Upper Farm, Cosmeston

Noise Assessment

2nd September 2019

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1. INTRODUCTION

1.1. Overview

inacoustic has been commissioned to assess the impact of noise at the site known as Upper Farm Cosmeston, in respect of its suitability for residential-led development.

The following technical noise assessment has been produced to provide supporting information to accompany a planning application to Vale of Glamorgan Council and is based upon environmental noise measurements undertaken at the site and a subsequent noise modelling exercise.

This noise assessment is necessarily technical in nature; therefore a glossary of terms is included in Appendix A to assist the reader.

1.2. Scope and Objectives

The scope of the noise assessment can be summarised as follows:

- A sound monitoring survey was undertaken at discrete locations around the Site;
- A detailed assessment of the suitability of the Site, in accordance with relevant standards in respect of sound from the existing sources;
- An assessment of off-site road traffic effects; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of TAN11[1] and BS8233:2014[2].

[1] Planning Guidance (Wales), Technical Advice Note (TAN) 11: Noise – October 1997.
[2] British Standard Institution. BS 8233:2014: Guidance on noise reduction and sound insulation for buildings.

2. Planning Policy Framework

The development proposals for the Site are guided by the following policy directives and guidance:

2.1. National Policy

2.1.1. Technical Advice Note (Wales) 11 – Noise

Technical Advice Note (Wales) 11 (TAN11) has been referenced in determining the suitability of the Site for residential development. TAN11 sets out the Welsh Assembly Government's policies on noise-related planning issues. It sets out the overarching policy context for the management of noise within the planning system, in terms of how both noise-generating developments and noise-sensitive developments should be considered.

TAN11 gives guidance to local authorities in Wales guidance on the use of their planning powers to minimise the adverse impact of noise. Specifically, TAN11:

- outlines the considerations to be taken into account when determining planning applications for both noise-sensitive developments and for those activities which will generate noise;
- sets out noise exposure categories for residential development, encourages their use and recommends appropriate levels for exposure to different sources of noise; and
- advises on the use of planning conditions to minimise the impact of noise.

The four noise exposure category bands set out in TAN11 (or NECs) are designed to assist local planning authorities in evaluating applications for residential development in noisy areas. Table 1 summarises the noise levels that correspond to each NEC band for road traffic noise sources, which are the most relevant to this development.

Table 1: Noise Levels Corresponding to NECs For New Dwellings – $L_{AEQ,T}$ dB

Time Period	Noise Exposure Category (NEC) – Road Traffic Sources			
	A	B	C	D
07:00-23:00	<55	55 – 63	63 – 72	>72
23:00-07:00	<45	45 – 57	57 – 66	>66
N.B. Additionally, during night-time (2300 – 0700), sites where individual noise events exceed 82 dB L_{Amax} (slow time weighting) more than twice in any hour during this period should be treated as being in NEC C, regardless of the $L_{Aeq,8h}$ (except where the $L_{Aeq,8h}$ already puts the site in NEC D).				

The relevant planning advice to the local authority with respect to each NEC is presented in Table 2.

TABLE 2: PLANNING ADVICE CORRESPONDING TO NECS FOR NEW DWELLINGS

NEC	Advice to Local Planning Authority
A	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level.
B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise.
C	Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
D	Planning permission should normally be refused.

In addition to the above, TAN11 also states that during the night, (23:00 to 07:00 hours):

"*Sites where individual noise events regularly exceed 82dB L_{Amax} (S time weighting) several times in any hour should be treated as being in NEC C, regardless of the $L_{Aeq,8hr}$ (except where the $L_{Aeq,8hr}$ already puts the site into NEC D).*"

The advice within TAN 11 is useful as a planning tool; however, it is quite blunt, so reference is primarily made within this report to British Standards, which offer a greater degree of objective analysis.

2.2. British Standards

2.2.1. BS8233:2014

BS 8233:2014[3] draws on the results of research and experience to provide information on achieving internal acoustic environments appropriate to their functions. The guideline values provided are in terms of an average (L_{Aeq}) level.

The standard advises that, for steady external noise sources, it is desirable for internal ambient noise levels to not exceed the guidance values, as detailed below in Table 3.

TABLE 3: BS8233:2014 AMBIENT NOISE LEVELS

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room	40 dB $L_{Aeq,16hour}$	-
Sleeping	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

BS8233:2014 goes on to suggest that where development is considered necessary or desirable, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions will still be achieved.

With regard to maximum noise levels, the standard identifies that regular individual noise events (such as passing trains or scheduled aircraft etc) can cause sleep disturbance. The standard does not provide a guideline design target, but simply goes on to suggest that a guideline value may be set in terms of SEL or $L_{Amax,F}$, depending upon the character and number of events per night. It goes on to suggest that more sporadic noise events could require separate values.

In respect of external noise levels, the guidance in BS8233:2014 suggests that "*it is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments*".

BS8233:2014 provides a much more detailed narrative on noise levels in external amenity areas and acknowledges that it may not always be necessary or feasible to ensure that noise levels remain within these guideline values.

In respect of gardens and patios, BS8233:2014 states;

"...it is *also recognized that these guideline values are not achievable in all circumstances where development might be desirable."*

BS8233: 2014 goes on to state, for areas adjoining the strategic transport network:

"...a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited".

[3] British Standard 8233: 2014 *Guidance on sound insulation and noise reduction for buildings.* BSI

In respect of balconies, roof gardens and terraces, BS8233:2014 states; *"Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses; however, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space"*.

It is clear from the narrative of BS8233:2014, that Proposed Development within noisy environments should be designed to ensure that the recommended internal design standards are achieved, and that noise levels in external amenity areas are designed to effectively control and reduce noise levels, although it acknowledges that in certain circumstance meeting the external design recommendations may not be feasible, or necessary, especially where the provision of such spaces is desirable for other technical, planning or policy reasons.

2.3. Building Regulations

The Building Regulations cover acoustic conditions in schools (Requirement E4). In order to comply with Requirement E4, Approved Document E advises the criteria within Building Bulletin 93 (BB93) the *"Acoustic Design of Schools: Performance Standards"* be achieved. It should be noted that this assessment is based on the February 2015 release of BB93.

BB93 provides mandatory comprehensive acoustic guidance for primary and secondary education spaces. Performance standards for schools are detailed therein and give guidance on appropriate internal ambient noise levels, outdoor ambient noise levels, levels of airborne and impact sound insulation for internal partitions and suitable reverberant noise conditions for each area.

