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Noise Impact Assessment:

For Proposed

**Biomass Boiler
Intertissue Briton Ferry Site
Baglan Energy Park
Neath
SA11 2HZ**

For

**Axis acting on behalf of
Intertissue Ltd**

**Report No.: R24.0303/DRK
Report Date: 23rd May 2024**

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Noise & Vibration Consultants Ltd

**Member of Institute of Acoustics
Member of Association of Noise Consultants
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**Report undertaken & checked by:
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A handwritten signature in black ink, appearing to read 'D R Kettlewell', is written over a light gray background.

Date: 23rd May 2024

Summary

1. Intertissue Ltd ('the Applicant') is proposing to submit a planning application to construct and operate a biomass energy generation facility ('the biomass boiler') to replace the existing gas fired boiler at the existing Intertissue paper manufacturing and processing plant located at the Briton Ferry Site, Baglan Energy Park, Neath.
2. This assessment has been commissioned by Axis acting on behalf of Intertissue Ltd to determine the noise impact at the nearest sensitive receptors ('NSRs') in relation to the Proposed Development.
3. Noise levels have been considered and assessed during the construction and operational phases of the biomass boiler. Relevant and appropriate noise guidance and standards have been used to determine the noise impact and where appropriate amelioration measures provided to mitigate noise sources to acceptable and reasonable levels.
4. To determine any likely impact from noise it was necessary to establish typical baseline sound levels in the vicinity of NSRs. This information has helped determine any likely noise impact on NSRs during the operation of the proposed development.
5. The study benefits from a baseline sound study and the results of baseline sound measurements taken at NSR monitoring positions indicate that representative background sound levels during the daytime period (0700-2300 hours) range between 48dB and 56dB L_{A90} [54dB to 61dB L_{Aeq}]. The higher daytime background sound levels occur where NSRs are closer to the local road network. During the night-time monitoring period (i.e. 2300-0700 hours) results show background levels to range between 39-46dB L_{A90} [50dB to 56dB L_{Aeq}].
6. The Applicant has extant planning permission for a similar development, which was originally submitted and approved in 2015 (planning ref. P2015/0975 dated 17th December 2015) and then 'extended' via a subsequent application under s.73 of The Town and Country Planning Act 1990, resulting in the extant permission granted in 2020 (planning ref: P2020/0787). The methodology and noise criteria agreed with the Public Protection Officers at the Environmental Health Department at Neath Port Talbot CBC at the time has been followed (with the inclusion of any updates on NSRs, locations for monitoring and noise standards or guidance). The Officer's advised in 2015 that the assessment should consider BS4142 in terms of noise criteria at the nearest residential properties and BS8233 in relation to nearest commercial receptors to the site.
7. The impact of site operational noise at the NSRs to the north, east and south directions from site has been assessed. Additional noise predictions relative to ecological sensitive receptors to the west within the Baglan Bay SINC (Site of Importance for Nature Conservation) has also been included in the assessment.

8. The report predicts the impact of noise from the operation of the biomass boiler and associated plant on site, which would generally be contained within purpose-built buildings and fuel storage and transfer plant mounted external to the buildings. The noise assessment concludes the following:
- Noise levels from site operations have been undertaken using a noise prediction calculation model, internationally recognised calculation standard with appropriate input settings and plant noise limit data from the technology provider.
 - The highest predicted noise levels from site operations are shown to be well below established background sound levels measured during a weekend period to determine the lowest likely levels.
 - The highest predicted noise levels from site operations would not increase existing residual sound levels measured in terms of L_{Aeq} .
 - According to BS4142:2014+A1:2109, the assessment of highest likely site operational noise levels would indicate that impact is low. This includes a +3dB allowance for noise character in accordance with NRW guidance on design for new development.
 - Site noise levels would be within all relevant guidance and standards for noise (i.e. would be below night-time noise level according to WHO guidance, below recommended internal noise levels according to BS8233: 2014 and sleep disturbance criteria in terms of L_{Aeq}).
 - Noise levels predicted at nearest commercial receptors (i.e. offices) is shown to be well within a reasonable design range for an office environment according to BS8233: 2014.
 - The results show that the predicted site operational noise level would only increase existing ambient noise levels at Baglan Bay SINC ecological receptors by up to +1dB(A). This is not significant according to the advice provided within the ecological assessment report, which sets a precautionary limit of +3dB above ambient levels for birds.
 - The impact of site operational noise or the proposed and existing Intertissue Ltd plant have been assessed and would not exceed background sound levels and not increase existing residual L_{Aeq} levels and therefore there is no significant cumulative impact.
 - Best Available Techniques (BAT) would be applied in relation to the plant design, operation and site noise management.
 - Assessment of construction noise indicates that there would not be any significant impacts and residual sound levels are unlikely to increase.

- No significant impacts are likely to occur as a result of additional vehicle movements as a result of the development as these will be negligible in context with the existing baseline traffic flows on the local road network.
 - No significant impacts are predicted in relation to construction vibration or operational vibration and levels at nearest commercial premises are not expected to reach perceptible levels.
 - The results of construction noise at the ecological receptor (i.e. bird species) show noise levels would be at or below the existing ambient levels. The only marginal increase above existing levels at close proximity to the Site boundary shows the maximum construction noise would only exceed the measured ambient levels by +1dB(A). This is therefore not a significant increase and according to the Ecological Assessment report which advises any increase that is below +3dB above the existing ambient, are considered to be inconsequential.
 - In terms of L_{Amax} levels, the construction levels would be not significant at ecological receptors based on predicted levels and existing daytime ambient levels that are higher. The levels would be below the threshold and advice provided by the Ecological Assessment for Lapwing disturbance.
9. Noise amelioration measures to control site operational noise have been proposed to meet the requirements of best available techniques (BAT).

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1.0 INTRODUCTION

- 1.1 Intertissue Ltd ('the Applicant') is proposing to submit a planning application to construct and operate a biomass energy generation facility ('the biomass boiler') to replace the existing gas fired boiler at the existing Intertissue paper manufacturing and processing plant located at the Briton Ferry Site, Baglan Energy Park, Neath.
- 1.2 This assessment has been commissioned by Axis acting on behalf of Intertissue Ltd to determine the noise impact at the nearest sensitive receptors ('NSRs') in relation to the Proposed Development.
- 1.3 Noise levels have been considered and assessed during the construction and operational phases of the biomass boiler. Relevant and appropriate noise guidance and standards have been used to determine the noise impact and where appropriate amelioration measures provided to mitigate noise sources to acceptable and reasonable levels.
- 1.4 To determine any likely impact from noise it was necessary to establish typical baseline sound levels in the vicinity of NSRs. This information has helped determine any likely noise impact on NSRs during the operation of the proposed development.

Assessment Aims and Objectives

- 1.5 The aim of this assessment is to provide information in support of a planning application in relation to the impact of noise from the Proposed Development on sensitive receptors. This includes the provision of the following:
- information on typical existing site sound climate;
 - information and predictions on noise and vibration impacts from site construction activities;
 - information and predictions on noise impacts during site operations; and
 - noise mitigation measures, which would be necessary to comply with existing noise conditions and current noise standards to meet 'best available techniques' ('BAT').
- 1.6 The potential noise impacts from the proposed development are considered in the context of the existing ambient noise at the site, which is generally influenced by road traffic movements and existing industrial activities.
- 1.7 Appendix 1 provides details of technical terms within the chapter, for ease of reference. There is also a chart showing typical everyday noise levels to assist in understanding the subjective level of noise in terms of decibels.
- 1.8 Information used in this assessment has been obtained from the following sources:
- Ordnance Survey maps of the local area;
 - general layout and building elevations of the proposed development provided by Vital Energi, acting on behalf of Intertissue Ltd;

- British Standards BS 4142: 2014, BS8233: 2014 & BS 7445: 2003
- Technical Guidance Note IPPC H3;
- Guidelines for Community Noise – WHO: April 1999;
- National Resource Wales (NRW) Noise and Vibration Management: Environmental Permits (January 2022);
- ISO9613-2 Attenuation of sound during propagation outdoors – Part 2: General Method of Calculation: 1996;
- Calculation of Road Traffic Noise (CRTN): 1988;
- BS5228-1: 2009+A1:2014 Code of practice for noise and vibration control on construction and open sites;
- Neath Port Talbot CBC Decision Notice (ref. P2015/0975) for construction of a Biomass Boiler (8MW) with associated engineering operations and infrastructure, ancillary to the operation of the paper mill.

- 1.10 The noise prediction software used to assess the noise contribution from the site is CadnaA which utilises ISO9613-2.
- 1.11 The proposal includes fuel storage and boiler plant buildings and plant relevant to the operations at the site. These elements are illustrated on Figure 3.

2.0 SITE DESCRIPTION

2.1 Location

- 2.1.1 The application site is located at the Intertissue Briton Ferry Site on the Baglan Energy Park, Neath in South Wales.
- 2.1.2 The paper mill occupies circa 32ha of land in total and is fully operational. It comprises of a series of large, interlinked buildings together with a separate office block and associated infrastructure including weighbridges, car parking, a trailer park, internal roadways and circulation areas. As illustrated on Figure 2 the biomass boiler is proposed to be located within an area of the site which is surrounded on three sides by existing buildings. This part of the site is covered in hard standing and is currently used as external circulation space.
- 2.1.3 The biomass boiler and associated fuel storage are anticipated to occupy circa 0.186ha of land within this area.
- 2.1.4 Access to the Intertissue paper mill is achieved via a roundabout junction off Brunel Way which in turn provides a connection to the A48/A474 roundabout and ultimately the M4.
- 2.1.5 The site is relatively detached from sizable areas of residential development. The nearest residential properties are located to the north, east and south of the site off Church Road at circa 1km from the biomass boiler and Old Road and Handel Avenue at a distance of approximately 1.1km and 1.5km respectively.
- 2.1.6 The main source of existing noise affecting nearest property positions relates to the movement of vehicles on the local roads (road traffic).
- 2.1.7 The intervening land between site and receptors is generally formed by industrial and commercial development, vacant industrial grassland land on the Business Park and site access roads. This offers a mixed absorptive and reflective ground conditions for propagation (see Figure 1).

The Biomass Boiler

- 2.1.8 The main areas of plant and buildings relevant to the assessment include the following (as shown on Figure 2 of the attached):

Plant Enclosed Within Buildings

Main Building (Biomass Boiler House) - Building Height = 24m

- (i) Furnace
- (ii) Steam Boilers
- (iii) Economiser
- (iv) Back-up Compressor
- (v) Transformer
- (vi) Electrical Room
- (vii) Control Room

Building Located at Front of Boiler House - Building Height = 14.5m

- (viii) Electrostatic Precipitator
- (ix) Ash Skips

External Plant

- (i) Flue Stack (30m height)
- (ii) Walking floor
- (iii) Bulk Fuel Store (10m height)
- (iv) Walking floor conveyor
- (v) Diesel back-up Generator
- (vi) Hydraulic Rams
- (vii) Pipe Bridge/Ladder Rack
- (viii) HGV's

- 2.1.9 The biomass boiler would operate 24 hours a day and 7 days a week. Deliveries to the facility would typically occur during daytime periods with fuel brought to the facility between the hours of 08.00 and 17.00 Monday to Friday and 08.00 to 13.00 hours on Saturday.

2.2 Nearest Sensitive Receptors

Residential Receptors (Refer to Figure 1)

- 2.2.1 The nearest residential properties are located to the west, south and northern direction from the Site. The NSR positions include the following:

NSR(A): Old Road/Crawford Road (grid reference: 274269 193293)
NSR(B): Handel Avenue (grid reference: 273821 191466)
NSR(C): Fenbroke Close (grid reference: 274577 191978)
NSR(D): Burrows Road (grid reference: 274599 192555)
NSR(E): Travellers Caravan Park (grid reference: 273564 193746)

Commercial Receptors (Refer to Figure 1)

- 2.2.2 Further consideration is made in respect of commercial receptors (i.e. office facilities) on adjacent plots during daytime periods:

NSR(F): Innovation Centre (grid reference: 274074 192930)
NSR(G): Medical Centre (grid reference: 273638 193214)
NSR(H): Neath Port Talbot Council (grid reference: 273419 193294)
NSR(I): Ecolab (grid reference: 273718 193292)

Ecological Receptors (Refer to Figure 1)

- 2.2.3 For the nearest ecological receptors ('NER') we have included Baglan Bay Site of Importance for Nature Conservation ('SINC'). This area has also been included in the baseline monitoring survey (refer to section 4.0) and Figure 1.

2.2.4 Figure 1 attached, shows the site position relative to the NSRs and baseline sound monitoring positions.

2.3 Development Elements

2.3.1 In summary, the proposed development comprises the following key elements, each of which are subsequently described in further detail:

- biomass storage facilities including fuel storage and walking floor fuel handling system;
- boiler House including the combustion unit, boiler and other process plant, electrical room, control room;
- associated infrastructure including electrostatic precipitator, ash skips, pipe bridge/ladder rack; and
- vehicular and pedestrian access to the Facility and external hardstanding for vehicle manoeuvring (fuel deliveries would be segregated from the other working areas by clearly defined routes).

3.0 NOISE & VIBRATION GUIDANCE AND STANDARDS

3.1 Planning Policy & Guidance

3.1.1 The following section outlines the key planning policy and guidance that relates to the assessment of residential amenity and protection of residents from general environmental and industrial noise sources.

3.1.2 Within the introduction of Planning Guidance (Wales) Technical Advice Note ('TAN') 11, Noise – October 1997, it states:

“This note provides advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business.”

3.1.3 The guidance introduces the concept of Noise Exposure Categories (NEC), which has been derived to assist local planning authorities in their consideration of planning applications for residential development near transport related noise sources. The NEC procedure is only applicable for the introduction of a new residential development into an area with an existing noise source. At Annex B guidance is given for various types of noise sources, which include, for example, commercial developments, road traffic, construction sites, aircraft and railways. Whilst this guidance is not directly relevant to the proposed development, it nonetheless provides information on what absolute noise levels are deemed to be acceptable for new residential development affected by transportation noise and as such provides a useful indication of noise levels considered acceptable at residential receptors.

3.1.4 The daytime noise level at the boundary of NEC A and NEC B is based on guidance provided by the World Health Organisation health criteria that:

“General daytime outdoor noise levels of less than 55dB(A) Leq are desirable to prevent any significant community annoyance.”

3.1.5 The night-time noise level at the boundary of NEC A and NEC B is also based on the World Health Organisation health criteria, which states that:

“based on limited data available, a level of less than 35dB(A) is recommended to preserve the restorative process of sleep.”

3.1.6 Table 3.1 provides an interpretation of the NEC categories in terms of granting planning permission.

Table 3.1: NEC Category description in terms of planning issues

NEC Category	Description	Noise Range $L_{Aeq,T}$ dB
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 desirable.	<55dB(A) daytime (16hr) <45dB(A) night-time (8hr) Road, rail and mixed sources
B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection.	55-63dB(A) daytime (16hr) 45-59dB(A) night-time (8hr) Road, rail and mixed sources

3.1.7 For noisy industrial development the TAN11 refers to BS4142 Method for rating industrial noise affecting mixed residential and industrial areas. It gives the comment that *“the likelihood of complaints about noise from industrial development can be assessed, where the Standard is appropriate, using guidance in BS4142: 1990”* (note: the standard was updated in 1997 and in 2014).

3.1.8 Further comment is made in respect of noise levels within buildings in that *“in addition, general guidance on acceptable noise levels within buildings can be found in BS8233: 1987”* (note: the standard was updated in 1999 and in 2014).

BS 4142: 2014+A1:2019 ‘Methods for rating and assessing industrial and commercial sound’

3.1.9 BS 4142: 2014+A1:2019 ‘Methods for rating and assessing industrial and commercial sound’ is based on the measurement of background sound using L_{A90} noise measurements, compared to source noise levels measured in L_{Aeq} units. The differential between the two measurements; once any corrections have been applied for source noise tonality, distinct impulses etc. (i.e. the ‘rating’ level); determines the likelihood of complaints.

- 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.

3.1.10 In order to establish the rating level, corrections for the noise character need to be taken into consideration. The Standard states that when considering the perceptibility:

“Consider the subjective prominence of the character of the specific sound at the noise-sensitive locations and the extent to which such acoustically distinguishing characteristics will attract attention.”

3.1.11 The subjective method adopted includes the following character corrections:

Table 3.2: BS4142: 2014 Character Corrections

Level of perceptibility	Correction for tonal character dB	Correction for impulsivity dB	Correction for intermittency dB	Correction for other character dB
Not perceptible	0	0	0	0
Just perceptible	+2	+3	0	0
Clearly perceptible	+4	+6	+3*	+3*
Highly perceptible	+6	+9	+3*	+3*

*Standard defines this should be readily distinctive against the residual acoustic environment, it is interpreted therefore to be either clearly or highly perceptible as a character.

3.1.12 The assessment of noise from the site is based on previous monitoring (by NVC) and from other studies of Biomass facilities at similar distances to the sensitive receptors in this instance. The findings of this assessment work are provided below:

- a) Frequency analysis of this type of plant from previous experience does not typically produce any tonal characteristics when applying an appropriate noise control strategy. Additionally, when considering the separation distance between the plant and receptors and results of baseline monitoring compared with the noise contribution from site, tonal noise is not anticipated to be perceptible at the nearest receptor and there would be no requirement to apply a correction. Any mobile plant at the biomass boiler utilised on site would be fitted with broadband type noise reversing alarms.
- b) In terms of impulsivity considering the mechanical operation of the plant and design of the site (i.e. using automated feeding systems and enclosing the plant within a building) there is no significant impulse noise expected during normal plant operations (i.e. significant impacts or air release other than in an exceptional event during a safety steam vent release). Consequently it is not expected that impulsive noise from the proposed operations would be generated.
- c) In terms of intermittency whilst there would occasional delivery of fuel there is no specific intermittent character that is likely to be distinctive when considering the separation distance and the noise contribution relative to ambient noise.

