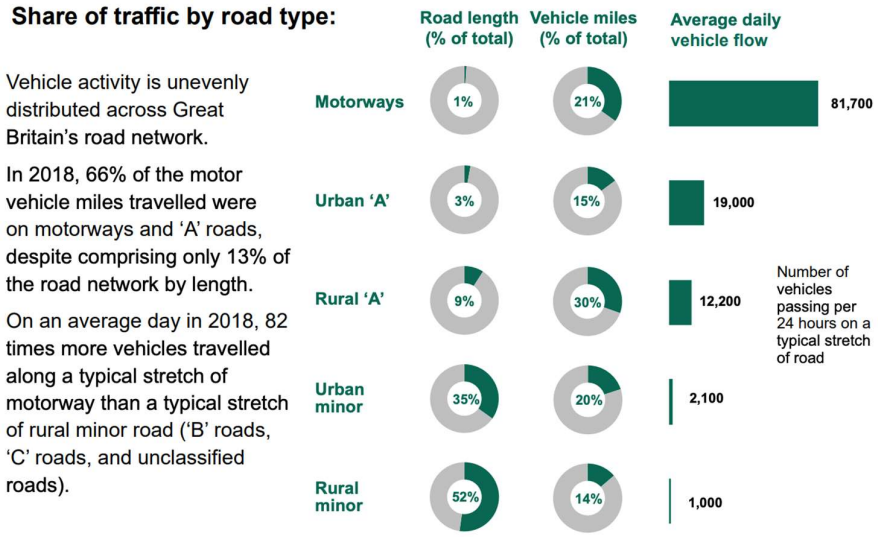
Table 3: Traffic Count Data Used in Assessment (Average Annual Daily Flow)

Source; Department for Transport[3],

Count Point	Description	Classification	Data Year	AADF	%HGV	Speed Limit MPH
502	M4 Manual Count Point	Motorway	2018	71420	8	70
647	A4229	A-road	2018	18596	5	60
73148	A48	Urban A-road	2018	8785	2	30

The DfT has also published data indicating typical traffic flows on various road types, replicated in the figure below. These typical traffic flows have been used to model the local roads around the site.

Figure 4: DfT Typical Traffic Flows[4]



All other local roads in the immediate site area have been modelled as 'rural minor' roads with the exception of the B4283, which has been treated as an 'urban A road'.

[3] https://roadtraffic.dft.gov.uk/#16/53.4737/-2.1279/basemap-countpoints

[4] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/808555/road-traffic-estimates-in-great-britain-2018.pdf

Appendix C – Sources for Railway Data

Train timetables and routes were first used to identify the number of trains per hour passing through Pyle Station.

Network rail have also published two documents[5] [6]that between them show the train type, the proportion of freight trains to passenger trains and the frequency of train movements at Pyle station.

The data as input into the model is broken down as follows:

Period	Train Type	Number	Number per Hour
Day (07:00-23:00)	Class 60	400	25
Night (23:00-07:00)	Class 60	115	14
	Freight	14	1

[5] https://www.networkrail.co.uk/wp-content/uploads/2016/11/Welsh-Route-Study.pdf

[6] https://sacuksprodnrdigital0001.blob.core.windows.net/working-timetable/WTT/01.%20WTT%20May%202020%20-%20December%202020/PB/PB03.pdf

Appendix D – Extrium Noise Viewer

The Extrium noise viewer was reviewed to calibrate the noise model and to check that the calculated noise levels are similar to real world noise levels. The Extrium Noise maps used to calibrate the noise model are shown below.