2.3.1. Internal Ambient Noise Levels

BB93 stipulates the maximum indoor ambient noise levels (IANL), $L_{Aeq,30mins}$, in unoccupied, critical spaces should not exceed certain values, in order to provide clear communication of speech between teacher and student and suitable study conditions. In addition, it advises that noise intrusion levels should not regularly exceed 60 dB $L_{A1,30mins}$ in the rooms having limits of 40 dB $L_{Aeq,30mins}$ or less for their IANL. The recommended maximum internal ambient noise levels apply to the contributions from both external noise sources (excluding noise from staff/pupils/equipment and playgrounds) and internal building services systems associated with the school itself.

The upper limits for the indoor ambient noise levels for this development are detailed below in Table 4.

TABLE 4: UPPER LIMIT FOR INDOOR AMBIENT NOISE LEVEL

Type of Room	Upper Limit for the Indoor Ambient Noise Level - $L_{Aeq,30mins}$ dB
Class Bases/Small Teaching Rooms/Common Room	40
Office/Meeting/Training Room	45
Corridors/Cloaks/Atrium/Dining Room	50
WCs/Kitchens	55

In order to protect students from regular discrete noise events, eg, aircraft, trains or HGV movements, indoor ambient noise levels should not exceed 60 dB $L_{A1,30mins}$. This is achieved by default for spaces with IANLs up to 40 dB $L_{Aeq,30mins}$, but requires assessment in spaces with higher IANL limits, eg, 45 and 50 dB. However, it should be noted that the only rooms types with IANLs higher than 40 dB are spaces that are not considered critical for learning (i.e. corridors and WCs), as such, no further consideration has been given the 60 dB $L_{A1,30mins}$ criteria.

Furthermore, BB93 states that for rooms that are naturally ventilated, then the indoor ambient noise level upper limit can be relaxed by 5 dB. Therefore, as an example, for a class base that is naturally ventilated, the indoor ambient noise level upper limit is $L_{Aeq,30mins}$ 45 dB.

2.4. Road Traffic Noise

The impact of any changes in road traffic noise levels due to the Completed Development traffic were assessed in accordance with the principles and guidance presented within the Design Manual for Roads and Bridges (DMRB).

The DMRB states that "The impact of a project at any location can be reported in terms of changes in absolute noise level. In the UK the standard index used for traffic noise is the $L_{A10,18hour}$ level, which is quoted in decibels".

In order to determine whether changes in traffic noise levels are likely to occur as a result of the Proposed Development , noise levels were predicted in accordance with the methodology contained within the Calculation of Road Traffic Noise (CRTN).

The calculation method uses a number of input variables to predict the noise level for any receptor point at a given distance from the road. However, in this assessment, the key factors are changes in traffic flows and the composition of the traffic (i.e. percentage HGVs). Therefore, the likely increase in road traffic noise levels as a direct result of the Proposed Development has been calculated in accordance with the Basic Noise Level (BNL) prediction method detailed in CRTN. This method considers the relative change in noise level for a notional road-side receptor at a distance of 10 m from the kerb and at a height of 1.5 m (free-field).

The DMRB presents a significance matrix for assessing the magnitude of changes in noise level as a result of traffic, which is reproduced in Table 5. This has been used in this assessment to consider the effect of any changes in road traffic noise levels. An increase in noise level represents an adverse effect whilst a reduction in noise represents a beneficial effect.

TABLE 5: ROAD TRAFFIC NOISE SIGNIFICANCE CRITERIA

Change in Noise Level, dB(A)	Significance of Effect	Change in Noise Level, dB(A)
0.0	No Change - No Effect	0.0
0.1 - 0.9	Negligible	0.1 - 0.9
1.0 - 2.9	Minor	1.0 - 2.9
3.0 - 4.9	Moderate	3.0 - 4.9
>5.0	Major	>5.0

3. Site Description

3.1. Site and Surrounding Area

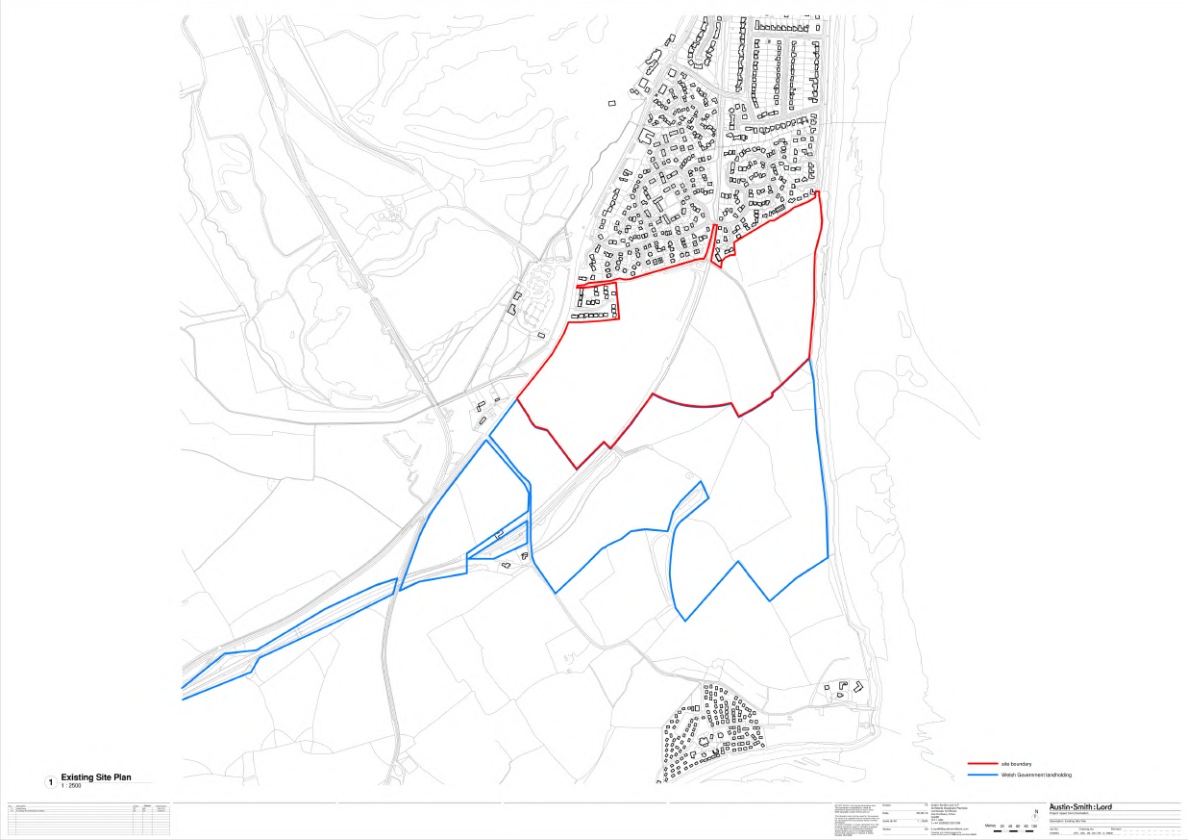
The Proposed Development site currently comprises 25.2Ha of greenfield land at Upper Cosmeston Farm located to the south of Penarth.