3.1.13 In conclusion, in view of the predicted noise contribution, separation distance from site to receptor, NVC's experience in dealing with this type of site and noise control measures proposed (i.e. plant enclosure and steam vents and plant noise limited) it is advised that a noise character penalty is not deemed to be necessary.

3.1.14 However, in respect of the latest NRW guidance, the guidance advises that a +3dB noise character correction should be considered for the industrial development relative to the Environmental Permit (refer to section 3.1.22 for further detail).

BS8233:2014 – Guidance on sound insulation and noise reduction for buildings

3.1.15 The British Standard BS8233 provides additional guidance on noise levels within buildings. These are based on the WHO recommendations and the criteria given in BS8233 for unoccupied spaces within residential properties.

3.1.16 The guidance provided in Section 7.7 of BS8233 provides recommended internal ambient noise levels for resting, dining and sleeping within residential dwellings. Table 3.3 provides detail of the levels given in the standard.

Table 3.3: BS8233: 2014 Indoor ambient noise levels for dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 dB $L_{Aeq,16hours}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hours}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hours}$	30 dB $L_{Aeq,8hours}$

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

- 3.1.17 This document provides further updated information on noise and its effects on the community. Within the document for noise ‘In Dwellings’ it states that *“the effects of noise in dwellings, typically, are sleep disturbance, annoyance and speech interference. For bedrooms the critical effect is sleep disturbance. Indoor guideline values for bedrooms are 30dB L_{Aeq} for continuous noise and 45dB L_{Amax} for single sound events. Lower noise levels may be disturbing depending upon the nature of the noise source.”*

World Health Organisation (2009) – Night noise guidelines for Europe

- 3.1.18 The WHO regional office for Europe set up a working group of experts to provide scientific advice to the Member States for the development of future legislation and policy action in the area of assessment and control of night noise exposure. Considering the scientific evidence on the thresholds of night noise exposure indicated by $L_{night,outside}$ as defined in the Environmental Noise Directive (2002/49/EC), an $L_{night,outside}$ of 40dB should be the target of the night noise guidance (NNG) to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly. $L_{night,outside}$ value of 55dB is recommended as an interim target for the countries where the NNG cannot be achieved in the short term for various reasons, and where policy-makers choose to adopt a stepwise approach.

NRW – Guidance: Noise and Vibration Management: Environmental Permits (January 2022)

- 3.1.19 As stated within the above guidance: *“Environmental permits have conditions that require operators to control pollution – this includes controlling noise and vibration.”*

- 3.1.20 This guidance covers:

- (i) *“how the environment agencies will assess noise from certain industrial processes;*
- (ii) *what the law says you must do to manage noise and vibration; and*
- (iii) *advice on how to manage noise – in particular, how to carry out a noise impact assessment and what operators should include in a noise management plan.”*

- 3.1.21 Operators (or permit applicants) must consider the potential noise impact of their site. They may need to carry out noise impact assessments:

- (i) At the permit application stage;
- (ii) When applying to vary a permit; and

- (iii) To comply with specific permit conditions.

3.1.22 The guidance advises on four steps that are required when carrying out a noise impact assessment, these include:

- (i) Desktop risk assessment – identification of any audible noise plant or operations, identification of NSR, description and ranking of noise sources in terms of potential off-site impact, description of land between site and NSR.
- (ii) Off-site monitoring survey – for new development this would relate to a study of the existing baseline sound conditions.
- (iii) Source assessment – noise modelling of plant or operations, and if industrial source, using BS4142 and ISO9613-2 for prediction.
- (iv) Best Available Techniques (BAT) or appropriate measures justification – measures to be adopted to avoid unacceptable noise pollution and demonstrate that BAT or appropriate measures would be introduced to prevent, or where that is not practicable, minimise noise impact.

3.1.23 The latest guidance from the NRW (Noise and vibration management: environmental permits – January 2022) states:

“For industrial noise impacts where the sound is neither impulsive nor tonal, but you can readily distinguish it against the usual residual acoustic environment, the environment agencies will expect you to apply a minimum character correction of +3 decibels (dB) ‘other’. This is unless you can robustly justify that you do not need such a correction.”

Construction Noise

3.1.24 For NSRs that could be exposed to construction noise, BS5228:2009+A1:2014 is considered to be the appropriate standard. This standard does not prescribe limits but requires ‘best practicable means’ (“BPM”) to be employed to control noise generation. The criterion therefore is that BPM should be employed and conditions implemented for example to restrict construction and demolition noise to non-sensitive hours.

3.1.25 The construction impact semantic scale, set out in Table 3.4 below, is based on the ABC method of assessment described in Annex E.3.2 of BS5228, which sets out threshold values depending upon the ambient noise at receptors, which have been defined from the baseline sound survey.

3.1.26 According to the guidance found within the Design Manual for Roads and Bridges (DMRB LA 111), the LOAEL and SOAEL for noise sensitive receptors within the construction activity study area, with reference to baseline noise levels are established in accordance with Table 3.4.

Table 3.4: Impact Magnitude Category – Construction Noise

Time Period	LOAEL	SOAEL	Threshold Level L _{Aeq1hr} dB
Day (0700-1900 Weekday and 0700-1200 Saturdays)	Baseline noise levels L _{Aeq,T}	Threshold level determined as per BS5228-1:2009+A1:2014 Section E3.2 and Table E.1 BS 5228-1:2009+A1:2014	65-75
Night (2300-0700)	Baseline noise levels L _{Aeq,T}	Threshold level determined as per BS5228-1:2009+A1:2014 Section E3.2 and Table E.1 BS 5228-1:2009+A1:2014	45-55
Evening and weekends (time periods not covered above)	Baseline noise levels L _{Aeq,T}	Threshold level determined as per BS5228-1:2009+A1:2014 Section E3.2 and Table E.1 BS 5228-1:2009+A1:2014	55-65

3.1.27 The magnitude of impact for construction noise, shall be determined in accordance with Table 3.5 (as defined in DMRB LA 111).

Table 3.5: Magnitude of Impact and Construction Noise Descriptions

Magnitude of Impact	Construction Noise Level
Negligible	Below LOAEL
Minor	Above or equal to LOAEL and below SOAEL
Moderate	Above or equal to SOAEL and below SOAEL +5dB
Major	Above or equal to SOAEL +5dB

Construction Phase – Vibration

3.1.28 For construction phase vibration, the LOAEL and SOAEL for construction vibration is set out in DMRB LA 111 and is provided in Table 3.6 below.

Table 3.6: Construction Vibration LOAELs and SOAELs for All Receptors

Time Period	LOAEL	SOAEL
All time periods	0.3mm/sec PPV	1.0mm PPV

3.1.29 The magnitude of impact for construction vibration, shall be determined in accordance with Table 3.7 (as defined in DMRB LA 111).

Table 3.7: Magnitude of Impact at Receptors

Magnitude of Impact	Vibration Level
Negligible	Below LOAEL
Minor (Slight)	Above or equal to LOAEL and below SOAEL
Moderate	Above or equal to SOAEL and below 10mm/s PPV
Major	Above or equal to 10mm/s PPV

Note: Construction vibration shall constitute a likely significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

- 1) 10 or more days or nights in any 15 consecutive days or nights; or
- 2) a total number of days exceeding 40 in any 6 consecutive months.

Existing Environmental Permit ('EP')

Permit Number: EPR/BU24891T

3.1.30 The advice under the existing EP for the Sofidel UK Limited site in Neath is found under section 3.5, which includes:

"3.5.1 Emissions from the activities shall be free from noise and vibration at levels likely to cause pollution outside the site, as perceived by an authorised officer of Natural Resources Wales, unless the operator has used appropriate measures, including, but not limited to, those specified in any approved noise and vibration management plan to prevent or where that is not practicable to minimise the noise and vibration.

3.5.2 The operator shall:

(a) if notified by Natural Resources Wales that the activities are giving rise to pollution outside the site due to noise and vibration, submit to Natural Resources Wales for approval within the period specified, a noise and vibration management plan which identifies and minimises the risks of pollution from noise and vibration;

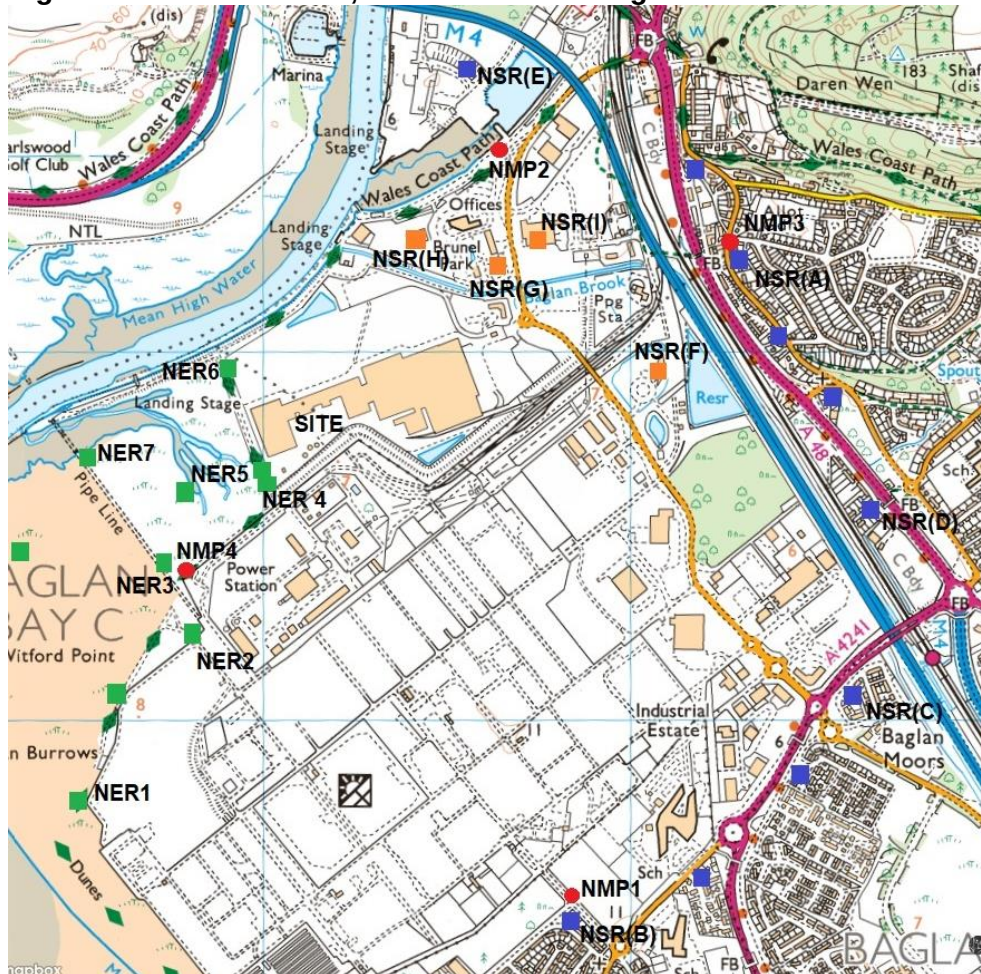
(b) implement the approved noise and vibration management plan, from the date of approval, unless otherwise agreed in writing by Natural Resources Wales."

4.0 BASELINE LEVELS & NOISE LIMITS

4.1 Baseline Sound Levels

- 4.1.1 Based on a review of previous response from Neath Port Talbot CBC, noise studies undertaken for previous planning submissions at the Site and identification of any new NSRs, we have carried out a baseline sound survey at the following locations:

Figure 4.1: Site Location, Baseline Monitoring Positions & NSRs



- **NMP1: Solar Way (grid reference: 273814 191544)**
This fixed position was chosen as being representative of NSRs to the south of the biomass boiler and the location positioned away from public activities over a weekend period. Indicative of background sound levels at NSR(B).
- **NMP2: Off Brunel Way (grid reference: 273637 193553)**
This fixed position was chosen as being representative of NSRs to the north of the biomass boiler (i.e. caravan park and commercial development) as location at similar or greater distance from the main source of noise (i.e. M4 Motorway) measured over the quieter weekend period of the week. Indicative of background sound levels at NSR(C), NSR(D) and NSR(E) and commercial receptors NSR(F to I).

- NMP3: Old Road/Crawford Road (grid reference 274256 193302)
This spot roaming monitoring position was chosen as being representative of NSRs to the east of the biomass boiler at slightly elevated position away from influence of A48 road screened by first row of houses closest to the A48. Measurements recorded over a morning, afternoon and evening Sunday period into early hours of Monday morning for lowest likely background sound levels. Indicative of background sound levels at NSR(A).
- NMP4: Baglan Bay – Ecological sensitive receptor (southwest of biomass boiler location) (grid reference: 272803 192400). Initial spot roaming noise monitoring across Baglan Bay was undertaken at various positions relative to the Intertissue site was carried out between 1000 hours to 1200 hours on Sunday 10th March 2024. Fixed position monitoring was then carried out at circa 400m from the Site (southwest direction) between Sunday afternoon through to the following morning (Monday 11th March 2024).

- 4.1.2 The noise monitoring positions are representative of the sound climate in the vicinity of the proposed development. Details of the instrumentation used for the survey are detailed in Appendix 2.
- 4.1.3 Monitoring was undertaken during a weekend period using 15-minute sequential measurements at each location. Monitoring of L_{Aeq} , L_{Amax} , L_{A90} measurement indices recorded for each monitoring period to determine typical 'representative' background sound levels in accordance with BS4142: 2014+A1:2019.
- 4.1.4 The baseline sound survey was undertaken at fixed positions between Saturday 9th through to Monday 11th March 2024 adjacent to NSRs locations and is therefore a good indication of the representative baseline sound levels. Any data recorded during rain periods or high wind speeds (i.e. >4m/s) were removed from the data set and therefore analysis of data from monitoring periods of low wind speeds and dry conditions were only used.
- 4.1.5 The background sound survey was carried out in accordance with BS 4142: 2014+A1:2019 and advice given in BS 7445:2003.
- 4.1.6 Although ambient noise levels can vary depending on weather conditions, the purpose of the baseline survey is to monitor sound levels under suitable weather conditions. This then provides a typical and representative indication of ambient conditions. The effect of wind on noise levels can be significant, as an example, BS 8233: 2014 (Paragraph 6.8) states:

“Whether noise levels are measured or predicted, wind gradients, temperature gradients and turbulence affect the level of received sound and audibility over short periods. The magnitude of these effects, i.e. variations in noise level and audibility, increases with increasing distance between source and receptor. The effects are asymmetrical and, for distances of 500m to 1000 m, typically range from increasing the level by typically 2 dB downwind to reducing it by typically 10 dB upwind. It is not usually practicable to use these factors in design, but the prevailing wind direction should be considered when planning building orientation. Noise from wind and precipitation, including the wind-generated noise from trees, can also affect noise measurements.”

- 4.1.7 For the purpose of this assessment, it is assumed that monitoring and assessment of operational noise from the proposed development is undertaken under appropriate weather conditions and therefore any positive or negative vector from wind direction is not representative. The effect of wind speed and direction can also increase background noise levels thereby masking any potential increase in site-specific noise levels. For this reason, it is assumed that typical weather conditions apply and no increase or decrease for the wind vector is required.

Site Baseline Noise Survey Results

- 4.1.8 The results of measurements taken at the fixed monitoring positions are presented in Tables 4.1 to 4.2 and detailed measurements are provided in Appendix 3.

Table 4.1: Daytime baseline sound levels at monitoring positions (0700-2300 hours)

Position (Refer to Figure 1)	Grid Reference	LAeq dB	LA10 dB	LA90 dB	Representative LA90 dB	LAmix dB
NMP1: Solar Way	273814 191544	54	55	48	48	53-88
NMP2: Off Brunel Way	273637 193553	59	61	56	56	63-80
NMP3: Off Old Road	274256 193302	61	63	55	55 ¹	73-82
NMP4: Baglan Bay (400m)	272803 192400	56	58	51	51	55-81

¹Based on short-term measurements during quietest part of week (i.e. Sunday)

Table 4.2: Night-time baseline sound levels at monitoring positions (2300-0700 hours)

Position (Refer to Figure 1)	Grid Reference	LAeq dB	LA10 dB	LA90 dB	Representative LA90 dB	LAmix dB
NMP1: Solar Way	273814 191544	50	52	47	44	47-79
NMP2: Off Brunel Way	273637 193553	56	59	52	46	59-87
NMP3: Off Old Road	274256 193302	50	52	39	39 ¹	64-73
NMP4: Baglan Bay (400m)	272803 192400	54	57	51	50	58-73

¹Based on short-term measurements during quietest part of week (i.e. Sunday-Monday)

- 4.1.9 The results of baseline sound measurements taken at NSR monitoring positions show that representative background sound levels during daytime (i.e. 0700-2300 hours) range between 48dB and 56dB LA90 [54dB to 61dB LAeq]. The higher daytime background sound levels occur where NSRs are closer to the local road network. During the night-time monitoring period (i.e. 2300-0700 hours) results show background levels to range between 39-46dB LA90 [50dB to 56dB LAeq].
- 4.1.10 At the ecological receptor (Baglan Bay) the spot roaming measurements recorded levels which varied between 45dB to 56dB LAeq. The higher levels were recorded at 20m from the Intertissue site boundary fence.

4.2 Proposed Development Noise Limits

- 4.2.1 In defining noise limits and the significance of the impact from the site BS4142:2014+A1:2019 indicates that a low impact occurs where the 'rating' level from site (which includes a noise character) does not exceed the

representative baseline sound level and an adverse impact where the 'rating' level is around +5dB above baseline sound levels (depending on the context i.e. if residual sound levels significantly increase).