Figure 5: Extrium Wales Lden

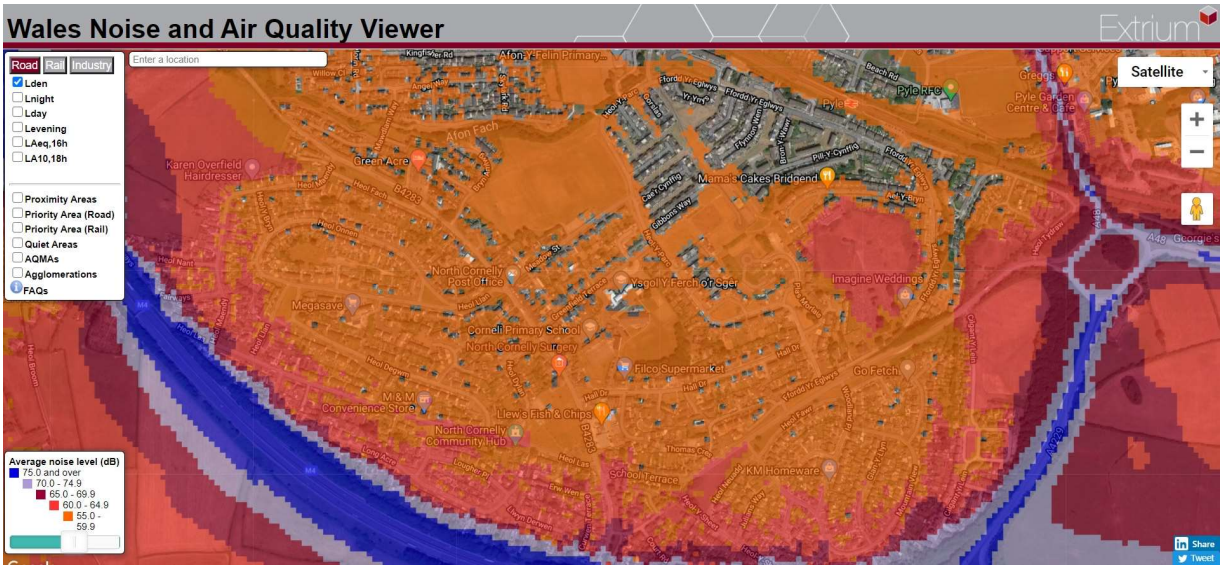


Figure 6: Extrium Wales Daytime Ambient Noise Level - Road

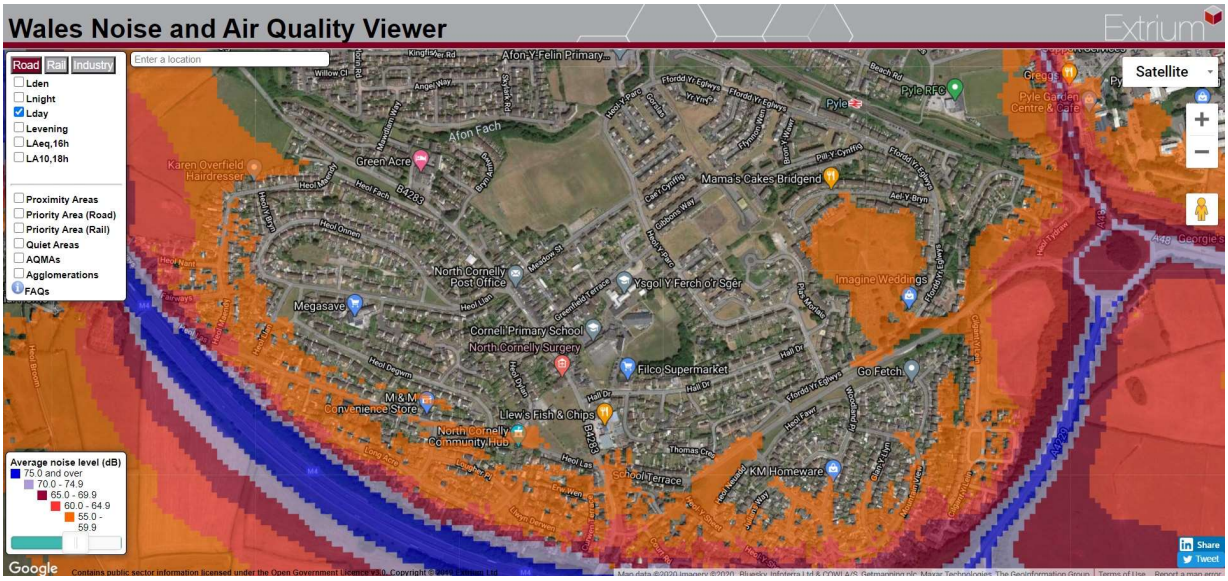


Figure 7: Extrium Wales Night-time Ambient Noise Level – Road

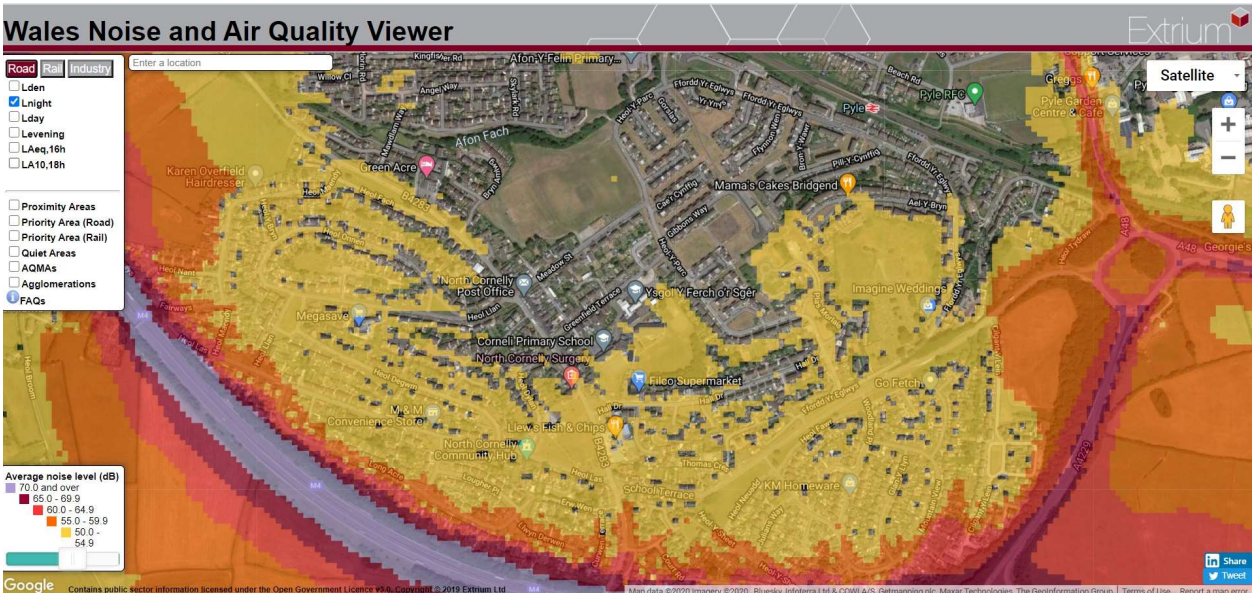


Figure 8: Extrium Wales Daytime Ambient Noise Level – Rail

Figure 9: Extrium Wales Night-time Ambient Noise Level – Rail