The site lies to the east of the B4267 Lavernock Road, which influences the sound environment of the immediate locality.

Away from the B4267 Lavernock Road, the sound environment across the site was influenced by natural sources such as birdsong and occasional overflying aircraft.

The Proposed Development area can be seen in Figure 1.

Figure 1: Proposed Development Site and Surrounding Area



3.2. Proposed Development Overview

11Ha of the site has been allocated for residential development within the recently adopted Vale of Glamorgan LDP. The allocation consists of circa 576 dwellings with associated community facilities including the retention of 1ha of the site for the provision of a primary school as shown in Figure 2.

The site is proposed for phased development, with the total development quantum as set out below:

- Phase 1 – Year 2022 - 50 residential units;
- Phase 1 & 2 – Year 2025 - 260 residential units, plus primary school; and
- Phase 1, 2 & 3 – Year 2029 - 576 residential units, plus primary school.

FIGURE 2: INDICATIVE MASTERPLAN

Since the original assessment was undertaken, the orientation of the school has changed; however this does not affect the outcome of the assessment.

The proposed building heights throughout the development are shown in Figure 3. Both illustrations also identify that no dwellings are proposed within 10 metres of the western boundary of the site, with Lavernock Road.

FIGURE 3: PROPOSED PARAMETER PLAN – BUILDING HEIGHTS

4. Measurement Methodology

4.1. General

The prevailing noise conditions in the area have been determined by an environmental noise survey conducted between Monday 26th and Tuesday 27th November 2018, with a repeat exercise conducted between Tuesday 14th and Wednesday 15th May 2019.

4.2. Measurement Details

All noise measurements were undertaken by a consultant certified as competent in environmental noise monitoring, and, in accordance with the principles of BS 7445[4].

All acoustic measurement equipment used during the noise survey conformed to Type 1 specification of British Standard 61672[5]. A full inventory of this equipment is shown in Table 6 below.

Table 6: Inventory of Sound Measurement Equipment

Measurement Position	Make, Model & Description	Serial Number
MP1 – November 2018	Rion NL-52 Sound Level Meter	00943360
	Rion NH-25 Preamplifier	43376
	Rion UC-59 Microphone	07154
MP1 – May 2019	Rion NL-52 Sound Level Meter	00764926
	Rion NH-25 Preamplifier	76427
	Rion UC-59 Microphone	12922
MP2	Rion NL-31 Sound Level Meter	00110027
	Rion NH-21 Preamplifier	00129
	Rion UC-53A Microphone	100496
All	Cirrus CR:515 Acoustic Calibrator	82501

The sound measurement equipment used during the survey was field calibrated at the start and end of the measurement period. A UKAS accredited calibration laboratory has calibrated the field calibrator used within the twelve months preceding the measurements. A drift of less than 0.2 dB in the field calibration was found to have occurred on the sound level meters.

The weather conditions during the survey were largely conducive with environmental noise measurement, with no precipitation and generally low wind speeds, with the exception of day 2 of the November survey, which has been excluded due to the influence of elevated wind speeds.

The microphones were fitted with protective windshields for the measurement, which is described in Table 7, with an aerial photograph illustrating their respective locations shown in Figure 4.

[4] British Standard 7445: 2003: Description and measurement of environmental noise. BSI
[5] British Standard 61672: 2013: Electroacoustics. Sound level meters. Part 1 Specifications. BSI.

TABLE 7: MEASUREMENT POSITION DESCRIPTIONS

Measurement Position	Description
MP1	A partially attended daytime and night-time source noise measurement at 8 metres from the southern edge of Lavernock Road. The microphone was located under free-field conditions, at a height of 1.5 metres above the ground. The sound environment at this location was primarily influenced by noise from road traffic using Lavernock Road and natural sources such as birdsong and moving vegetation. This measurement was undertaken during both November 2018 and May 2019. The exercise was repeated due to the undue influence of wind, during the 2nd day of the November survey, which has been edited out of that particular data set.
MP2	A partially attended daytime and night-time measurement of ambient sound towards the eastern extent of the site. The microphone was located under free-field conditions, at a height of 1.5 metres above the ground. The sound environment at this location was primarily influenced by natural sources such as birdsong and moving vegetation, with occasional contributions from overflying aircraft. This measurement was undertaken during November 2018, but was wind affected during the 2nd day of the survey. It was intended to repeat the measurement during May 2019; however, this area of the site was so heavily influenced by birdsong, the repeat exercise at this location was not deemed to be worthwhile.

FIGURE 4: MEASUREMENT POSITIONS

The summarised results of the noise measurements are presented in Table 8 and Table 9 with full, measured time histories presented under Appendix B.

TABLE 8: SUMMARY OF NOISE MEASUREMENT RESULTS

Position	Period	Noise Level, dB			
		$L_{Aeq,T}$	L_{A90}	L_{A10}	L_{AMax}
MP1 – November 2018	Day	61.4	49.3	64.3	73.6
	Night	51.4	26.0	44.5	70.8
MP1 – May 2019	Day	61.6	48.0	64.6	79.3
	*Night	53.0	32.0	46.9	72.6
MP2 – November 2018	Day	40.1	32.0	38.1	63.4
	Night	37.2	29.0	31.9	48.2
*denotes "*Dawn Chorus*" period excluded					

TABLE 9: SPECTRAL MEASUREMENT RESULTS

Period	dB(A)	Octave Band (Hz) Sound Level (dB)							
		63	250	250	500	1000	2000	4000	8000
MP1 – November 2018									
$L_{eq,T}$									
Day	61.4	63.2	56.6	55.2	55.1	59.3	53.4	41.2	33.4
Night	51.4	51.1	46.1	45.1	45.0	49.1	44.1	33.9	28.2
L_{FMax}									
Night	70.8	70.7	64.4	66.1	67.1	69.1	59.2	51.8	47.1
MP1 – May 2019									
$L_{eq,T}$									
Day	61.6	66.5	62.2	59.2	55.4	58.1	53.3	51.4	44.4
Night	53.0	56.1	52.8	49.1	46.2	49.7	45.6	42.1	34.1
L_{FMax}									
Night	72.6	69.8	70.2	66.5	64.3	70.9	64.5	54.8	40.4

5. Noise Assessment – Site Suitability

5.1. Noise Modelling

The baseline noise measurement results for MP1, presented in Table 8 have been used to predict noise levels across the area of the site in the vicinity of Lavernock Road. Towards the eastern edge of this area and certainly beyond the modelled area, road traffic noise ceases to become any sort of tangible factor, hence the limited modelling area.