- 4.2.2 Based on the requirements set out in BS4142: 2014+A1:2019 to achieve a **low impact**, the following noise limits would apply:

Table 4.3: Noise Limits Daytime (relative to BS4142 low impact)

NSR	Location	Grid Reference X Y	Day (0700-2300 hours)		
			Representative Background Sound Level L _{A90} dB	Residual Sound Level L _{Aeq} dB	Rating Noise Level Limit L _{Aeq1hr} dB
A	Old Road/Crawford Road	274269 193293	55	61	55
B	Handel Avenue	273821 191466	48	54	48
C	Fenbroke Close	274577 191978	56	59	56
D	Burrows Road	274599 192555	56	59	56
E	Travellers Caravan Park	273564 193746	56	59	56

¹Rating level includes any relevant noise character penalties in accordance with BS4142:2014+A1:2019

Table 4.4: Noise Limits Night-time (relative to BS4142 low impact)

NSR	Location	Grid Reference X Y	Night (2300-0700 hours)		
			Representative Background Sound Level L _{A90} dB	Residual Sound Level L _{Aeq} dB	Rating Noise Level Limit L _{Aeq,15mins} dB
A	Old Road/Crawford Road	274269 193293	39	50	39
B	Handel Avenue	273821 191466	44	50	44
C	Fenbroke Close	274577 191978	46	56	46
D	Burrows Road	274599 192555	46	56	46
E	Travellers Caravan Park	273564 193746	46	56	46

¹Rating level includes any relevant noise character penalties in accordance with BS4142:2014+A1:2019

Latest Advice Set Out in Latest Natural Resources Wales (NRW) Guidance (Noise and vibration management: environmental permits January 2022)

- 4.2.3 The latest guidance from NRW (Noise and vibration management: environmental permits – January 2022) states:

“For industrial noise impacts where the sound is neither impulsive nor tonal, but you can readily distinguish it against the usual residual acoustic environment, the environment agencies will expect you to apply a minimum character correction of +3 decibels (dB) ‘other’. This is unless you can robustly justify that you do not need such a correction.”

- 4.2.4 Whilst the biomass boiler would be designed to eliminate noise character at NSRs during the detailed design stage (by specification to the EPC Contractor) to comply with the NRW guidance on design, the above limits would be reduced by a further 3dB to allow for noise character. The resultant design limit levels are presented below in Table 4.5.

Table 4.5: NRW Design Noise Limits

NSR	Location	Daytime Noise Limits LAeq,1hr dB	Night-time Noise Limits LAeq15mins dB
A	Old Road/Crawford Road	52	36
B	Handel Avenue	45	41
C	Fenbroke Close	53	43
D	Burrows Road	53	43
E	Travellers Caravan Park	53	43

5.0 NOISE LEVEL PREDICTIONS

5.1 Introduction

- 5.1.1 Noise has been defined as sound, which is undesired by the recipient. The effects of noise on the neighbourhood are varied and complicated, including such things as interference with speech communication, disturbance of work, leisure or sleep. A further complicating factor is that in any one neighbourhood some individuals will be more sensitive to noise than others.
- 5.1.2 A measure that is in general use and is recommended internationally for the description of environmental noise is the equivalent continuous noise level or L_{Aeq} parameter.
- 5.1.3 In general, the level of noise in the local environs ^{that} arises from a development site will depend on a number of factors. The more significant of which are:
- (a) The sound power levels of the plant or equipment used on site.
 - (b) The periods of operation of the plant on site.
 - (c) The distance between the source noise and the receiving position.
 - (d) The presence or absence of screening effects due to barriers, or ground absorption.
 - (e) Any reflection effects due to the facades of buildings etc.

5.2 Prediction Methodology

Site Operational Noise

- 5.2.1 For site operational noise this assessment has used ISO9613-2 prediction modelling and CadnaA software for producing noise maps of the highest likely generated noise.
- 5.2.2 The methodology takes into account source position, distance and duration of activity. Any local screening from existing buildings on the intervening ground in relation to the NSRs has not been taken into account.
- 5.2.3 The noise modelling assumes that all fixed plant is operating. During the daytime scenario, the model allows for mobile plant operating in the service yard and HGV movement to and from the Site. The prediction calculations therefore provide an indication of the highest likely noise level. Refer to Appendix 7 for daytime and night-time noise contour maps.

5.3 Plant Complement

- 5.3.1 The assumed plant noise levels from which the noise predictions were made are provided in Appendix 5. The plant complement is based on information provided by the Technology Provider.

5.4 Results of Noise Predictions

5.4.1 This assessment has used empirical data of the fixed plant and any vehicle movements likely to be used for the calculations at the nearest property boundary locations during normal site operations. Refer to Appendix 5 for further information on plant noise levels.

5.4.2 Prediction calculations have been undertaken using CadnaA noise prediction modelling software in accordance with ISO9613-2 calculation methodology with the following settings.

Ground Absorption (G) = 0.5
Temperature = 10degC
Relative humidity = 70%
Maximum order of reflection = 3
Octave band frequency data used.

Residential receptor height for daytime operations = 1.5m above ground (height at Old Road NSR taken as 8m above ground due to elevation).

Residential receptor height for night-time operations = 4m above ground (Old Road at 11m above ground due to elevation).

Commercial receptor height assumed to be 4m above ground level.

Ecological receptor height assumed to be 1.5m above ground level during daytime and night-time.

5.4.3 The above represents reasonable input settings for calculation which have been shown to provide an accurate prediction of likely noise contribution (albeit slightly erring on the pessimistic side) based on many years of experience and shown following compliance monitoring on other sites in the UK. Results of noise mapping are provided in Appendix 7.

5.4.4 The noise model has included local screening from the existing Intertissue buildings.

Site Plant Noise Assessment:

General Activities

5.4.5 Table 5.1 provides the output results from the noise prediction model from the Biomass building plant which assumes that building doors in the fuel feed building are in the open position during daytime and closed during night-time. The Biomass plant building doors are assumed to be closed during daytime and night-time periods.

Table 5.1: Predicted Noise Contribution from Fixed, Mobile Plant & HGVs Operating at the Biomass Boiler Facility (Daytime)

NSR	Receptor Position	Noise from Site L _{Aeq} dB Refer to Map 1 (Appendix 7)	Existing Background Sound Levels L _{A90} dB [L _{Aeq}]
A	Old Road/Crawford Road	28	55 [61]
B	Handel Avenue	29	48 [54]
C	Fenbroke Close	28	56 [59] ¹
D	Burrows Road	27	56 [59] ¹
E	Travellers Caravan Park	27	56 [59] ¹
F	Innovation Centre	32	56 [59] ¹
G	Medical Centre	34	56 [59] ¹
H	Neath Port Council Offices	34	56 [59] ¹
I	Ecolab	32	56 [59] ¹

¹Background sound levels at NMP2 assumed to be similar due to relative position of elevated M4 Motorway.

Table 5.2: Predicted Noise Contribution from Fixed Plant Operating at the Biomass Boiler Facility (Night-time)

NSR	Receptor Position	Noise from Site L _{Aeq} dB Refer to Map 1 (Appendix 7)	Existing Background Sound Levels L _{A90} dB [L _{Aeq}]
A	Old Road/Crawford Road	26	39 [50]
B	Handel Avenue	29	44 [50]
C	Fenbroke Close	28	46 [56] ¹
D	Burrows Road	27	46 [56] ¹
E	Travellers Caravan Park	27	46 [56] ¹
F	Innovation Centre	30	46 [56] ¹
G	Medical Centre	29	46 [56] ¹
H	Neath Port Council Offices	33	46 [56] ¹
I	Ecolab	29	46 [56] ¹

¹Background sound levels at NMP2 assumed to be similar due to relative position of elevated M4 Motorway.

BS4142: 2014+A1:2019 Assessment

5.4.6 Tables 5.3 to 5.6 provided below show a summary assessment using BS4142: 2014+A1:2019, further detailed analysis of noise at the nearest sensitive receptor [NSR (A)] is provided in Appendix 4 attached.

Table 5.3: BS4142 Assessment from Biomass Boiler Facility (Daytime)

NSR:	A. Old Road	B. Handel Avenue	C. Fenbroke Close
Calculated Noise Level	28dB LAeq _{1hr}	29dB LAeq _{1hr}	28dB LAeq _{1hr}
Noise Character Penalty	+3dB	+3dB	+3dB
Rating level	31dB	32dB	31dB
Background noise	55dB LA90*	48dB LA90*	56dB LA90*
Rating above background noise	-24	-16	-25
Conclusion	Low Impact	Low Impact	Low Impact

Table 5.4: BS4142 Assessment from Biomass Plant (Daytime)

NSR:	D. Burrows Road	E. Travellers Caravan Park
Calculated Noise Level	27dB LAeq _{1hr}	27dB LAeq _{1hr}
Noise Character Penalty	+3dB	+3dB
Rating level	30dB	30dB
Background noise	56dB LA90	56dB LA90
Rating above background noise	-26	-26
Conclusion	Low Impact	Low Impact

Table 5.5: BS4142 Assessment from Biomass Plant (Night-time)

NSR:	A. Old Road	B. Handel Avenue	C. Fenbroke Close
Calculated Noise Level	26dB LAeq _{1hr}	29dB LAeq _{1hr}	28dB LAeq _{1hr}
Noise Character Penalty	+3dB	+3dB	+3dB
Rating level	29dB	32dB	31dB
Background noise	39dB LA90*	44dB LA90*	46dB LA90*
Rating above background noise	-10	-12	-15
Conclusion	Low Impact	Low Impact	Low Impact

Table 5.6: BS4142 Assessment from Biomass Plant (Night-time)

NSR:	D. Burrows Road	E. Travellers Caravan Park
Calculated Noise Level	27dB LAeq _{1hr}	27dB LAeq _{1hr}
Noise Character Penalty	+3dB	+3dB
Rating level	30dB	30dB
Background noise	46dB LA90	46dB LA90
Rating above background noise	-16	-16
Conclusion	Low Impact	Low Impact

5.4.7 The above tables show the highest predicted rating noise levels from site operations which are likely to occur during the daytime and night-time operating periods. This is based on noise levels advised by the technology provider and plant working simultaneously and is therefore the highest likely noise to be generated by the Proposed Development.

5.4.8 The above would indicate that with the proposed recommendations on noise control, the levels at residential receptors would indicate that impact would be **low** and would result in internal noise levels within bedrooms that would be well within sleep disturbance criteria according to BS8233: 2014 (allowing for an open window attenuation of 10-15dB) i.e. 16dB to 19dB LAeq compared with guidance level of 30dB.

5.5 Noise levels at adjacent Offices

5.5.1 To meet design guidance for internal noise levels (for residential receptors) BS8233: 2014 during daytime periods would indicate that an external level of around 45dB to 50dB LAeq_{8hrs} would be reasonable. For noise levels at office windows BS8233: 2014 is referenced where external noise levels of 55-65dB(A) Leq_{8hrs} would be appropriate (assuming single or double glazed windows are installed).

5.5.2 The resultant noise contribution at nearest commercial offices has been considered below.

- 5.5.3 The predicted noise levels with the proposed mitigation measures at the nearest commercial unit offices are provided below in Table 5.7.

Table 5.7: Predicted noise levels at adjacent offices

NSR	Noise from Biomass plant Daytime LAeq _{1hr} dB	Reasonable external noise level to Offices (closed window) according to BS8233:2014 LAeq dB
F) Innovation Centre	32	55-65
G) Medical Centre	34	55-65
H) Neath Port Council Offices	34	55-65
I) Ecolab	32	55-65

- 5.5.4 The above predicted levels within adjacent offices are well within reasonable external design noise levels. Note that modern office type developments would normally have windows closed due to air conditioning systems operating.

5.6 Ecological Receptors

- 5.6.1 The measured baseline and predicted noise levels from the Proposed Development at the Baglan Bay SINC ecological receptors are provided in Table 5.8.

Table 5.8: Predicted Noise Contribution from the Biomass Boiler Facility (Daytime & Night-time)

NSR	Receptor Position Relative to Intertissue Site Boundary (approx.)	Noise from Site LAeq dB Refer to Maps 1 & 2 (Appendix 7)	Existing Baseline Sound Levels LAeq dB	Increase in noise level LAeq dB
NER1	Baglan Bay (20m) SW	47 (day) 46 (night)	54-56	+1
NER2	Baglan Bay (400m) SW	40 39	56 (day) 54 (night)	0
NER3	Baglan Bay (500m) SW	37 37	46	+1
NER4	Baglan Bay (120m) NW	39 39	53	0
NER5	Baglan Bay (200m) NW	37 36	49	0
NER6	Baglan Bay (1km) SW	29 28	46	0
NER7	Baglan Bay (1.2km) SW	29 28	51	0

- 5.6.2 The results show that the predicted site operational noise level would only increase existing ambient noise levels at Baglan Bay SINC ecological receptors by up to +1dB(A). This is not significant according to the advice provided within the ecological assessment report, which sets a precautionary limit of +3dB above ambient levels for birds.

5.7 Cumulative Impacts

- 5.7.1 The cumulative impact of the Proposed Development with the existing noise climate which includes the operation of the Intertissue site at NSRs is provided in Tables 5.9 and 5.10.

Table 5.9: Predicted Cumulative Noise Impact from Proposed Development (Daytime)

NSR	Receptor Position	Existing Baseline Noise Levels L _{Aeq} dB Daytime	Noise from Proposed Development L _{Aeq,1hr} dB Daytime	Cumulative noise level L _{Aeq,1hr} dB	Increase due to Proposed Development L _{Aeq,1hr} dB
A	Old Road/Crawford Rd	61	28	61	0
B	Handel Avenue	54	29	54	0
C	Fenbroke Close	59	28	59	0
D	Burrows Road	59	27	59	0
E	Travellers Caravan Park	59	27	59	0
F	Innovation Centre	59	32	59	0
G	Medical Centre	59	34	59	0
H	Neath Port Council Offices	59	34	59	0
I	Ecolab	59	32	59	0

Table 5.10: Predicted Cumulative Noise Impact from Proposed Development (Night-time)

NSR	Receptor Position	Existing Baseline Noise Levels L _{Aeq} dB Night-time	Noise from Proposed Development L _{Aeq,15mins} dB Night-time	Cumulative noise level L _{Aeq,15mins} dB	Increase due to Proposed Development L _{Aeq,15mins} dB
A	Old Road/Crawford Rd	50	26	50	0
B	Handel Avenue	50	29	50	0
C	Fenbroke Close	56	28	56	0
D	Burrows Road	56	27	56	0
E	Travellers Caravan Park	56	27	56	0
F	Innovation Centre	56	30	56	0
G	Medical Centre	56	29	56	0
H	Neath Port Council Offices	56	33	56	0
I	Ecolab	56	29	56	0

5.7.2 The above results show no change in the residual noise levels at NSRs as a result of the operation of the Proposed Development and no change to the impact conclusions relative to BS4142: 2014+A1:2019.

5.8 Road Traffic Impacts

5.8.1 According to the Transport Statement also supporting the planning application, this shows that when taking into account a sensitivity test trip generation (i.e. worst case) scenario the number of two-way movements to and from site would only result in 16 HGV movements which would result in a **negligible** impact onto the local road network and therefore would not present any significant impacts.

5.8.2 The noise model for daytime allows for the HGV movements on site based on 2 HGVs in and out of the Site per hour.

5.9 Operation Vibration

- 5.9.1 Monitoring of ground-borne vibration has previously been undertaken by NVC at facilities incorporating boiler plant technology. Further details are provided in Appendix 9 and the vibration parameters are presented in Appendix 8.
- 5.9.2 For the monitoring of night-time operations at an existing facility, the seismograph transducer showed vibration levels from the plant in close proximity (1 m to 5 m distance) ranged between 0.05 mm/sec to 0.1 mm/sec. This indicates that operational vibration levels are imperceptible.
- 5.9.3 The vibration survey results at a similar facility indicate that vibration levels from site operations is negligible and would therefore be imperceptible at all receptors including the ecological receptor to the southwest of Site. In terms of BS6472 this would conclude that vibration levels would be well below a 'low probability of adverse comment' and therefore nuisance conditions are highly unlikely to occur.

6.0 CONSTRUCTION NOISE & VIBRATION

Construction Noise

6.1 In general, the level of noise in the local environs arising from the construction of a development site will depend on a number of factors. The most significant of which are as follows:

- The sound power levels (SWL's) or sound pressure levels (SPL's) of the plant or equipment used on site;
- The periods of operation of the plant on site;
- The distance between the source noise and the receiving position;
- The presence or absence of screening effects due to barriers, or ground absorption; and,
- Any reflection effects due to the facades of buildings etc.

Calculation Methodology

6.2 The calculation method used in this study for construction noise is based upon theoretical noise propagation theory, which takes into account source position, distance, direction, screening and frequency content in relation to the nearest residential property boundary positions. British Standard BS5228 methodology has been used to estimate construction noise levels at the nearest existing dwellings including source noise levels for construction plant.

6.3 Noise levels emanating from the Site due to construction works associated with the proposed development will vary from day to day. In order to give an indication of the probable noise levels generated by the works, a worst-case scenario has been considered for several construction activities, namely soil movement, piling and building construction. See Appendix 5 for further information.

Predicted Noise Levels: Construction

6.4 The highest likely noise levels for the proposed development in terms of construction noise are provided below. This is based on calculations for soil movement work and general site activities at the closest approach to existing dwellings.

6.5 It is difficult to estimate how long this type of activity would last but typically in areas close to the site boundary (i.e. noisiest construction period assessed) this is normally completed in weeks rather than months.

6.6 The results of calculations for piling, soil movement, general site activities and building construction are summarised below in Table 6.1.