The predictions have been carried out using the noise-modelling suite Cadna/A, in accordance with the CRTN prediction methodology for road traffic noise. The overall results in have been processed to determine appropriate noise emission rates for the road affecting the site. The $L_{Aeq,16hour}$ daytime (07:00 to 23:00) and $L_{Aeq,8hour}$ night-time (23:00 to 07:00) noise levels at a distance of 10 metres from the roads have been derived, as required to populate the noise model.

In addition to the derived road traffic source noise levels used in the predictions, the model also considers the effects of the topographical conditions throughout the area, ground absorption, atmospheric absorption, acoustic reflections, acoustic screening as well as applying a light downwind propagation correction to represent worst case.

The model has been used to determine the daytime $L_{Aeq,16\text{-}hour}$ (07:00 to 23:00) and night-time $L_{Aeq,8\text{-}hour}$ (23:00 to 07:00) noise levels across the site.

To allow determination of the suitability of the Site for residential development, the output from the daytime and night-time baseline noise models has been presented in the form of noise contours overlaid on a plan of the Proposed Development area, as presented below.

5.2. Assessment

Figure 5 and Figure 6 identify the predicted site-wide noise levels for the 16-hour (07:00 to 23:00) daytime, at ground level and 8-hour night-time (23:00 to 07:00) at first floor levels respectively.

Figure 7 and Figure 8 identify the site-wide L_{Aeq} noise levels in the context of key amenity benchmarking criteria, as set out in BS8233 for the daytime and night-time at ground and first floor levels, respectively.

To place the levels in Figure 6 and Figure 7 in context, they accord to the following factors:

- Daytime levels of below 50 dB(A) and night-time of 45 dB(A) (NEC A) are the threshold for BS8233-compliant internal noise levels achieved with windows open for ventilation. External amenity criteria comfortably met;
- 50 to 55 dB(A) by day (NEC A) and 45 to 50 dB(A) by night (NEC B) are the threshold for BS8233 plus 5dB relaxation internal noise levels achieved with windows open for ventilation. External amenity criteria met;
- 55 to 60 dB(A) by day (NEC B) and 50 to 55 dB(A) by night (NEC B) identify BS8233-compliant internal noise levels achieved with standard thermally insulating windows shut and ventilation provided by an alternative means to an open window. External amenity criteria marginally exceeded; and
- Over 60 dB(A) by day (NEC B and higher) and 55 dB(A) by night (NEC B and higher) requires detailed consideration. Detailed facade consideration and design may be required in order to achieve BS8233-compliant internal noise levels and Part F (UK Building Regulations) compliance.

FIGURE 5: DAYTIME $L_{AEQ,16\text{-}HOUR}$ NOISE LEVELS – DB

FIGURE 6: NIGHT-TIME $L_{AEQ,8\text{-HOUR}}$ NOISE LEVELS – DB

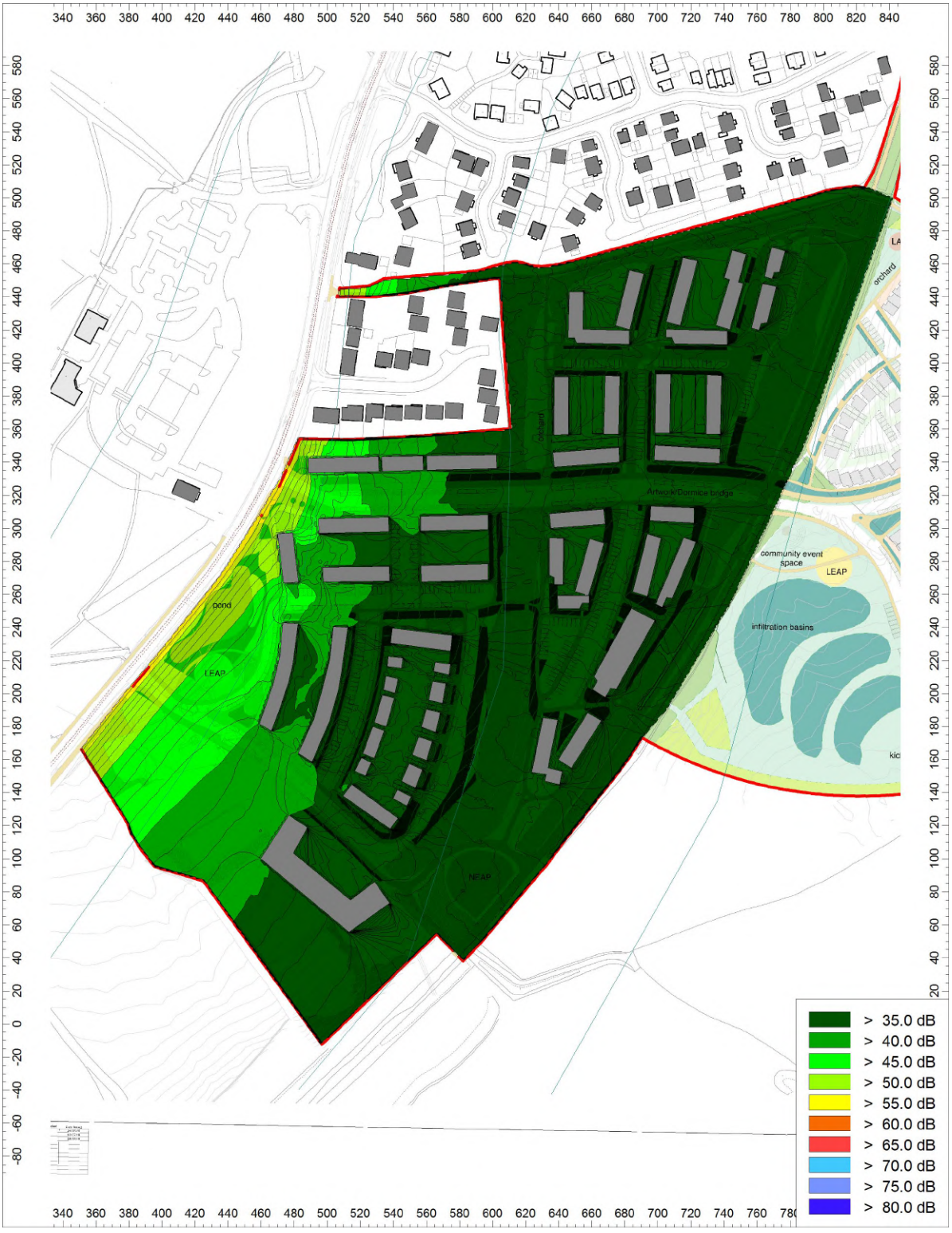


FIGURE 7: DAYTIME $L_{AEQ,16\text{-HOUR}}$ BS8233: 2014 AMENITY CONSTRAINTS

FIGURE 8: NIGHT-TIME $L_{AEQ,8\text{-}HOUR}$ BS8233: 2014 AMENITY CONSTRAINTS

5.2.1. Results

In summary the data presented in Figure 6 and Figure 7 can be interpreted as follows:

- The site is categorised as NEC A to NEC B of TAN11, with only the Proposed Development areas immediately adjacent to the Lavernock Road Corridor experiencing a higher categorisation of NEC B.
- The vast majority of the site will be broadly suitable for ventilation via open windows.
- No part of the built form of the development is proposed in areas with ambient sound levels of greater than 60 dB(A) by day and 55 dB(A) by night, thus ensuring that none of the residential units will require substantial acoustic façade mitigation; with their external building fabric design being steered by thermal requirements.
- The area of the site proposed for educational uses is primarily affected by noise levels of less than $L_{Aeq,T}$ 55 dB during the day, resulting in minimal acoustic constraint to the use of this area for a school and associated external teaching/play space.
- The vast majority of gardens of the Proposed Development will comply with the <55 dB(A) criterion for external amenity space, set out in BS8233:2014, with those adjacent to Lavernock Road, being easily compliant once garden boundary structures are installed.
- The parameter plan design of the Proposed Development has responded to the only significant noise source affecting the site; being road traffic on Lavernock Road, thus negating the necessity for acoustic mitigation.
- Noise levels towards the eastern edge of the modelled area cease to be influenced by road traffic on Lavernock Road, being entirely diluted by natural sources, such as birdsong, moving vegetation and, under certain conditions, wave action on the foreshore.

Considering the above; the site is largely unconstrained by noise, and is considered, on this basis to be suitable, in its entirety for residential and educational uses.

Since the original assessment was undertaken, the orientation of the school has changed; however this does not affect the outcome of the assessment.

6. Noise Assessment – Off-Site Road Traffic

6.1. Noise Modelling

This assessment has been based on a comparison of the following scenarios, against the baseline (+ committed development) for each assessment year:

- 2022 + Committed dev + 50 residential dwellings (Phase 1);
- 2025 + Committed dev + 260 residential dwellings + school (Phase 1 & 2); and
- 2029 + Committed dev + 576 residential dwellings + school (Phase 1, 2 & 3).

The traffic data used in the assessment has been provided by The Applicant's transport consultant and is contained in Appendix C. The data includes details of 18-hour (06:00 to 00:00) annual average weekday traffic flows (AAWT), percentage HGV for the assessment years considered and the speed limit for each considered road link.

The likely change in road traffic noise levels as a direct result of the Proposed Development has been determined by comparing predicted noise levels for the without the Proposed Development scenarios, with the with the Proposed Development scenarios. The calculations reflect the predicted change in traffic flows on the assessed routes

The predicted changes are set out in Table 10.

Table 10: Predicted Changes in Traffic Noise

Road Link	Predicted Change in Road Traffic Noise – $L_{A10,18\text{-hour}}$ dB			Significance of Effect		
	2022	2025	2029	2022	2025	2029
A4231/A4055/Sully Moors Road roundabout junction						
A4231	0.0	0.0	0.0	No Change	No Change	No Change
A4055 (E)	0.0	0.0	0.0	No Change	No Change	No Change
Sully Moors Road	0.0	0.1	+0.1	No Change	Negligible	Negligible
A4055 (W)	0.0	0.0	+0.1	No Change	No Change	Negligible
Sully Moors Road/B4267/Hayes Road roundabout junction						
Sully Moors Road	0.0	+0.1	+0.1	No Change	Negligible	Negligible
B4267	0.0	+0.1	+0.1	No Change	Negligible	Negligible
Hayes Road	0.0	0.0	0.0	No Change	No Change	No Change
Lavernock Road/Cosmeston Lake Country Park priority junction						
Lavernock Road (S)	+0.1	+0.4	+0.7	Negligible	Negligible	Negligible
Cosmeston Lakes	0.0	+0.4	0.0	No Change	Negligible	No Change
Lavernock Rd (N)	+0.1	+0.4	+0.7	Negligible	Negligible	Negligible

Road Link	Predicted Change in Road Traffic Noise – $L_{A10,18\text{-hour}}$ dB			Significance of Effect		
	2022	2025	2029	2022	2025	2029
Lavernock Road/Cosmeston Drive priority junction						
Lavernock Road (N)	+0.1	+0.4	+0.6	Negligible	Negligible	Negligible
Cosmeston Drive	0.0	0.0	0.0	No Change	No Change	No Change
Lavernock Road (S)	+0.1	+0.4	+0.7	Negligible	Negligible	Negligible
Lavernock Road/Westbourne Road priority junction						
Lavernock Road (N)	+0.1	+0.4	+1.0	Negligible	Negligible	Minor
Westbourne Road	0.0	+0.2	+0.3	No Change	Negligible	Negligible
Lavernock Road (S)	+0.1	+0.4	+0.6	Negligible	Negligible	Negligible
B4267/Augusta Road/Lavernock Road/Castle Avenue crossroads						
B4267	+0.1	+0.4	+0.8	Negligible	Negligible	Negligible
Augusta Road	0.0	+0.4	0.0	No Change	Negligible	No Change
Lavernock Road	+0.1	+0.5	+0.8	Negligible	Negligible	Negligible
Castle Avenue	0.0	+0.3	0.0	No Change	Negligible	Negligible
Lavernock Road/Dinas Road/Victoria Road crossroads						
Lavernock Road (N)	+0.1	+0.4	+0.7	Negligible	Negligible	Negligible
Victoria Road	0.0	+0.1	0.0	No Change	Negligible	No Change
Lavernock Road (S)	+0.1	+0.4	+0.8	Negligible	Negligible	Negligible
Dinas Road	0.0	+0.2	+0.2	No Change	Negligible	Negligible
Cardiff Road/B4267/A4055 signalised junction						
Cardiff Road (E)	0.0	+0.1	+0.2	No Change	Negligible	Negligible
B4267 (S)	0.0	+0.2	+0.4	No Change	Negligible	Negligible
Cardiff Road (W)	0.0	0.0	0.0	No Change	No Change	No Change