Table 6.1: Noise Predictions for Highest Likely Construction Noise at Nearest Receptors

Receptor Position	Distance to receptor (m)	Activity	Noise Level, dB L _{Aeq} 1hr	Typical Residual Noise L _{Aeq} dB	BS5228 Threshold Value L _{Aeq} 1hr dB (daytime)
NSR(A): Old Road/ Crawford Road	1200	Piling Soil Movement General site activities Infrastructure Building Construction	36-38 31 31 31-33 36-38	60-64 60-64 60-64 60-64 60-64	65
NSR(B): Handel Avenue	1450	Piling Soil Movement General site activities Infrastructure Building Construction	41-42 37 37 37-38 41-42	56 56 56 56 56	65
NSR(C): Fenbroke Close	1640	Piling Soil Movement General site activities Infrastructure Building Construction	39 36 36 37 41	58-63 58-63 58-63 58-63 58-63	65
NSR(E) Travellers Caravan Park	1000	Piling Soil Movement General site activities Infrastructure Building construction	39 32 32 32 39	58-63 58-63 58-63 58-63 58-63	65
NSR(G) Medical Centre	350	Piling Soil Movement General site activities Infrastructure Building Construction	46 39 39 40 44	58-63 58-63 58-63 58-63 58-63	65
Ecological Receptor Baglan Bay SINC	20-1200	Piling Soil Movement General site activities Infrastructure Building Construction	40-56 37-52 36-52 37-53 40-57	46-56 46-56 46-56 46-56 46-56	65

Note: Construction noise prediction levels given above allows for the site screening from the existing Intertissue buildings and highest level predicted assumes that the plant equipment is operating 100% of the time.

- 6.7 The highest construction noise levels are likely to be created during the piling and the construction of buildings. This would however, be well within the level of noise normally found to be acceptable for an activity of this type and duration. The results show that for the construction period the noise level from construction activities at the existing residential properties will not exceed reasonable daytime absolute noise levels and existing residual noise levels would not change.
- 6.8 For the construction period noise generated by site activities will be below reasonable absolute noise criteria (i.e. below 65dB L_{Aeq}). The results show that the threshold proposed by BS5228 would not be exceeded and therefore a **negligible** impact magnitude and **neutral** impact significance.
- 6.9 The results at the nearest commercial receptors show no exceedance of residual levels and well below guidance thresholds for noise for this type of receptor.

- 6.10 The results of construction noise at the ecological receptor (i.e. bird species) show noise levels would be at or below the existing residual levels (recorded during a Sunday period). The only marginal increase above existing levels was at 20m from the Intertissue south-western boundary where noise levels during the building construction works is shown to exceed the Sunday measured ambient levels by only +1dB(A). This is therefore not a significant increase and according to the Ecological Assessment report (K24-003) where increases below +3dB above existing ambient are considered to be inconsequential.
- 6.11 In terms of L_{Amax} levels, based on empirical data at construction sites these are circa +2dB to +8dB higher than the L_{Aeq} levels i.e. At the ecological receptor locations the predicted L_{Amax} at 20m from the site western boundary location would range between 42dB and 65dB. The measured L_{Amax} at this location over a 10-minute period was shown to be 67dB to 69dB. We therefore do not consider this to be significant based on daytime levels for any bird and the advice provided by the Ecological Assessment (i.e. Lapwing sudden noise up to 72dB may be disturbing as advised by the ecology report).

Construction Vibration

Typical Vibration Levels

- 6.12 The highest levels of vibration generated by plant are likely to arise from the following:
- Piling Rigs
 - Vibratory rollers and compactors
 - Material offloading onto hard surfaces
 - Concrete vibratory plant
- 6.13 Typical field measurements taken at sites in the UK where piling or vibratory rollers have been used (on clay-based ground, which is likely to be the highest generated vibration) would indicate that at a distance of around 20 metres the peak particle velocity is around 14-17 mm/s reducing to 1.5 to 2 mm/s at 30 metres distance and <1mm/s at 50 metres. For vibro piling measured levels of vibration are shown to be between 1mm/s and 3mm/s at a distance of between 20 to 30 metres (ref. BS5228-2: 2009 Table D4).

BS 5228: 2009 Part 2: Vibration

- 6.14 Part 2 of the Standard deals with vibration from construction and open sites and provides information on the effects of the levels of vibration, human and structural response, response limits of structures and practical measures to reduce vibration.
- 6.15 The distance from nearest residential receptors to any likely use of piling rigs (i.e. building foundation construction) and vibratory compaction (i.e. during road construction) is likely to exceed a distance of 1km based on the nearest existing residential receptors. The distance to any existing commercial or industrial buildings would also be in excess of 500 metres.

Conclusion

- 6.16 Based upon the above information, it is clear that even at the closest approach to existing residential properties (i.e. 1km), the levels of ground-borne vibration would be zero. Similarly, the levels of vibration at the closest approach to existing commercial buildings would be greater than 500 metres with no potential ground vibration being detectable.
- 6.17 Construction vibration would be approached on a 'best practice' basis in accordance with BS5228: 2009 Part 2.

7.0 MITIGATION MEASURES

Mitigation of Construction Period Effects

- 7.1 In accordance with BS5228, best available techniques would be employed to control the noise generation (e.g. using equipment that is regularly maintained and fitted with silencers or acoustic hoods where practicable, appropriate location of noisy plant relative to receptors, avoiding un-necessary plant operation or revving of engines and use of broadband reverse alarms for mobile plant etc.).
- 7.2 Use of non-percussive piling techniques would assist in minimising noise levels during this activity.

Mitigation of Operation Period Effects

- 7.2 Neath Port Talbot CBC is able to apply conditions to any forthcoming planning permission to ensure that noise limits for daytime and night-time operations is achieved.
- 7.3 The predicted noise levels from the site have been calculated with the noise mitigation measures in position, site layout and operations to ensure that the resultant noise levels are within appropriate guidance and standards.

Noise Mitigation Measures

- 7.4 The following inherent noise mitigation measures are assumed to be in place to achieve the noise criteria.
- (i) Mobile plant used on site would be fitted with broadband noise type reverse alarms (e.g. Brigade Electronics 'smart alarms') or visual alarms used instead (subject to health and safety risk assessment).
 - (ii) Plant noise levels used for the noise prediction model under normal plant operation are detailed in Appendix 5.
 - (iii) Biomass boiler plant and electrostatic precipitator to be located within a purpose-built building with single skin cladding having a minimum R_w value of 24dB.
 - (iv) Induced draught fan to be enclosed to reduce noise levels down to a level not exceeding 85dB LAeq @ 1m.
 - (v) Boiler ventilation openings to be fitted with single bank acoustic louvres having a minimum R_w value of 10dB.
 - (vi) Fan stack fitted with silencer to reduce noise levels down to a level below 85dB LAeq @ 1m above the stack.
 - (vii) Doors into the Biomass building to be closed during night-time periods.
 - (viii) Mobile plant not operated external to buildings during night-time period.

- (ix) Emergency generator designed to a noise level of 80dB LAeq @ 1m.
- (x) Boiler Safety Valve and Storm Valve fitted with silencers to reduce noise levels not exceeding 85dB LAeq @ 1m.

7.5 The design of the proposed Intertissue Ltd Boiler Plant has been assessed on the basis of applying (BAT).

8.0 CONCLUSIONS

8.1 This assessment has been commissioned by Axis acting on behalf of Intertissue Ltd to determine the noise and vibration impact at the nearest existing residential properties in relation to the proposed biomass facility.

8.2 Noise and vibration levels have been considered and assessed during the construction and operational phases of the proposed development. Relevant and appropriate noise guidance and standards have been used to determine the noise impact and where appropriate amelioration measures provided to mitigate noise sources to acceptable and reasonable levels.

8.3 To determine any likely impact from noise it was necessary to establish typical baseline sound levels in the vicinity of the nearest residential property boundaries. This information has helped determine any likely noise impact on nearest receptors to the site during the operation of the proposed development.

8.4 The results of the investigation into the existing noise climate have established the following:

Representative background sound levels during a Sunday period were shown to be between 42dB LA90 and 57dB LA90 at agreed monitoring positions during daytime periods. For the Sunday night-time period background sound levels were recorded to vary between 39dB LA90 and 54dB LA90.

8.5 Pre-application dialogue has been undertaken with Public Protection Officers at the Environmental Health Department at Neath Port Talbot CBC to discuss the proposal and agree the assessment methodology and noise criteria, which is reflected in this assessment. The Officer's advised that the assessment should consider BS4142: 2014 in terms of noise criteria at the nearest residential properties and BS8233: 2014 in relation to nearest commercial receptors to the site. Consideration of vibration is also to be assessed during construction and operational periods.

8.6 The report predicts the impact of noise from the operation of the biomass boiler and associated plant on site, which would generally be contained within purpose-built buildings and fuel storage and transfer plant mounted external to the buildings. The noise assessment concludes the following:

- Noise levels from site operations have been undertaken using a noise prediction calculation model, internationally recognised calculation standard with appropriate input settings and plant noise limit data from the technology provider.
- The highest predicted noise levels from site operations are shown to be well below established background sound levels measured during a weekend period to determine the lowest likely levels.
- The highest predicted noise levels from site operations would not increase existing residual sound levels measured in terms of L_{Aeq} .

- According to BS4142:2014+A1:2109, the assessment of highest likely site operational noise levels would indicate that impact is low. This includes a +3dB allowance for noise character in accordance with NRW guidance on design for new development.
- Site noise levels would be within all relevant guidance and standards for noise (i.e. would be below night-time noise level according to WHO guidance, below recommended internal noise levels according to BS8233: 2014 and sleep disturbance criteria in terms of L_{Aeq}).
- Noise levels predicted at nearest commercial receptors (i.e. offices) is shown to be well within a reasonable design range for an office environment according to BS8233: 2014.
- The results show that the predicted site operational noise level would only increase existing ambient noise levels at Baglan Bay SINC ecological receptors by up to +1dB(A). This is not significant according to the advice provided within the ecological assessment report, which sets a precautionary limit of +3dB above ambient levels for birds.
- The impact of site operational noise or the proposed and existing Intertissue Ltd plant have been assessed and would not exceed background sound levels and not increase existing residual L_{Aeq} levels and therefore there is no significant cumulative impact.
- Best Available Techniques (BAT) would be applied in relation to the plant design, operation and site noise management.
- Assessment of construction noise indicates that there would not be any significant impacts and residual sound levels are unlikely to increase.
- No significant impacts are likely to occur as a result of additional vehicle movements as a result of the development as these will be negligible in context with the existing baseline traffic flows on the local road network.
- No significant impacts are predicted in relation to construction vibration or operational vibration and levels at nearest commercial premises are not expected to reach perceptible levels.
- The results of construction noise at the ecological receptor (i.e. bird species) show noise levels would be at or below the existing ambient levels. The only marginal increase above existing levels at close proximity to the Site boundary shows the maximum construction noise would only exceed the measured ambient levels by +1dB(A). This is therefore not a significant increase and according to the Ecological Assessment report which advises any increase that is below +3dB above the existing ambient, are considered to be inconsequential.

- In terms of L_{Amax} levels, the construction levels would be not significant at ecological receptors based on predicted levels and existing daytime ambient levels that are higher. The levels would be below the threshold and advice provided by the Ecological Assessment for Lapwing disturbance.

8.7 Noise amelioration measures to control site operational noise have been proposed to meet the requirements of best available techniques (BAT).

REFERENCES

1. Technical Advice Note TAN11 'Noise': 1997
2. Guidelines for Community Noise – World Health Organisation: April 1999
3. Community Noise – World Health Organisation: 1995
4. BS 7445: 2003, Description and measurement of environmental noise.
5. BS 5228: 2009+A1:2014 Parts 1 & 2 'Code of practice for noise and vibration control on construction and open sites'.
6. BS8233: 2014 'Guidance on sound insulation and noise reduction for buildings'
7. BS4142:2014+A1:2019: 'Methods for rating and assessing industrial and commercial sound'
8. ISO 9613-2: Acoustics – Attenuation of sound during propagation outdoors: General method of calculation
9. Neath Port Talbot CBC Decision Notice (ref. P2015/0975) for construction of a Biomass Boiler (8MW) with associated engineering operations and infrastructure, ancillary to the operation of the paper mill.

FIGURES

Figure 1: Baseline Measurements & Receptor Positions

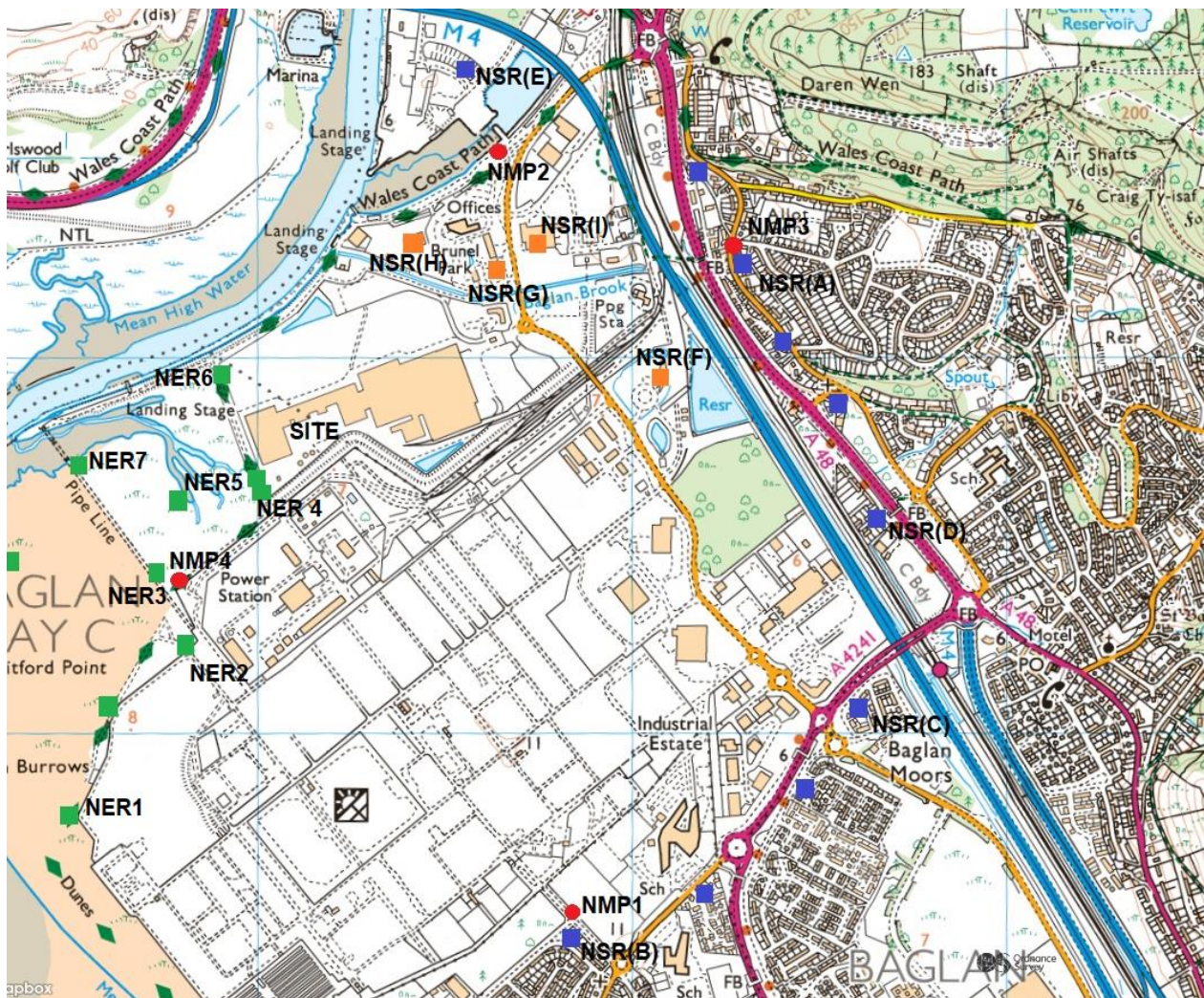
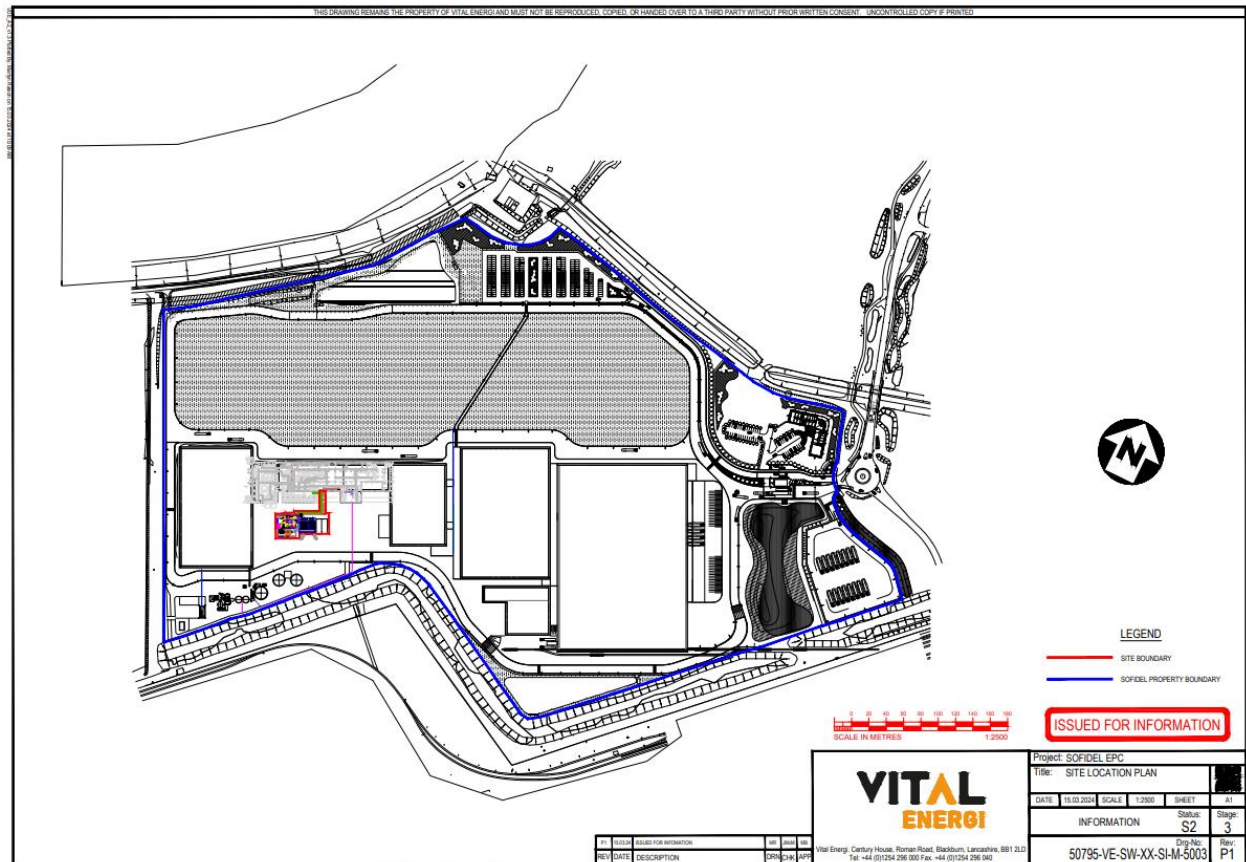


Figure 2: Site Location at Intertissue



APPENDICES

APPENDIX 1

BASIC ACOUSTIC TERMINOLOGY

Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air.