Road Link	Predicted Change in Road Traffic Noise – $L_{A10,18\text{-hour}}$ dB			Significance of Effect		
	2022	2025	2029	2022	2025	2029
A4055/B4267/Andrew Road signalised crossroads						
B4267	0.0	0.0	+0.1	No Change	No Change	Negligible
A4055 (E)	0.0	+0.1	+0.3	No Change	Negligible	Negligible
A4055 (W)	0.0	+0.1	+0.2	No Change	Negligible	Negligible
A4055/A4160 signalised intersection						
A4160 (N)	0.0	+0.1	+0.2	No Change	Negligible	Negligible
A4055 (E)	0.0	0.0	+0.1	No Change	No Change	Negligible
A4160 (S)	0.0	0.0	0.0	No Change	No Change	No Change
A4055 (W)	0.0	+0.1	+0.3	No Change	Negligible	Negligible

The results presented in Table 10 identify that the development is largely predicted to engender a negligible change in road traffic under future year scenarios, giving rise to a wide area **Negligible Effect** in localised road traffic noise. There is however, a **Localised Minor Effect** along one section of Lavernock Road, between the site and Westbourne Road.

7. CONSTRUCTION

The precise construction method and phasing have not yet been determined; however, a Construction Environmental Management Plan (CEMP) will be prepared and submitted in due course to the Local Planning Authority for approval, which will be steered by the criteria set out in BS 5228: 2009+A: 2014[6].

With regard to vibration, the document sets a ground vibration limit, in terms of Peak Particle Velocity (PPV) of 1 mm per second at any occupied residential property and 3 mm per second at any other property in any orthogonal direction.

It is anticipated that construction hours will be limited by condition, agreed with the Local Planning Authority.

With respect to the minimisation of acoustic disruption arising from construction activity, the following techniques will be employed:

- effective co-ordination and time management of construction operations would be important in avoiding noise and vibration nuisance to surrounding uses. Early and helpful communications with the surrounding receptors would assist reducing potential for and in managing any complaints arising during the demolition and construction works of the Proposed Development; and
- contractors would be required to ensure that works are carried out in accordance with Best Practice Measures (BPM) as stipulated in the Control of Pollution Act 1974. A full explanation of measures to control construction noise would be incorporated within the CEMP and detailed in all construction method statements.

The Proposed Development in regards to general noise mitigation would be in accordance with Best Practicable Means (BPM) as specified in BS 5228 and would comprise the following, where possible:

- use of continuous flight auger piling, at locations where noise-sensitive receptors are within 20 metres;
- using 'silenced' plant and equipment;
- switching off engines where vehicles are standing for a significant period of time;
- fitting of acoustic enclosures to suppress noisy equipment;
- operating plant at low speeds and incorporating of automatic low speed idling;
- selecting electrically driven equipment in preference to internal combustion powered, hydraulic power in preference to pneumatic and wheeled in lieu of tracked plant;
- properly maintaining all plant (greased, blown silencers replaced, saws kept sharpened, teeth set and blades flat, worn bearings replaced, etc.);
- considering the use of temporary screening or enclosures for static noisy plant to reduce noise emissions;
- certifying plant to meet any relevant EC Directive standards; and
- undertaking awareness training of all contractors in regards to BS5228 (Parts 1 and 2) which would form a prerequisite of their appointment.

Typically, adopting BPM would reduce overall construction noise levels by approximately 5 dB.

Should any non-routine activities be identified that would make it impracticable to work to the adopted target criterion, provisions would be set out in advance and with the agreement of the Local Planning Authority, to reduce and control the effect. It is recommended that noise monitoring is

[6] British Standard BS 5228: 2009+A: 2014 Code of practice for noise and vibration control on construction and open sites. BSI

carried out during particularly noisy phases of work close to the site boundary so that such situations can be actively managed in accordance with the CEMP.

For any proposed construction works to be undertaken outside of the permitted working day, particularly at night, prior consent would be sought from the Local Planning Authority. Dispensation procedures for works would be agreed in advance and included within Construction Method Statements and a CEMP.

Deliveries and removal of material off-site, would be subject to the following controls;

- ensuring that construction traffic is parked off the public highway;
- controlling the discharge of trucks from Site to avoid congestion; and
- implementing traffic management systems at the entrance to the site at all times to control the traffic into the site.

By implementing the aforementioned measures, it is anticipated that any noise impacts to nearby sensitive receptors during the demolition and construction works will be minimised.

8. CONCLUSION

inacoustic has been commissioned to assess the impact of noise at the site known as Upper Farm Cosmeston, in respect of its suitability for residential-led development.

This technical noise assessment has been produced to provide supporting information to accompany a planning application to Vale of Glamorgan Council and is based upon environmental noise measurements undertaken at the site and a subsequent noise modelling exercise.

The suitability of the site for residential-led development has been assessed, based on the current parameter plans and the predicted noise levels.

Where the measured levels indicate that noise may be a determining factor in the granting of planning permission, mitigation measures have been proposed to ensure satisfactory acoustic conditions are met.

The assessment has identified that the site is suitable for residential and educational development, in accordance with the current parameter plans, without the need for specific acoustic mitigation measures.

The noise effects of changes to off-site levels of road traffic have also been considered and predicted to give rise to no more than a wide area Negligible Effect, with a localised Minor Effect, adjacent to the site.

In light of the above, which demonstrates that the site is predicted to meet the requirements of the relevant British Standard and planning guidance, it is considered that noise does not present a constraint to the residential-led development of the site.

9. APPENDICES

9.1. Appendix A – Definition of Terms

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa ($20x10^{-6}$ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
Leq,T	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
Lmax,T	A noise level index defined as the maximum noise level during the period T. Lmax is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L90,T	A noise level index. The noise level exceeded for 90% of the time over the period T. L90 can be considered to be the "average minimum" noise level and is often used to describe the background noise.
L10,T	A noise level index. The noise level exceeded for 10% of the time over the period T. L10 can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

TABLE 11: TYPICAL SOUND LEVELS FOUND IN THE ENVIRONMENT

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source.

A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not be normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10}, the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq}.

This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound.

To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS 4142 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1hour}$ dB and $L_{A90,15mins}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125 ms.

9.2. Appendix B – Measurement Results

FIGURE 9: MEASURED NOISE RESULTS – MP1 (NOVEMBER 2018)

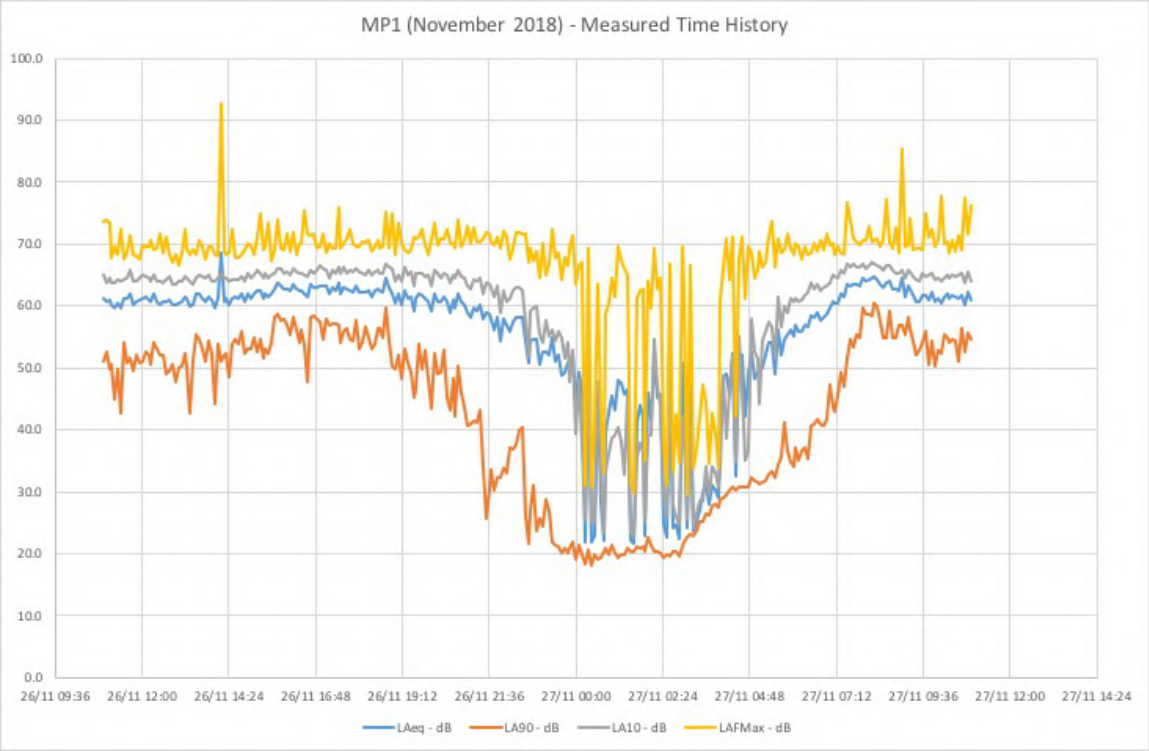


FIGURE 10: MEASURED NOISE RESULTS – MP1 (MAY 2019)