Between the quietest audible sound and the loudest tolerable sound there is a million to one ratio in sound pressure level. It is because of this wide range that a noise level scale based on logarithms is used in noise measurement. This is the decibel or dB scale.

Audibility of sound covers a range of about 0 to 140 decibels (dB) corresponding to the intensity of the sound pressure level. The ability to recognise a particular sound is dependent on the pitch or frequencies present in the source. Sound pressure measurements taken with a microphone cannot differentiate in the same way as the ear, consequently a correction is applied by the noise measuring instrument in order to correspond more closely to the frequency response of the ear which responds to sounds from 20 Hz to 20000 Hz. This is known as 'A weighting' and written as dB(A).

The use of this unit is internationally accepted and correlates well with subjective annoyance to noise.

The logarithmic basis of noise measurements means that when considering more than one noise source their addition must be undertaken in terms of logarithmic arithmetic. Thus, two noise sources each of 40 dB(A) acting together would not give rise to $40 + 40 = 80$ dB(A) but rather $40 + 40 = 43$ dB(A). This 3 dB(A) increase represents a doubling in sound energy but would be only just perceptible to a human ear.

The attached chart gives typical noise levels in terms of dB(A) for common situations.

Noise levels can vary with time according to source activity and indices have been developed in order to be able to assign a value to represent a period of noise level variations and to correspond with subjective response.

The definition in layman's terms is given below for terminology used in the measurement and results obtained during the survey work.

A-weighting: Normal hearing covers the frequency (pitch) range from about 20Hz to 20,000 Hz but sensitivity of the ear is greatest between about 500Hz and 5000Hz. The "A-weighting" is an electrical circuit built into noise meters to mimic this characteristic of the human ear.

Ambient noise: The totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far.

Attenuation: Noise reduction

Background noise: The general quiet periods of ambient noise when the noise source under investigation is not there.

Decibel (dB): The unit of measurement for sound based on a logarithmic scale. 0dB is the threshold of normal hearing; 140dB is the threshold of pain. A change of 1dB is only detectable under controlled laboratory conditions.

dB(A) [decibel A weighted]: Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) serves to distinguish sounds of different frequency (or pitch) in a similar way to how the human ear responds. Measurements in dB(A) broadly agrees with an individual's assessment of loudness. A change of 3dB(A) is the minimum perceptible under normal everyday conditions, and a change of 10dB(A) corresponds roughly to doubling or halving the loudness of sound.

dB(C): [decibel C weighted]: Frequency weighting which does not alter low frequency octave band levels by very much compared to 'A' weighting. Similar to linear reading (i.e. linear does not alter frequency spectra at all)

Frequency (Hz): The number of sound waves to pass a point in one second.

LAeq: This is a noise index used to describe the "average" level of a noise that varies with time (T). It allows for the different sensitivities of the human ear to different frequencies (pitch), and averages fluctuating noise levels in a manner, which correlates well with human perceptions of loudness.

LA10,T: This noise index gives an indication of the upper limit or peak levels of the fluctuating noise. It is the "A weighted" noise level exceeded for 10 per cent of the specified measurement period (T). e.g. If the measurement period was over 10 hours and the LA10 reading was say 60dB, then this means that for 1 hour out of 10 the level went above 60dB.

LA90,T: This noise index gives an indication of the lower limit or levels of the fluctuating noise. It is the "A weighted" noise level exceeded for 90 per cent of the specified measurement period (T). e.g. If the measurement period was over 10 hours and the LA90 reading was say 50dB, then this means that for 9 hours out of 10 the level went above 50dB.

L_{Amax}: This is the highest A weighted noise level recorded during a noise measurement period.

L_{night,outside} : This is the A-weighted long-term average sound level measured outside as defined in ISO 1996-2: 1987, determined over all the night periods of a year.

Residual noise: The ambient noise remaining at a given position in a given situation when the noise source under investigation is not there.

Specific noise: The noise source under investigation for assessing the likelihood of complaints

Examples of typical noise levels

Source/Activity	Indicative noise level [dB(A)]
Threshold of hearing	0
Rural night-time background	20-40
Quiet bedroom	35
Wind farm at 350m	35-45
Busy road at 5km	35-45
Car at 65km/h at 100m	55
Busy general office	60
Conversation	60
Truck at 50km/h at 100m	65
City Traffic at 5m	75-85
Pneumatic drill at 7m	95
Jet aircraft at 250m	105
Threshold of pain	140

APPENDIX 2

NOISE SURVEY DETAILS

The background sound measurements were undertaken at accessible receptor positions or the closest accessible position or similar distance from local roads relative to the nearest sensitive receptors to identify typical baseline sound levels. The monitoring of residual and background sound was carried out during a weekend period such that the lowest likely background sound levels could be established for the assessment.

The following instrumentation was used for all noise measurements:

March 2024

<i>Manufacturer</i>	<i>Description</i>	<i>Type</i>	<i>Calibration Due date</i>	<i>Serial No.</i>
Cirrus	Real Time Sound Analyser	171A	June 2024	G061253
Cirrus	Real Time Sound Analyser	171B	April 2024	G056142
Cirrus	Real Time Sound Analyser	1710	April 2024	G066350
Norsonic	Integrating Sound Level Meter	140	February 2025	1405418
Cirrus	Electronic Calibrator	CR: 513A	April 2024	031523

The following set-up parameters were used on the sound level meters during noise measurement:

Static Noise Monitoring:

Time Weighting: Fast
Frequency Weighting: 'A'
Measurement Period: 15-minute intervals

Calibration

Calibration setting: 94dB

The noise meters were calibrated with the electronic calibrator prior to commencement and on completion of the survey. No significant drift in calibration was observed.

Survey Dates and Personnel

Baseline Survey – Saturday 9th to Monday 11th March 2024

Static noise measurement positions in March 2024 were chosen following a review of the original baseline study undertaken in February 2015. Similar locations were previously agreed with the Local Authority as being suitable for determining representative baseline sound level data at NSRs relative to the Proposed Development (see Appendix 3 for detailed information). Mr. D.R. Kettlewell of Noise & Vibration Consultants Limited carried out the baseline survey and was remained in Neath for the duration of the survey.

Measurements were recorded at three fixed monitoring positions during daytime and night-time periods. Data logging of L_{Aeq} , L_{A10} , L_{A90} and L_{Amax} were recorded at 15-minute intervals for information on the variation of sound levels at NSRs. Some additional spot roaming measurements were recorded at one location [NSR(A)] during the morning, afternoon evening and night-time periods due to security and access limitations.

The noise meters were mounted on a tripod at a height of circa 1.5 metres above ground level and fitted with a wind and rain shield.

Meteorological Conditions

Baseline Survey

Weather details were recorded by the NVC engineer during the period of the surveys are provided below:

Saturday 9th March 2024

During the early evening period it was dry, with light cloud cover, light easterly winds (1 to 2m/s) and temperature 9-10degC.

Rain started around 2000 hours and continued until circa 2300 hours. The weather then remained dry until 0200 hours when rain returned until 0600 hours.

Sunday 10th March 2024

The weather conditions remained dry from 0600 to midnight on Sunday. The wind direction was southeasterly to northeasterly and light (1-3m/s) with a temperature ranging between 7-10degC and a light cloud cover with sunny intervals.

Monday 11th March 2024

During the night-time period of Monday it remained dry, with light cloud cover, light north east wind direction (1-2m/s) and temperature of 6-9degC.

The climatic conditions were suitable for monitoring environmental noise levels in accordance with advice given in BS4142:2014+A1:2019 and BS 7445:2003 'Description and measurement of environmental noise'.

Baseline Survey Results

Appendix 3 attached, details all measurements taken showing the resultant levels at the selected measurement positions.

APPENDIX 3

BASELINE SOUND SURVEY RESULTS

Noise Survey Results

Date: Saturday 9th March 2024
Location: Intertissue Briton Ferry Site, Baglan Energy Park, Neath
Client: Axis
Project: Intertissue Briton Ferry Site Biomass Boiler
Data: **Baseline Sound Survey: Position NMP1 - Solar Way (off Handel Avenue)**
Instrumentation: Cirrus 171A Real Time Analyser (G066350)
Calibration: 94dB

TABLE 1

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmix (dB)	Observations
18:30	15:00	54.4	56.2	51.5	73.3	Local road traffic movement
18:45	15:00	53.2	54.4	51.6	62.5	Birdsong
19:00	15:00	53.9	55.2	50.9	66.4	No audible noise from Intertissue
19:15	15:00	54.1	55.3	51.1	68.7	
19:30	15:00	53.1	54.5	51.1	62.0	
19:45	15:00	52.3	54.1	50.2	59.7	
20:00	15:00	52.5	54.1	49.9	62.8	Rain
20:15	15:00	51.9	53.2	49.6	66.4	Rain
20:30	15:00	51.9	53.3	48.9	65.1	Rain
20:45	15:00	50.2	51.6	48.4	60.1	Rain
21:00	15:00	50.4	52.1	47.9	63.5	Rain
21:15	15:00	49.9	51.1	47.9	59.4	Rain
21:30	15:00	50.2	51.9	47.8	61.1	Rain
21:45	15:00	49.6	51.0	47.7	59.8	Rain
22:00	15:00	48.8	50.1	47.1	58.4	Rain
22:15	15:00	48.4	49.6	46.9	53.9	Rain
22:30	15:00	48.6	49.7	46.0	64.9	Rain
22:45	15:00	49.9	51.5	47.3	63.8	Rain
Average 1830-2300		51.7	53.1	49.3	54-73	
Average 1830-2000		53.5	55	51	60-73	Excludes Rain

Noise Survey Results

Date: Satruday 9th - Sunday 10th March 2024
Location: Intertissue Briton Ferry Site, Baglan Energy Park, Neath
Client: Axis
Project: Interissue Briton Ferry Site Biomass Boiler
Data: **Baseline Sound Survey: Position NMP1 - Solar Way (off Handel Avenue)**
Instrumentation: Cirrus 171A Real Time Analyser (G066350)
Calibration: 94dB

TABLE 2

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmix (dB)	Observations
23:00	15:00	51.3	53.2	48.9	59.1	
23:15	15:00	51.8	52.6	49.1	64.3	
23:30	15:00	50.8	52.3	48.8	58.0	
23:45	15:00	49.3	50.3	47.2	65.7	
00:00	15:00	49.3	50.7	47.6	58.0	
00:15	15:00	49.6	50.3	46.9	65.2	
00:30	15:00	48.1	49.7	46.2	55.6	
00:45	15:00	48.0	49.4	46.3	56.2	
01:00	15:00	48.1	49.7	45.9	54.2	
01:15	15:00	50.1	51.2	45.9	67.1	
01:30	15:00	46.0	47.9	43.7	52.7	
01:45	15:00	46.6	47.5	42.2	64.6	
02:00	15:00	47.6	49.5	44.7	58.6	Rain
02:15	15:00	47.6	49.0	45.8	58.4	Rain
02:30	15:00	47.3	48.8	45.3	58.6	Rain
02:45	15:00	47.8	47.4	44.0	67.5	Rain
03:00	15:00	44.8	46.2	43.0	52.6	Rain
03:15	15:00	46.6	48.1	44.1	51.9	Rain
03:30	15:00	47.5	48.9	45.7	54.2	Rain
03:45	15:00	50.3	51.2	45.6	64.9	Rain
04:00	15:00	47.2	48.9	44.6	55.4	Rain
04:15	15:00	48.0	49.1	45.2	65.0	Rain
04:30	15:00	47.8	49.3	44.7	63.3	Rain
04:45	15:00	49.1	52.0	44.6	61.6	Rain
05:00	15:00	48.7	50.1	45.9	64.3	Rain
05:15	15:00	50.4	51.7	47.9	64.4	Rain
05:30	15:00	51.3	52.4	49.8	57.4	Rain
05:45	15:00	52.6	54.0	50.7	60.6	Rain
06:00	15:00	53.2	53.9	49.8	68.7	
06:15	15:00	49.8	51.2	47.0	63.9	
06:30	15:00	50.5	51.5	47.9	65.7	
06:45	15:00	52.0	54.3	48.1	64.3	
Average 2300-0700		49.4	50.8	46.8	52-69	
Average 1830-2300		51.7	53.1	49.3	54-73	
Average 2300-0700		50.0	51.3	47.3	53-69	Excludes Rain

Noise Survey Results

Date: Sunday 10th March 2024
Location: Intertissue Briton Ferry Site, Baglan Energy Park, Neath
Client: Axis
Project: Interissue Briton Ferry Site Biomass Boiler
Data: Baseline Sound Survey: Position NMP1 - Solar Way (off Handel Avenue)
Instrumentation: Cirrus 171A Real Time Analyser (G066350)
Calibration: 94dB

TABLE 3

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmix (dB)	Observations
07:00	15:00	52.4	53.9	47.6	68.5	
07:15	15:00	52.5	54.3	48.9	70.8	
07:30	15:00	50.7	51.4	48.3	65.8	
07:45	15:00	53.7	55.1	51.0	67.1	
08:00	15:00	53.7	54.8	51.3	66.5	
08:15	15:00	53.9	55.7	51.1	65.7	
08:30	15:00	54.0	56.1	49.1	71.4	
08:45	15:00	53.9	57.1	49.3	66.3	
09:00	15:00	55.5	59.2	49.2	72.3	
09:15	15:00	54.5	58.0	49.4	71.4	
09:30	15:00	54.5	57.2	50.5	68.0	
09:45	15:00	62.0	61.4	51.4	87.9	
10:00	15:00	55.5	56.4	50.8	79.8	
10:15	15:00	53.5	55.6	50.0	71.8	
10:30	15:00	53.0	54.6	49.9	65.8	
10:45	15:00	60.9	56.5	50.4	85.0	
11:00	15:00	57.8	57.2	49.9	88.1	
11:15	15:00	53.7	56.4	49.7	70.8	
11:30	15:00	53.8	56.2	49.7	69.4	
11:45	15:00	53.1	55.9	49.1	66.9	
12:00	15:00	60.2	60.0	49.5	85.4	
12:15	15:00	56.5	60.4	50.7	72.1	
12:30	15:00	56.0	59.4	50.3	73.3	
12:45	15:00	61.7	58.3	50.0	87.0	
13:00	15:00	53.7	56.2	49.7	68.2	
13:15	15:00	54.2	57.0	49.0	69.4	
13:30	15:00	53.5	56.0	48.8	68.5	
13:45	15:00	51.6	53.1	47.4	67.1	
14:00	15:00	51.8	54.3	46.3	67.1	
14:15	15:00	53.6	56.6	46.2	73.8	
14:30	15:00	50.2	54.5	41.5	64.2	
14:45	15:00	48.1	52.1	40.0	65.8	
Average 0700-1500		55.8	56.3	48.9	64-88	

Noise Survey Results

Date: Sunday 10th March 2024

Location: Intertissue Briton Ferry Site, Baglan Energy Park, Neath

Client: Axis

Project: Interissue Briton Ferry Site Biomass Boiler

Data: Baseline Sound Survey: Position NMP1 - Solar Way (off Handel Avenue)

Instrumentation: Cirrus 171A Real Time Analyser (G066350)

Calibration: 94dB

TABLE 4

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmx (dB)	Observations
15:00	15:00	48.6	50.0	38.5	72.1	
15:15	15:00	48.5	52.1	40.3	64.9	
15:30	15:00	48.4	50.6	39.4	69.8	
15:45	15:00	51.5	51.7	41.1	70.6	
16:00	15:00	51.5	52.8	41.3	71.7	
16:15	15:00	48.8	50.6	40.9	66.2	
16:30	15:00	47.5	49.9	40.3	66.5	
16:45	15:00	49.8	51.9	39.6	71.8	
17:00	15:00	49.3	51.0	39.3	68.6	
17:15	15:00	49.7	51.7	41.0	72.0	
17:30	15:00	49.9	52.3	44.9	66.6	
17:45	15:00	51.4	53.8	46.5	66.1	
18:00	15:00	48.3	50.7	42.1	65.0	
18:15	15:00	48.7	52.0	39.5	67.6	
18:30	15:00	49.0	49.4	38.3	78.6	
18:45	15:00	54.6	55.1	46.4	79.8	
19:00	15:00	49.5	51.4	44.9	63.1	
19:15	15:00	49.2	51.2	44.5	69.9	
19:30	15:00	48.4	49.6	43.7	60.7	
19:45	15:00	49.0	50.4	45.8	62.0	
20:00	15:00	51.3	52.7	47.4	66.1	
20:15	15:00	49.5	50.8	47.5	60.6	
20:30	15:00	51.3	52.9	48.2	63.5	
20:45	15:00	51.0	53.4	47.0	66.0	
21:00	15:00	50.0	50.9	46.7	67.4	
21:15	15:00	49.1	50.0	47.9	52.5	
21:30	15:00	48.6	50.0	46.2	62.0	
21:45	15:00	47.8	49.1	44.4	63.2	
22:00	15:00	44.1	45.6	41.5	57.5	
22:15	15:00	47.4	47.0	40.4	68.7	
22:30	15:00	43.8	45.3	40.9	58.2	
22:45	15:00	41.0	41.9	35.8	59.2	
Average 1500-2300		49.5	51.1	44.1	53-80	

Noise Survey Results

Date: Sunday 10th - Moday 11th March 2024
Location: Intertissue Briton Ferry Site, Baglan Energy Park, Neath
Client: Axis
Project: Interissue Briton Ferry Site Biomass Boiler
Data: **Baseline Sound Survey: Position NMP1 - Solar Way (off Handel Avenue)**
Instrumentation: Cirrus 171A Real Time Analyser (G066350)
Calibration: 94dB

TABLE 5

Start Time	Run Time (mins.)	L _{Aeq} (dB)	L _{A10} (dB)	L _{A90} (dB)	L _{Amax} (dB)	Observations
23:00	15:00	43.0	43.0	36.0	59.3	
23:15	15:00	41.6	42.6	37.2	61.5	
23:30	15:00	38.0	39.9	35.7	47.3	
23:45	15:00	46.3	49.4	35.4	65.3	
00:00	15:00	43.2	43.4	39.9	63.6	
00:15	15:00	52.9	45.4	38.9	79.0	
00:30	15:00	43.5	45.1	41.3	54.1	
00:45	15:00	45.0	46.3	39.8	60.5	
01:00	15:00	44.8	45.8	41.0	59.8	
01:15	15:00	43.0	45.5	39.5	52.8	
01:30	15:00	42.7	44.3	40.3	51.3	
01:45	15:00	43.7	45.6	38.8	57.4	
02:00	15:00	41.2	43.3	38.3	50.5	
02:15	15:00	43.7	45.6	41.1	49.8	
02:30	15:00	44.3	46.2	41.5	54.0	
02:45	15:00	44.3	46.6	40.5	63.0	
03:00	15:00	44.2	46.2	40.2	55.4	
03:15	15:00	45.1	45.9	40.9	62.7	
03:30	15:00	43.4	45.4	40.4	51.5	
03:45	15:00	45.2	47.3	41.6	60.2	
04:00	15:00	46.1	47.9	43.2	56.2	
04:15	15:00	48.8	50.5	46.1	56.3	
04:30	15:00	49.6	51.6	46.5	61.5	
04:45	15:00	50.0	51.7	47.4	57.4	
05:00	15:00	49.9	51.8	47.2	59.2	
05:15	15:00	51.3	54.0	47.2	58.8	
05:30	15:00	50.0	52.5	46.3	58.6	
05:45	15:00	52.6	54.6	49.9	63.4	
06:00	15:00	53.6	56.0	50.9	63.6	
06:15	15:00	56.1	58.6	52.2	72.2	
06:30	15:00	56.8	59.8	52.7	70.0	
06:45	15:00	56.5	58.6	53.2	70.6	
Average 2300-0700		49.7	51.8	46.0	47-79	
Average 0700-2300		53.7	54.8	47.5	53-88	

Noise Survey Results

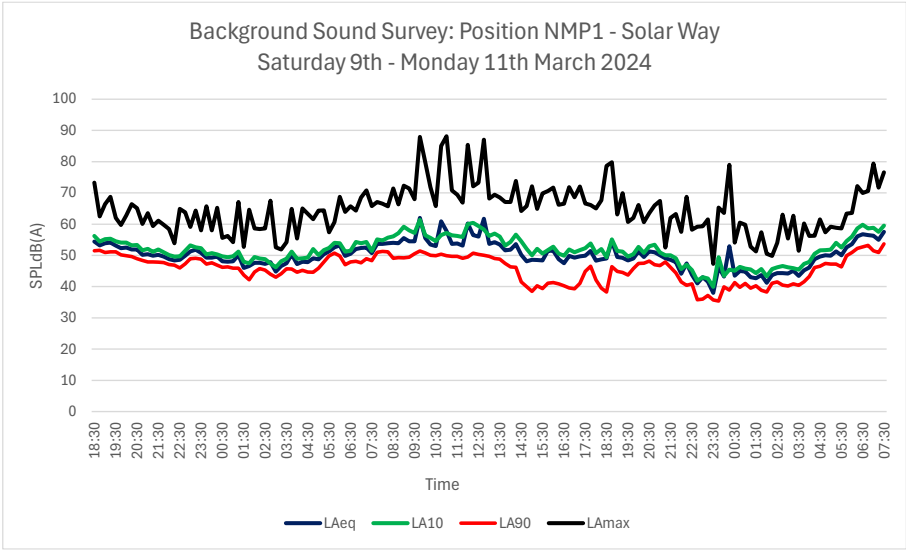
Date: Sunday 10th - Moday 11th March 2024
Location: Intertissue Briton Ferry Site, Baglan Energy Park, Neath
Client: Axis
Project: Interissue Briton Ferry Site Biomass Boiler
Data: **Baseline Sound Survey: Position NMP1 - Solar Way (off Handel Avenue)**
Instrumentation: Cirrus 171A Real Time Analyser (G066350)
Calibration: 94dB

TABLE 6

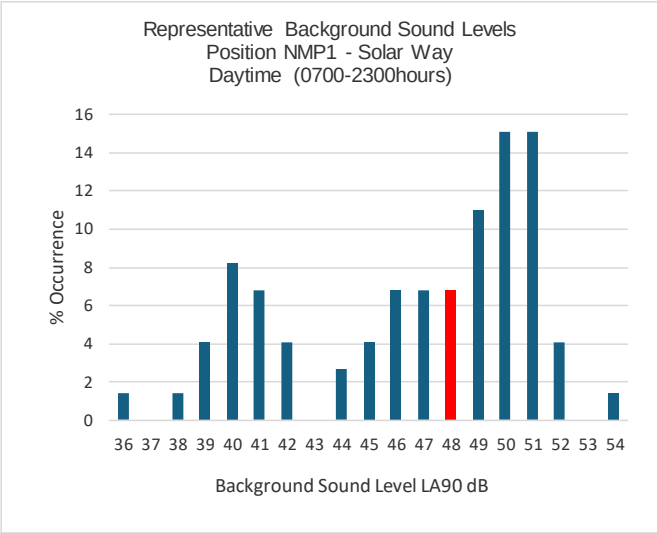
Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmx (dB)	Observations
07:00	15:00	56.3	58.8	51.5	79.4	
07:15	15:00	55.0	57.5	50.9	71.7	
07:30	15:00	57.5	59.5	53.7	76.6	
Average 0700-0745		56.3	58.6	52.2	72-79	

Overall Average	49.6	51.3	46.4	47-79	
Overall Average	53.5	54.8	48.2	53-88	

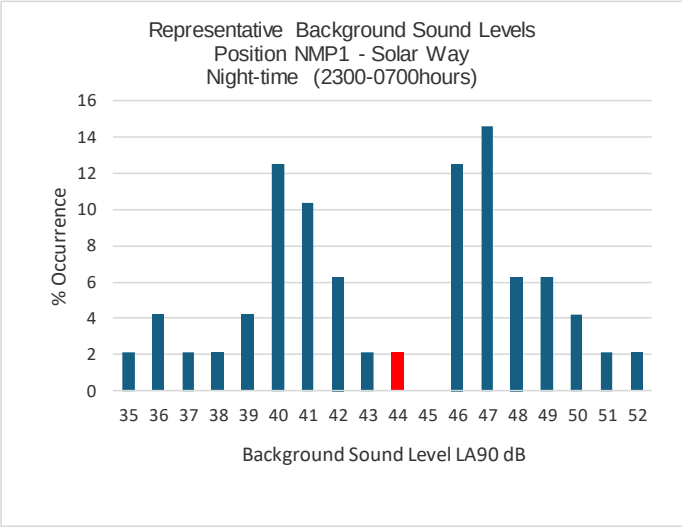
Overall Average	49.8	51.6	46.5	47-79	Excludes Rain
Overall Average	53.8	55.1	48.2	53-88	Excludes Rain



LA90	% Occurrence
36	1.4
37	0.0
38	1.4
39	4.1
40	8.2
41	6.8
42	4.1
43	0
44	2.7
45	4.1
46	6.8
47	6.8
48	6.8
49	11.0
50	15.1
51	15.1
52	4.1
53	0
54	1.4



LA90	% Occurrence
35	2.1
36	4.2
37	2.1
38	2.1
39	4.2
40	12.5
41	10.4
42	6.3
43	2.1
44	2.1
45	0
46	12.5
47	14.6
48	6.3
49	6.3
50	4.2
51	2.1
52	2.1
53	4.2



Noise Survey Results

Date: Satrunday 9th March 2024

Location: Intertissue Briton Ferry Site, Baglan Energy Park, Neath

Client: Axis

Project: Interissue Briton Ferry Site Biomass Boiler

Data: **Baseline Sound Survey: Position NMP2 - Off Brunel Way**

Instrumentation: Cirrus 171A Real Time Analyser (G061253)

Calibration: 94dB

TABLE 7

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmx (dB)	Observations
19:00	15:00	58.3	60.1	56.1	66.7	Distant road traffic noise from M4 Motorway (elevated)
19:15	15:00	57.8	59.3	55.8	63.7	
19:30	15:00	58.1	60.0	55.7	66.9	
19:45	15:00	57.3	59.1	54.4	69.1	
20:00	15:00	58.0	59.9	55.0	73.8	Rain
20:15	15:00	56.9	59.0	53.6	65.6	Rain
20:30	15:00	57.1	59.1	54.2	64.0	Rain
20:45	15:00	56.0	57.6	53.4	70.4	Rain
21:00	15:00	55.8	57.6	52.6	71.5	Rain
21:15	15:00	56.1	57.8	53.5	66.3	Rain
21:30	15:00	56.0	57.8	53.1	64.6	Rain
21:45	15:00	55.6	57.8	52.2	65.5	Rain
22:00	15:00	55.9	57.4	52.4	69.0	Rain
22:15	15:00	55.3	57.3	52.2	64.9	Rain
22:30	15:00	54.4	56.2	51.0	63.8	Rain
22:45	15:00	54.3	56.2	50.8	65.7	Rain
Average 1900-2300		56.6	58.4	53.7	64-74	
Average 1900-2000		57.8	59.6	55.5	64-69	Excludes Rain

Noise Survey Results

Date: Satrunday 9th - Sunday 10th March 2024
Location: Intertissue Briton Ferry Site, Baglan Energy Park, Neath
Client: Axis
Project: Interissue Briton Ferry Site Biomass Boiler
Data: **Baseline Sound Survey: Position NMP2 - Off Brunel Way**
Instrumentation: Cirrus 171A Real Time Analyser (G061253)
Calibration: 94dB

TABLE 8

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmx (dB)	Observations
23:00	15:00	54.9	56.7	51.7	66.8	
23:15	15:00	56.3	58.3	53.8	64.3	
23:30	15:00	55.4	56.7	53.0	66.9	
23:45	15:00	54.9	57.1	51.0	65.6	
00:00	15:00	55.0	57.0	50.9	67.2	
00:15	15:00	55.8	58.1	52.3	64.7	
00:30	15:00	54.8	57.4	49.8	63.4	
00:45	15:00	55.4	57.7	50.5	68.6	
01:00	15:00	53.8	57.0	48.8	64.0	
01:15	15:00	53.9	56.7	49.4	63.0	
01:30	15:00	53.1	56.0	44.9	67.0	
01:45	15:00	53.2	56.8	45.5	64.8	
02:00	15:00	54.3	57.3	46.8	68.8	Rain
02:15	15:00	52.5	55.2	46.3	64.1	Rain
02:30	15:00	53.1	55.8	47.6	67.9	Rain
02:45	15:00	52.5	55.6	43.3	61.7	Rain
03:00	15:00	51.6	54.1	45.9	64.1	Rain
03:15	15:00	51.6	54.8	45.9	59.3	Rain
03:30	15:00	52.9	55.8	47.5	60.9	Rain
03:45	15:00	53.1	56.4	46.8	65.7	Rain
04:00	15:00	53.1	56.1	45.7	66.1	Rain
04:15	15:00	53.1	55.9	46.9	62.3	Rain
04:30	15:00	53.0	55.9	47.1	65.3	Rain
04:45	15:00	52.4	54.7	47.6	64.1	Rain
05:00	15:00	54.0	56.1	49.6	65.8	Rain
05:15	15:00	54.6	56.4	51.6	64.4	Rain
05:30	15:00	55.9	58.0	52.6	66.9	Rain
05:45	15:00	56.6	59.4	52.2	71.4	Rain
06:00	15:00	58.6	61.9	54.0	68.1	
06:15	15:00	58.0	60.7	53.4	75.4	
06:30	15:00	58.5	61.7	54.0	66.6	
06:45	15:00	56.8	58.9	53.4	66.1	
Average 2300-0700		54.8	57.5	50.4	59-75	
Average 1900-2300		56.6	58.4	53.7	64-74	
Average 2300-0700		55.8	58.4	51.7	63-75	Excludes Rain

Noise Survey Results

Date: Sunday 10th March 2024
Location: Intertissue Briton Ferry Site, Baglan Energy Park, Neath
Client: Axis
Project: Intertissue Briton Ferry Site Biomass Boiler
Data: **Baseline Sound Survey: Position NMP2 - Off Brunel Way**
Instrumentation: Cirrus 171A Real Time Analyser (G061253)
Calibration: 94dB

TABLE 9

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmx (dB)	Observations
07:00	15:00	56.6	58.5	53.1	69.6	
07:15	15:00	56.5	58.5	53.4	70.1	
07:30	15:00	56.7	58.4	54.2	64.3	
07:45	15:00	57.9	59.8	54.8	69.9	
08:00	15:00	57.6	59.0	54.7	75.4	
08:15	15:00	58.2	60.2	55.6	64.5	
08:30	15:00	57.4	59.5	53.8	71.7	
08:45	15:00	60.3	61.3	55.8	80.2	
09:00	15:00	59.6	62.2	56.0	70.3	
09:15	15:00	58.4	60.4	56.0	66.5	
09:30	15:00	59.5	61.6	57.0	68.1	
09:45	15:00	60.5	62.3	58.1	70.7	
10:00	15:00	59.9	62.1	57.3	69.4	
10:15	15:00	60.5	62.9	57.5	67.1	
10:30	15:00	60.4	62.8	57.4	69.9	
10:45	15:00	61.0	62.9	58.4	68.4	
11:00	15:00	60.8	63.3	57.8	68.4	
11:15	15:00	60.4	62.3	57.5	72.5	
11:30	15:00	60.2	62.1	57.4	68.2	
11:45	15:00	59.8	61.8	57.3	67.7	
12:00	15:00	60.0	62.2	57.6	68.3	
12:15	15:00	60.1	62.4	57.4	67.8	
12:30	15:00	59.6	61.8	56.7	70.3	
12:45	15:00	59.9	61.8	57.1	72.8	
13:00	15:00	59.5	61.6	56.9	66.6	
13:15	15:00	59.6	62.0	56.6	74.2	
13:30	15:00	59.8	61.8	57.2	68.9	
13:45	15:00	59.1	61.5	56.1	69.7	
14:00	15:00	58.8	60.7	56.2	73.7	
14:15	15:00	58.6	60.9	56.2	67.0	
14:30	15:00	58.5	60.6	55.7	70.9	
14:45	15:00	57.7	60.1	55.0	66.9	
Average 0700-1500		59.3	61.2	56.3	64-80	

Noise Survey Results

Date: Sunday 10th March 2024

Location: Intertissue Briton Ferry Site, Baglan Energy Park, Neath

Client: Axis

Project: Interissue Briton Ferry Site Biomass Boiler

Data: **Baseline Sound Survey: Position NMP2 - Off Brunel Way**

Instrumentation: Cirrus 171A Real Time Analyser (G061253)

Calibration: 94dB

TABLE 10

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmx (dB)	Observations
15:00	15:00	58.1	60.7	54.9	67.9	
15:15	15:00	57.7	60.1	54.7	66.5	
15:30	15:00	57.5	60.5	53.8	69.7	
15:45	15:00	57.8	60.4	54.4	72.9	
16:00	15:00	57.5	59.8	55.0	67.4	
16:15	15:00	57.9	60.1	55.5	68.6	
16:30	15:00	58.4	60.8	55.9	65.1	
16:45	15:00	58.8	61.3	55.7	69.8	
17:00	15:00	59.3	61.0	57.0	68.9	
17:15	15:00	60.3	62.3	57.8	71.3	
17:30	15:00	59.6	61.6	57.6	67.2	
17:45	15:00	60.1	62.3	57.9	68.1	
18:00	15:00	60.0	62.2	57.3	71.6	
18:15	15:00	59.3	61.8	56.2	73.4	
18:30	15:00	59.4	61.7	56.7	67.6	
18:45	15:00	58.8	61.1	56.4	66.7	
19:00	15:00	58.6	60.4	56.4	72.5	
19:15	15:00	58.0	60.3	55.6	65.2	
19:30	15:00	58.8	60.8	56.2	68.4	
19:45	15:00	58.2	59.3	56.2	67.0	
20:00	15:00	57.7	59.1	55.6	65.2	
20:15	15:00	56.9	58.6	54.4	65.2	
20:30	15:00	57.5	59.8	54.7	67.0	
20:45	15:00	58.2	59.9	55.4	67.2	
21:00	15:00	57.6	59.9	53.6	67.1	
21:15	15:00	57.5	59.4	55.0	63.4	
21:30	15:00	56.7	58.4	54.1	65.6	
21:45	15:00	59.4	58.7	53.4	79.9	
22:00	15:00	55.1	57.2	50.8	68.0	
22:15	15:00	54.6	56.8	51.2	63.0	
22:30	15:00	53.0	54.7	50.0	63.8	
22:45	15:00	52.6	55.0	47.7	64.3	
Average 1500-2300		58.1	60.2	55.3	63-80	