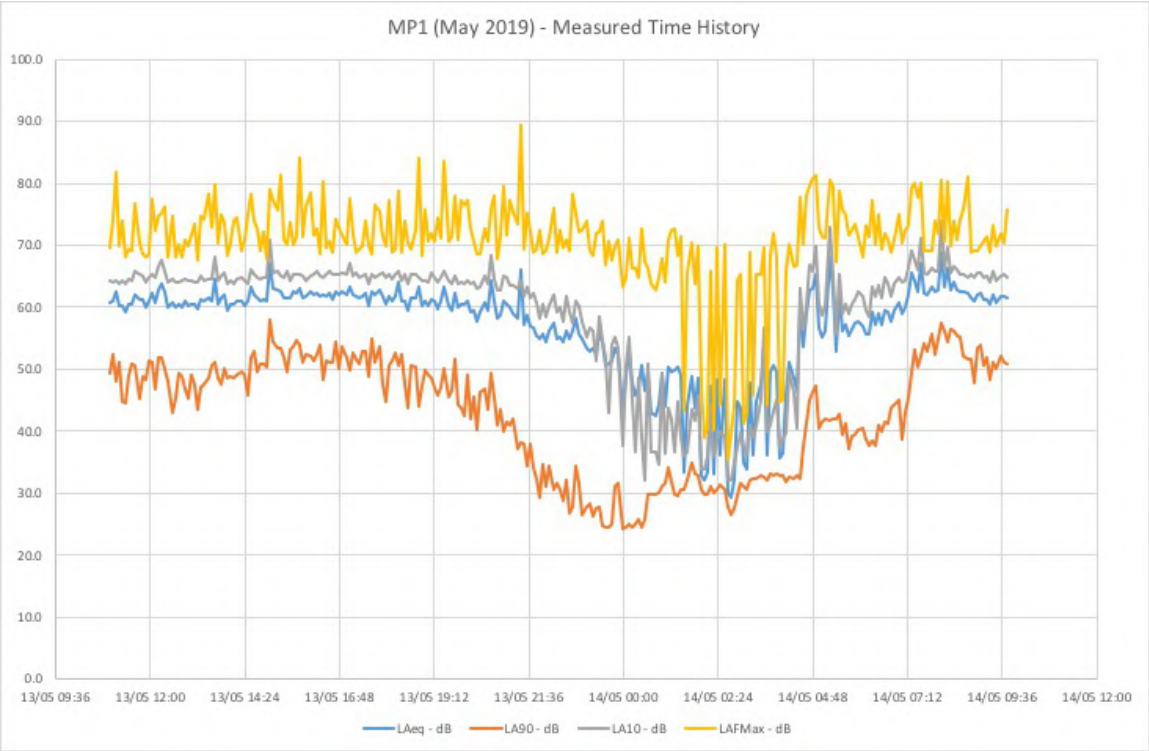
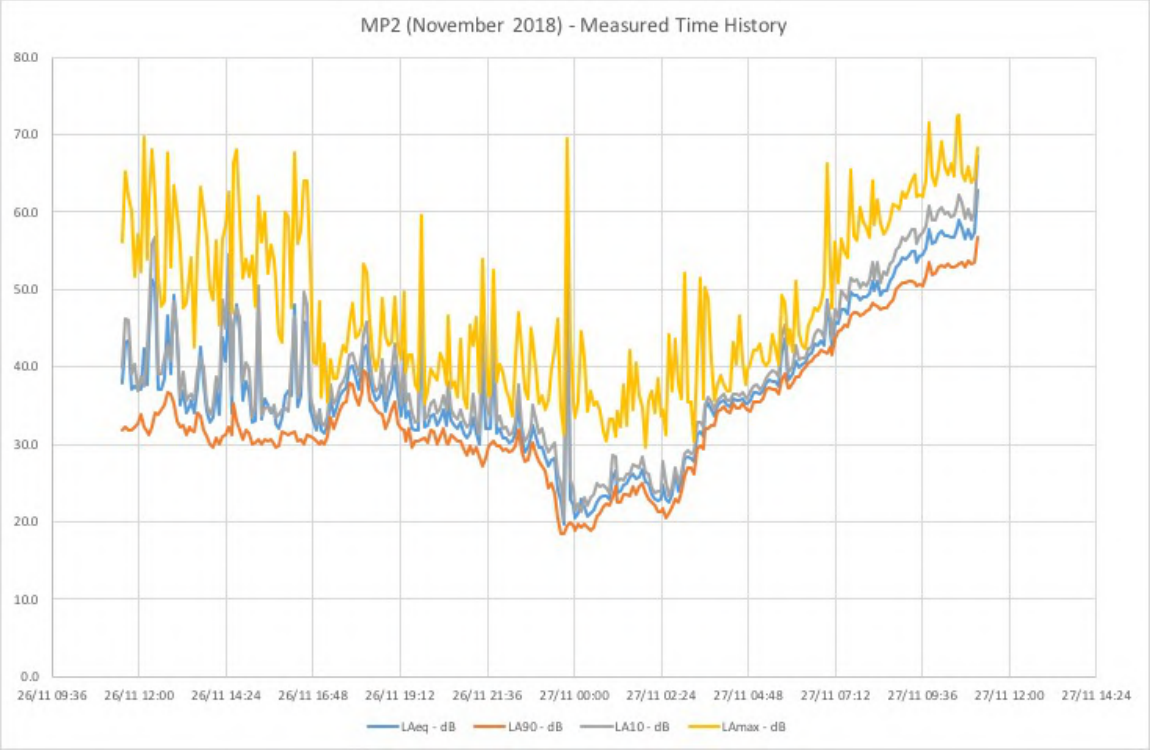


FIGURE 11: MEASURED NOISE RESULTS – MP2 (NOVEMBER 2018)



9.3. Appendix C – Traffic Flows Used in the Assessment

Road Link	AAWT 18-hour Baseline + Committed Development			AAWT 18-hour Baseline + Committed Development + Proposed Development		
	2022	2025	2029	2022	2025	2029
A4231/A4055/Sully Moors Road roundabout junction						
A4231	12822	13225	14137	12834	13294	14291
A4055 (E)	13339	13756	14697	13339	13756	14697
Sully Moors Road	13023	13415	14300	13061	13592	14693
A4055 (W)	17420	17982	19254	17443	18090	19492
Sully Moors Road/B4267/Hayes Road roundabout junction						
Sully Moors Road	11903	12251	13037	11941	12428	13430
B4267	13630	14033	14944	13668	14210	15337
Hayes Road	6134	6332	6780	6134	6332	6780
Lavernock Road/Cosmeston Lake Country Park priority junction						
Lavernock Road (S)	11234	11588	12387	11408	12722	14503
Cosmeston Lakes	349	360	386	349	360	386
Lavernock Rd (N)	11304	11660	12464	11478	12794	14580
Lavernock Road/Cosmeston Drive priority junction						
Lavernock Road (N)	12033	12412	13270	12207	13547	15386
Cosmeston Drive	1453	1500	1606	1453	1500	1606
Lavernock Road (S)	11226	11579	12378	11399	12713	14494
Lavernock Road/Westbourne Road priority junction						
Lavernock Road (N)	5951	6144	6580	6084	6756	8215
Westbourne Road	6645	6849	7312	6685	7101	7792
Lavernock Road (S)	12473	12867	13757	12646	14000	15871

Road Link	AAWT 18-hour Baseline + Committed Development			AAWT 18-hour Baseline + Committed Development + Proposed Development		
	2022	2025	2029	2022	2025	2029
B4267/Augusta Road/Lavernock Road/Castle Avenue crossroads						
B4267	6976	7202	7714	7109	7953	9218
Augusta Road	1130	1167	1249	1130	1232	1249
Lavernock Road	6331	6536	7000	6463	7416	8504
Castle Avenue	1453	1500	1606	1453	1565	1606
Lavernock Road/Dinas Road/Victoria Road crossroads						
Lavernock Road (N)	6361	6567	7033	6480	7125	8270
Victoria Road	3687	3806	4076	3687	3871	4076
Lavernock Road (S)	6754	6973	7468	6886	7723	8907
Dinas Road	3399	3509	3758	3412	3636	3961
Cardiff Road/B4267/A4055 signalised junction						
Cardiff Road (E)	20822	21461	22908	20941	22020	24145
B4267 (S)	12091	12475	13345	12210	13034	14582
Cardiff Road (W)	12012	12373	13190	12012	12373	13190
A4055/B4267/Andrew Road signalised crossroads						
B4267	8164	8421	9003	8179	8491	9158
A4055 (E)	16477	16987	18141	16581	17475	19223
A4055 (W)	18978	19562	20882	19098	20120	22119
A4055/A4160 signalised intersection						
A4160 (N)	9929	10240	10943	9978	10466	11443
A4055 (E)	24732	25521	27305	24788	25783	27887
A4160 (S)	18333	18927	20271	18333	18927	20271
A4055 (W)	16165	16669	17809	16269	17157	18890

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