Noise Survey Results

Date: Sunday 10th - Moday 11th March 2024
Location: Intertissue Briton Ferry Site, Baglan Energy Park, Neath
Client: Axis
Project: Interissue Briton Ferry Site Biomass Boiler
Data: **Baseline Sound Survey: Position NMP2 - Off Brunel Way**
Instrumentation: Cirrus 171A Real Time Analyser (G061253)
Calibration: 94dB

TABLE 11

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmix (dB)	Observations
23:00	15:00	57.2	55.1	48.0	80.7	
23:15	15:00	51.1	52.7	46.5	62.9	
23:30	15:00	51.3	53.1	45.7	64.0	
23:45	15:00	49.8	51.6	46.4	63.0	
00:00	15:00	58.9	51.9	45.4	86.8	
00:15	15:00	51.1	53.3	45.7	63.9	
00:30	15:00	52.6	55.4	46.4	65.5	
00:45	15:00	51.2	54.8	42.9	60.9	
01:00	15:00	50.9	53.5	44.5	65.7	
01:15	15:00	52.5	55.5	45.2	62.7	
01:30	15:00	51.5	54.8	43.0	59.4	
01:45	15:00	51.0	54.7	43.7	60.0	
02:00	15:00	49.9	53.6	41.7	59.1	
02:15	15:00	51.9	55.3	44.8	60.3	
02:30	15:00	52.7	55.5	44.0	64.7	
02:45	15:00	52.4	55.7	45.9	61.1	
03:00	15:00	53.1	55.4	48.2	63.3	
03:15	15:00	52.5	54.8	47.8	62.2	
03:30	15:00	52.2	55.0	44.8	60.4	
03:45	15:00	55.7	56.7	49.8	75.4	
04:00	15:00	54.3	57.0	48.2	67.4	
04:15	15:00	55.4	57.6	51.0	66.1	
04:30	15:00	55.5	57.7	51.0	65.6	
04:45	15:00	54.9	57.0	51.0	63.3	
05:00	15:00	56.0	58.1	52.8	65.8	
05:15	15:00	58.3	60.1	55.3	68.1	
05:30	15:00	59.1	62.0	54.7	69.2	
05:45	15:00	61.3	63.9	57.0	70.8	
06:00	15:00	61.2	63.8	57.4	73.5	
06:15	15:00	60.5	62.9	57.4	72.2	
06:30	15:00	62.2	64.6	59.3	70.3	
06:45	15:00	61.5	63.6	58.8	67.0	
Average 2300-0700		56.4	58.5	52.1	59-87	
Average 0700-2300		58.7	60.8	55.9	63-80	

Noise Survey Results

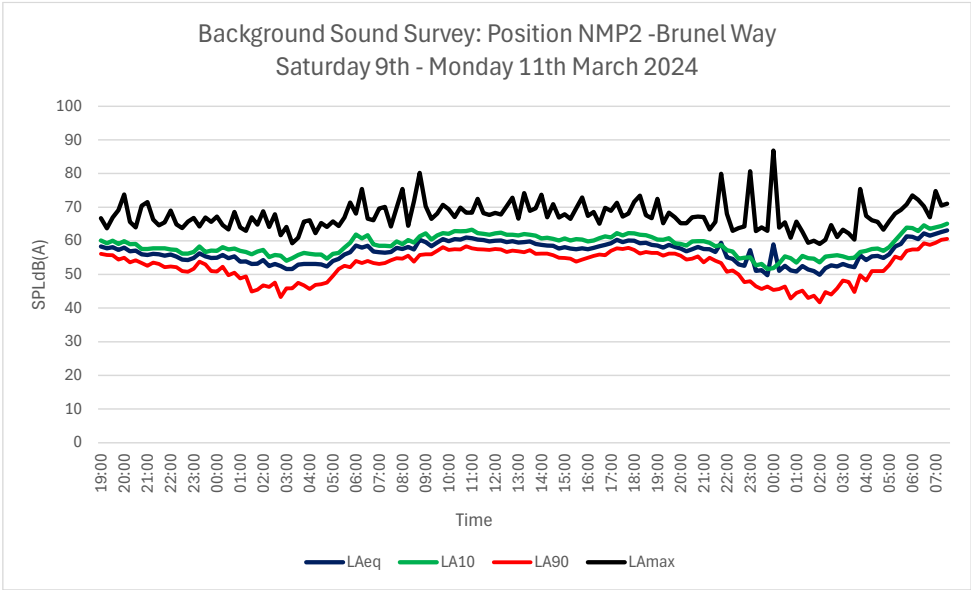
Date: Sunday 10th - Moday 11th March 2024
Location: Intertissue Briton Ferry Site, Baglan Energy Park, Neath
Client: Axis
Project: Intertissue Briton Ferry Site Biomass Boiler
Data: **Baseline Sound Survey: Position NMP2 - Off Brunel Way**
Instrumentation: Cirrus 171A Real Time Analyser (G061253)
Calibration: 94dB

TABLE 12

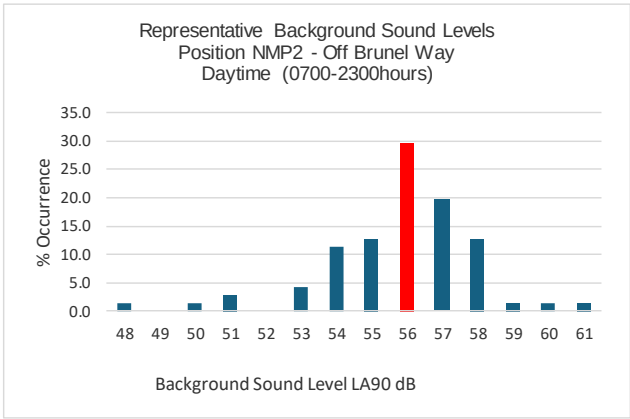
Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmx (dB)	Observations
07:00	15:00	62.1	64.0	59.4	74.8	
07:15	15:00	62.6	64.4	60.3	70.5	
07:30	15:00	63.1	65.1	60.6	71.0	
Average 0700-0745		62.6	64.5	60.1	71-75	

Overall Average	55.7	58.0	51.3	59-87	
Overall Average	58.6	60.7	55.8	63-80	

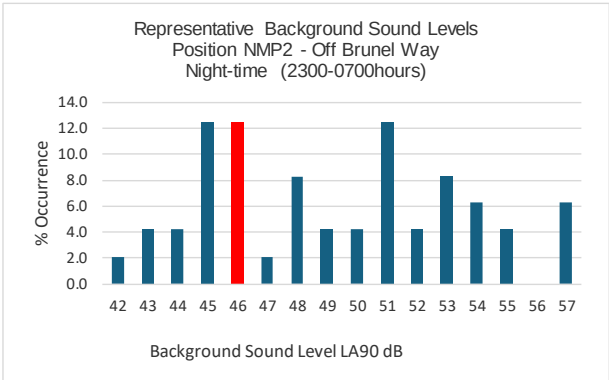
Overall Average	56.2	58.5	52.0	59-87	Excludes Rain
Overall Average	58.9	61.0	56.2	63-80	Excludes Rain



LA90	% Occurrence
48	1.4
49	0
50	1.4
51	2.8
52	0
53	4.2
54	11.3
55	12.7
56	29.6
57	19.7
58	12.7
59	1.4
60	1.4
61	1.4



LA90	% Occurrence
42	2.1
43	4.2
44	4.2
45	12.5
46	12.5
47	2.1
48	8.3
49	4.2
50	4.2
51	12.5
52	4.2
53	8.3
54	6.3
55	4.2
56	0
57	6.3
58	0
59	4.2



Noise Survey Results

Date: Sunday 10th March 2024 **TABLE 13**
Location: Intertissue Briton Ferry Site, Baglan Energy Park, Neath
Client: Axis
Project: Intertissue Briton Ferry Site Biomass Boiler
Data: **Baseline Sound Survey: Position NMP3 - Old Road/Crawford Road**
Instrumentation: Cirrus 171B Real Time Analyser (G056142)
Calibration: 94dB

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmix (dB)	Observations
07:00	15:00	59.3	61.7	52.8	77.2	Local road traffic noise
07:15	15:00	59.7	62.5	53.2	77.4	Local road traffic noise
07:30	15:00	60.8	63.3	52.4	78.6	Local road traffic noise
07:45	15:00	60.3	63.3	51.5	79.6	Local road traffic noise
08:00	15:00	58.3	61.8	51.5	73.4	Local road traffic noise
08:15	15:00	59.9	62.8	52.6	75.3	Local road traffic noise
08:30	15:00	60.9	63.8	54.4	75.7	Local road traffic noise
08:45	15:00	62.0	64.9	54.1	77.8	Local road traffic noise
Average 0700-0900		60.2	63.1	52.9	73-80	

Noise Survey Results

Date: Sunday 10th March 2024 **TABLE 14**
Location: Intertissue Briton Ferry Site, Baglan Energy Park, Neath
Client: Axis
Project: Intertissue Briton Ferry Site Biomass Boiler
Data: **Baseline Sound Survey: Position NMP3 - Old Road/Crawford Road**
Instrumentation: Cirrus 171B Real Time Analyser (G056142)
Calibration: 94dB

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmix (dB)	Observations
15:00	15:00	64.2	66.4	60.2	78.4	Local road traffic noise
15:15	15:00	64.1	66.4	59.1	77.5	Local road traffic noise
15:30	15:00	64.2	66.4	59.8	78.5	Local road traffic noise
15:45	15:00	64.4	66.6	59.3	75.9	Local road traffic noise
16:00	15:00	64.7	66.4	59.4	82.4	Local road traffic noise
Average 1500-1615		64.3	66.4	59.5	76-82	

Noise Survey Results

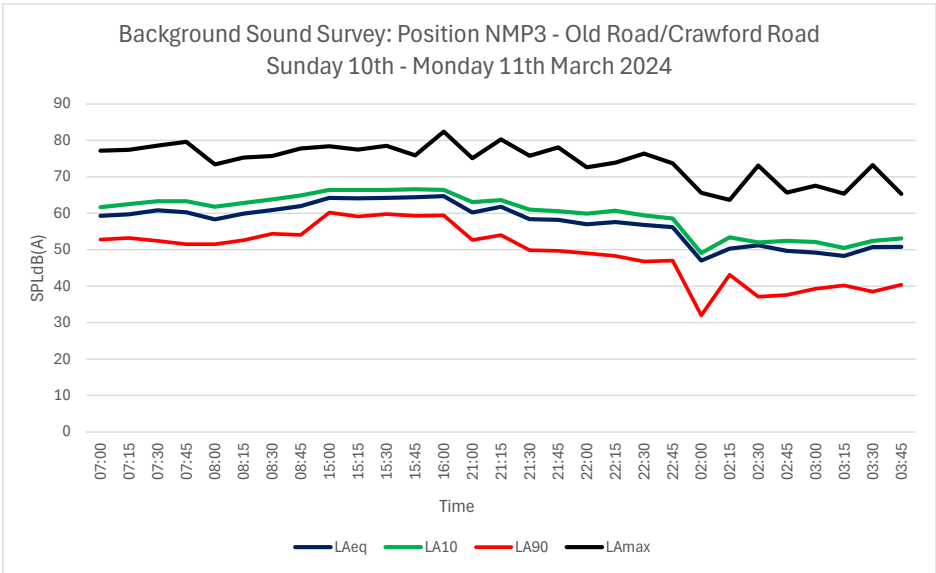
Date: Sunday 10th March 2024 **TABLE 15**
Location: Intertissue Briton Ferry Site, Baglan Energy Park, Neath
Client: Axis
Project: Intertissue Briton Ferry Site Biomass Boiler
Data: **Baseline Sound Survey: Position NMP3 - Old Road/Crawford Road**
Instrumentation: Cirrus 171B Real Time Analyser (G056142)
Calibration: 94dB

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmix (dB)	Observations
21:00	15:00	60.2	63.1	52.7	75.1	Local road traffic noise
21:15	15:00	61.8	63.6	54.0	80.3	Local road traffic noise
21:30	15:00	58.4	61.0	49.9	75.8	Local road traffic noise
21:45	15:00	58.2	60.6	49.7	78.1	Local road traffic noise
22:00	15:00	57.0	59.9	49.0	72.6	Local road traffic noise
22:15	15:00	57.6	60.7	48.3	73.9	Local road traffic noise
22:30	15:00	56.8	59.4	46.8	76.4	Local road traffic noise
22:45	15:00	56.2	58.6	47.0	73.7	Local road traffic noise
Average 2100-2300		58.6	61.1	50.3	73-80	

Noise Survey Results

Date: Sunday 10th - Monday 11th March 2024 **TABLE 16**
Location: Intertissue Briton Ferry Site, Baglan Energy Park, Neath
Client: Axis
Project: Intertissue Briton Ferry Site Biomass Boiler
Data: **Baseline Sound Survey: Position NMP3 - Old Road/Crawford Road**
Instrumentation: Cirrus 171B Real Time Analyser (G056142)
Calibration: 94dB

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmix (dB)	Observations
02:00	15:00	47.0	49.1	32.0	65.6	Distant road traffic noise
02:15	15:00	50.3	53.4	43.1	63.7	Distant road traffic noise
02:30	15:00	51.2	52.0	37.1	73.1	Distant road traffic noise
02:45	15:00	49.7	52.4	37.6	65.7	Distant road traffic noise
03:00	15:00	49.2	52.1	39.3	67.6	Distant road traffic noise
03:15	15:00	48.3	50.5	40.2	65.4	Distant road traffic noise
03:30	15:00	50.7	52.4	38.5	73.2	Distant road traffic noise
03:45	15:00	50.8	53.1	40.4	65.3	Distant road traffic noise
Average 0200-0400		49.8	52.0	39.4	64-73	
Overall Average		61.0	63.4	54.8	73-82	



Noise Survey Results

Date: Sunday 10th March 2024
Location: Intertissue Briton Ferry Site, Baglan Energy Park, Neath
Client: Axis
Project: Interissue Briton Ferry Site Biomass Boiler
Data: **Baseline Sound Survey: NMP4 Baglan Bay (400m from Intertissue)**
Instrumentation: Norsonic 140 Real Time Analyser (1405418)
Calibration: 94dB

TABLE 17

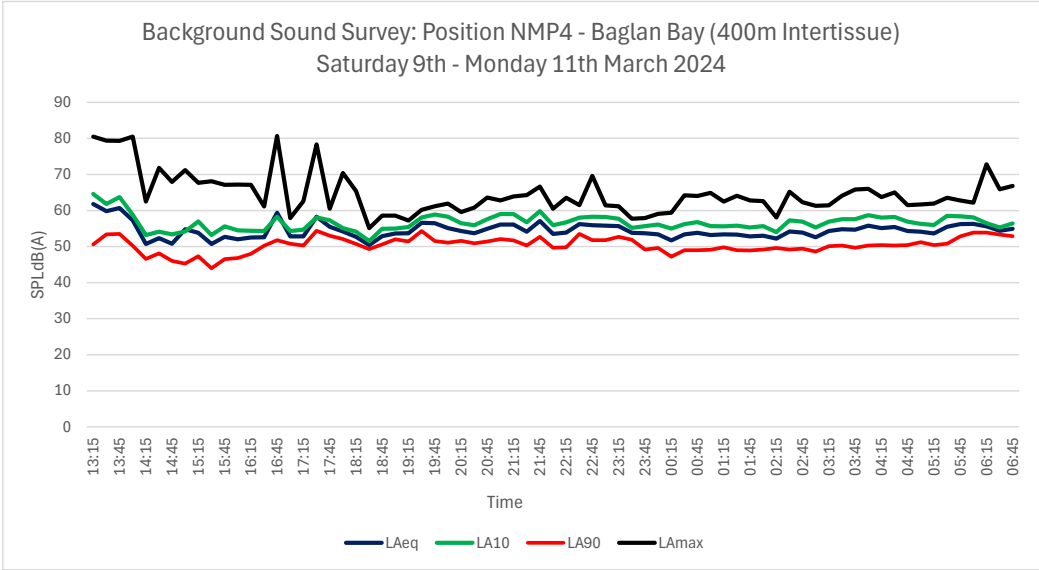
Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmix (dB)	Observations
13:15	15:00	61.8	64.6	50.6	80.5	Distant industrial noise from Intertissue & birdsong
13:30	15:00	59.8	61.8	53.4	79.4	
13:45	15:00	60.7	63.7	53.5	79.3	
14:00	15:00	57.3	58.8	50.2	80.5	
14:15	15:00	50.7	53.2	46.6	62.5	
14:30	15:00	52.3	54.1	48.1	71.8	
14:45	15:00	50.8	53.4	46.0	67.9	
15:00	15:00	54.8	54.2	45.3	71.2	
15:15	15:00	53.8	57.0	47.3	67.7	
15:30	15:00	50.7	53.2	44.0	68.1	
15:45	15:00	52.7	55.6	46.5	67.1	
16:00	15:00	52.0	54.5	46.8	67.2	
16:15	15:00	52.5	54.4	48.0	67.1	
16:30	15:00	52.6	54.3	50.2	61.1	
16:45	15:00	59.4	58.3	51.8	80.7	
17:00	15:00	52.8	54.3	50.8	57.9	
17:15	15:00	52.8	54.7	50.3	62.6	
17:30	15:00	58.3	58.1	54.4	78.3	
17:45	15:00	55.5	57.3	53.0	60.5	
18:00	15:00	54.2	55.1	52.1	70.4	
18:15	15:00	52.7	54.1	50.7	65.4	
18:30	15:00	50.4	51.5	49.3	55.1	
18:45	15:00	52.9	54.9	50.6	58.6	
19:00	15:00	53.6	55.0	52.0	58.6	
19:15	15:00	53.7	55.4	51.4	57.2	
19:30	15:00	56.6	58.1	54.3	60.2	
19:45	15:00	56.5	58.9	51.5	61.2	
20:00	15:00	55.1	58.3	51.1	61.9	
20:15	15:00	54.3	56.5	51.6	59.6	
20:30	15:00	53.7	55.9	50.9	60.8	
20:45	15:00	54.9	57.6	51.4	63.6	
21:00	15:00	56.1	59.0	52.1	62.8	
21:15	15:00	56.1	59.0	51.7	63.9	
21:30	15:00	54.1	56.7	50.3	64.3	
21:45	15:00	57.1	59.8	52.7	66.6	
22:00	15:00	53.5	55.9	49.7	60.5	
22:15	15:00	53.9	56.7	49.8	63.5	
22:30	15:00	56.2	58.0	53.5	61.5	
22:45	15:00	55.9	58.3	51.8	69.6	
Average 1315-2300		55.6	57.7	51.0	55-81	

Noise Survey Results

Date: Sunday 10th - Monday 11th March 2024
Location: Intertissue Briton Ferry Site, Baglan Energy Park, Neath
Client: Axis
Project: Intertissue Briton Ferry Site Biomass Boiler
Data: **Baseline Sound Survey: NMP4 Baglan Bay (400m from Intertissue)**
Instrumentation: Norsonic 140 Real Time Analyser (1405418)
Calibration: 94dB

TABLE 18

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmix (dB)	Observations
23:00	15:00	55.8	58.2	51.8	61.4	
23:15	15:00	55.7	57.7	52.7	61.2	
23:30	15:00	53.8	55.2	51.9	57.7	
23:45	15:00	53.7	55.7	49.2	57.9	
00:00	15:00	53.4	56.1	49.6	59.1	
00:15	15:00	51.7	55.0	47.2	59.4	
00:30	15:00	53.4	56.2	49.0	64.2	
00:45	15:00	53.8	56.8	49.0	64.0	
01:00	15:00	53.2	55.7	49.1	64.9	
01:15	15:00	53.4	55.6	49.8	62.5	
01:30	15:00	53.3	55.8	49.0	64.1	
01:45	15:00	52.8	55.3	48.9	62.8	
02:00	15:00	53.0	55.7	49.2	62.6	
02:15	15:00	52.2	54.0	49.6	58.1	
02:30	15:00	54.2	57.3	49.2	65.2	
02:45	15:00	53.9	56.9	49.4	62.3	
03:00	15:00	52.6	55.3	48.6	61.3	
03:15	15:00	54.3	56.9	50.1	61.4	
03:30	15:00	54.8	57.6	50.3	64.1	
03:45	15:00	54.7	57.6	49.7	65.8	
04:00	15:00	55.8	58.7	50.3	66.0	
04:15	15:00	55.1	58.0	50.4	63.7	
04:30	15:00	55.4	58.2	50.3	65.0	
04:45	15:00	54.3	56.9	50.4	61.5	
05:00	15:00	54.1	56.3	51.2	61.7	
05:15	15:00	53.6	56.0	50.4	61.9	
05:30	15:00	55.5	58.5	50.8	63.5	
05:45	15:00	56.2	58.4	52.8	62.8	
06:00	15:00	56.3	58.1	53.9	62.2	
06:15	15:00	55.6	56.5	53.9	72.8	
06:30	15:00	54.4	55.3	53.3	65.9	
06:45	15:00	54.9	56.4	52.9	66.8	
Average 2300-0700		54.3	56.7	50.7	58-73	
Average 1315-2300		55.6	57.7	51.0	55-81	



Noise Survey Results

Date: Sunday 10th March 2024
Location: Intertissue Briton Ferry Site, Baglan Energy Park, Neath
Client: Axis
Project: Intertissue Briton Ferry Site Biomass Boiler
Data: Baseline Sound Survey: Roaming Measurements (Baglan Bay)
Instrumentation: Norsonic 140 Real Time Analyser (1405418)
Calibration: 94dB

TABLE 19

Start Time	Run Time (mins.)	L _{Aeq} (dB)	L _{A10} (dB)	L _{A90} (dB)	L _{Amax} (dB)	Observations	Photo	NER Figure 1
10:03	05:00	46.1	46.8	41.1	71.2	1km Intertissue (SW direction) Birdsong, dist. Motorbikes & Ind noise	1	NER1
10:13	05:00	46.4	48.0	43.3	68.4	500m Intertissue (SW). Birdsong, industrial noise from Intertissue site	2	NER2
10:24	05:00	51.1	53.6	46.9	71.4	400m Intertissue (SW). Noise from Intertissue Site, birdsong	3	NER3
10:38	05:00	53.7	56.1	50.1	69.0	20m south of Intertissue: Noise from Intertissue site	4	NER4
10:48	05:00	56.4	58.9	52.2	67.0	20m south of Intertissue: Noise from Intertissue site	5	NER5
10:56	05:00	52.8	55.3	48.6	70.4	100m NW of Intertissue Building. Dist. Road traffic, Intertissue & birdsong	6	NER6
11:06	05:00	49.0	51.1	46.7	59.9	200m NW of Intertissue Building (Dist. Road traffic, Intertissue & birdsong)	7	NER7
11:40	05:00	44.8	46.0	43.0	55.1	1.05km Intertissue boundary (SW). Sea noise, birdsong & dist. road traffic	8	
11:47	05:00	51.1	52.5	49.4	56.0	1.2km (SW) of Intertissue (top of sand dune), noise from sea	9	

Predicted Noise Development Only	Increase L _{Aeq} dB
29	0
37	1
40	0
47	1
47	1
39	0
32	0
29	0

PHOTO 1



PHOTO 2



PHOTO 3



PHOTO 4

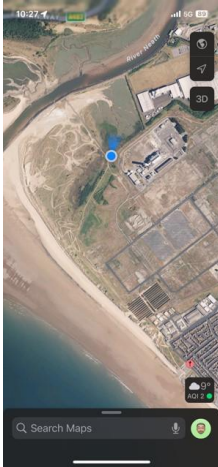
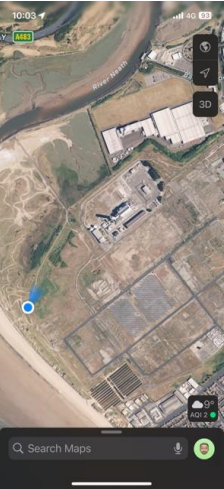


PHOTO 6



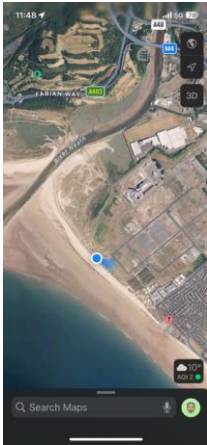
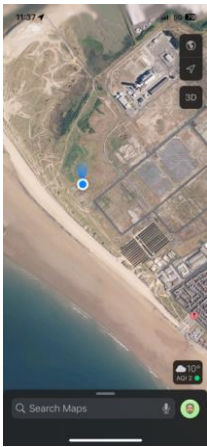
PHOTO 7



PHOTO 8



PHOTO 9



APPENDIX 4

BS4142: 2014 ASSESSMENT (DETAILED EXAMPLE)

NSR(A) OLD ROAD: BS4142:2014+A1:2019 ASSESSMENT (NIGHT-TIME)

Results		Relevant clause	Commentary
Calculated Specific sound level	$L_{Aeq(15 \text{ min})} = 26\text{dB}$	7.3.6	Specific sound source calculated using ISO9613-2
Background sound level	$L_{A90(15 \text{ min})} = 39\text{dB}$	8.1.3 8.2	Measured over Sunday period deemed to be an indication of the lowest likely background sound.
Assessment during the daytime, so reference time interval is 15mins.		7.2	
Acoustic feature correction	+3dB	9.2	No acoustic feature expected. The specific sound is not expected to be tonal, impulsive or its intermittency distinct above the residual acoustic environment. NRW guidance advises an allowance of +3dB for noise character for design.
Rating level	$(26 + 3) \text{ dB} = 29\text{dB}$	9.2	No significant perceptible noise character predicted
Background sound level	$L_{A90} = 39\text{dB}$	8	Lowest value used of background sound period to cover worst case
Excess of rating over background sound level	$(29 - 39) \text{ dB} = -10\text{dB}$	11	
Assessment indicates low impact		11	
Uncertainty of the assessment	Not significant	10	The excess of the rating level over the background sound level is negative. Residual levels are significantly higher (50dB LAeq) and the uncertainty of the measurement does not have any significance to the outcome of the assessment. Appropriate standards used for the calculation and baseline sound survey undertaken covering the quietest likely time period. All instruments used Type 1, calibrated and in calibration limits.

APPENDIX 5

PLANT NOISE LEVELS

Component	Sound Pressure Level (dB(A) @ 1 m)	Location	Mitigation Measures	Operation
Fuel Store – Walking Floor	75	Fuel Store	-	Daytime/Night-time
Fuel Store – Walking Floor – Hydraulic Power Unit	85	Fuel Store	-	Daytime/Night-time
Fuel Conveyor	85	Fuel Store & Boiler House	-	Daytime/Night-time
Hydraulic Stoker	75	Boiler House	Located in Building	Daytime/Night-time
Hydraulic Stoker – Power Unit	85	Boiler House	Located in Building	Daytime/Night-time
Primary Air Fan	80	Boiler House	Located in Building	Daytime/Night-time
Secondary Air Fan	80	Boiler House	Located in Building	Daytime/Night-time
Grate Hydraulic Power Unit	75	Boiler House	Located in Building	Daytime/Night-time
Bottom Ash Conveyor	85	Boiler House & part external.	Partly Located in Building	Daytime/Night-time
Sootblowers	85	Boiler House	Located in Building	Intermittent
Electrostatic Precipitator	70	External	Located in Building	Daytime/Night-time
Recirculation Fan	85	Boiler House	Located in Building	Daytime/Night-time
Induced Draught Fan	95	Boiler House	Acoustic Enclosure To reduce noise level to 85dB LAeq @ 1m	Daytime/Night-time
Chimney	85	At emission source.	Silencer	Daytime/Night-time
Boiler ventilation openings	75	Boiler House	Acoustic Louvre Rw 10dB	Daytime/Night-time
Fly Ash Screw Conveyor	75	External: Under Electrostatic Precipitator	-	Daytime/Night-time
Boiler Feed Pumps (3 x 50%)	2 x 75	Boiler House	-	Daytime/Night-time
Emergency Driven – Boiler Feed Pumps (2 x 25%)	80	Boiler House	Located in Building	Intermittent Use
Air Compressor	70	Boiler House	Located in Building	Daytime/Night-time
Boiler Safety Valve(s)	85	Boiler House, but noise emission source at roof mounted vent.	Silencer	Intermittent Use
Boiler Storm Valve(s)	85	Boiler House, but noise emission source at roof mounted vent.	Silencer	Intermittent Use
Boiler Pressure Maintaining Valve(s)	80	Boiler House	Located in Building	Daytime/Night-time
Boiler Pressure Regulating Valve	80	Boiler House	Located in Building	Daytime/Night-time
Generator	80	External	Acoustic Enclosure	Daytime/Night-time
Mobile Plant	variable	External	Broadband noise type reversing alarms	Daytime

APPENDIX 6

CONSTRUCTION PLANT INVENTORY

Construction Plant Inventory

Piling Activities:

Plant Type	Sound Power Level	% Operating Time	Distance Ratio
Piling Rig	116	100	1.0
Lorry	103	20	1.0
Truck Mixer	107	100	1.0
Concrete Pump	110	100	1.0

Soil Movements:

Plant Type	Sound Power Level	% Operating Time	Distance Ratio
Excavator/Loader	106	100	1.0
Lorry	106	100	0.8
8 Wheel Tipper	107	100	0.8
Dozer	108	100	0.8
Dump Truck	107	100	0.8

General Site Noisy Activities:

Plant Type	Sound Power Level	% Operating Time	Distance Ratio
Excavator	104	100	1.0
Dumper	104	100	0.8
Lorry	99	20	0.8
Compressor	95	100	1.0
Generator	103	100	1.0
Telehandler	105	100	0.8
Mobile Crane	94	100	1.0

Infrastructure Construction:

Plant Type	Sound Power Level	% Operating Time	Distance Ratio
Asphalt Melter	103	100	0.8
Asphalt Spreader	110	100	0.8
Road Roller	102	100	0.8
Lorry	103	10	0.8

Building Construction:

Plant Type	Sound Power Level	% Operating Time	Distance Ratio
Steelwork Erection	108	100	1.0
Concrete Pump	103	100	1.0
HGV	103	20	0.8
Cutting/Grinding	107	100	1.0
Concrete vibrators	106	100	1.0
Hydraulic Pump	106	100	1.0

APPENDIX 7

NOISE MAPPING

NOISE MODEL SETTINGS & MAPPING RESULTS

INPUT DATA FOR ISO 9613 CALCS

Noise Prediction Model

There are a number of empirical or semi-empirical sound propagation models in common use. One of these is ISO9613-2 which is the International Standard used to predict noise propagation.

The noise levels produced by the ERC plant at each of the nearest sensitive receptors has been calculated using a computer model, which is based on ISO 9613, Acoustics – Attenuation of Sound During Propagation Outdoors [1996]. The propagation model described in Part 2 of the standard provides a method for predicting sound pressure levels.

The computer model utilises octave band frequency data of the noise source to assess and predict the noise contribution with the site in full operation.

The ISO propagation model provides a method for calculating the sound pressure level at a specific position by taking the sound power level radiating from the building facades in frequency bands and subtracting a number of attenuation factors according to the following:

$$\text{Predicted sound pressure level} = L_w + D - A_{\text{geo}} - A_{\text{gr}} - A_{\text{bar}} - A_{\text{misc}}$$

The prediction modelling uses octave band frequency sound power level data calculated in different wall and roof areas of the ERC plant and corrects the level for the following additional propagation factors and attenuation:

Octave band frequency spectra:

Based on noise data provided by Technology providers recorded at other similar sites when under load conditions. The noise levels at specific face positions are provided below that have been used for the noise model.

D – Directivity Factor

The Directivity Index will depend on the radiating surface and whether it is located in free space, at junction of two surfaces or more and the correction factor changes accordingly. Directivity factor is generally = 2.

A_{geo} - Geometrical Divergence

The geometrical divergence of sound waves accounts for the spherical spreading in the free field from a point source resulting in attenuation depending on distance, which relates to the following correction:

$$A_{\text{geo}} = 20 \times \log(d) + 11 \text{ [where } d = \text{distance from the noise source]}$$

Receiver height assumed = Daytime = 1.5m, Night-time = 4m above ground level

A_{atm} - Atmospheric Absorption

When sound energy propagates through the atmosphere it is attenuated as a result of the conversion of the sound energy into heat. The attenuation is dependent upon the relative humidity and the temperature of the air through which the sound energy is travelling. The attenuation is also dependent upon the frequency content of the sound energy with higher levels of attenuation towards higher frequencies.

The attenuation therefore depends upon the distance from the sound source and according to ISO9613 is calculated according to the following formula:

$$A_{\text{atm}} = d \times a \quad [\text{Where } d = \text{distance from the source}]$$

a = atmospheric absorption coefficient in dB/m]

From ISO9613 Part 1 [1996] I have used values of 'a' corresponding to a temperature of 10°C and a relative humidity of 70%. This will give an indication of the lowest likely atmospheric attenuation as examples worked at 20deg C and -5deg C indicate a reduction of around -0.5dB(A) on those values calculated. The values for each one-third octave band are given below in table 1.

Table 1: Atmospheric absorption attenuation based on temperature of 10°C and a relative humidity of 70%

Third Octave Band Centre Frequency (Hz)	50	63	80	100	125	160	200	250
Atmospheric Absorption Coefficient (dB/km)	0.0785	0.122	0.186	0.28	0.411	0.584	0.797	1.04
Third Octave Band Centre Frequency (Hz)	315	400	500	630	800	1k	1.25k	1.6k
Atmospheric Absorption Coefficient (dB/km)	1.31	1.6	1.93	2.33	2.87	3.66	4.86	6.73
Third Octave Band Centre Frequency (Hz)	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k
Atmospheric Absorption Coefficient (dB/km)	9.66	14.3	21.5	32.8	50.2	76.9	117	175

A_{gr} – Ground Effect

Ground Effect for Calcs

$G = 0.5$ (mixed ground absorption)

The ground effect is a result of the interference of sound reflected by the ground which interferes with the direct sound propagating from the noise source to the receiver. The prediction of the ground effects is relatively complex and is dependent upon a number of factors including ground conditions, source height, receiver height and the propagation height between the source and receiver. The ground conditions are described according to a variable 'G' which varies between 0 for 'hard' ground and 1 for 'soft' ground. Hard ground refers to paving, concrete and any sites with low porosity. Soft ground refers to grassland, trees or other vegetation. I have assumed a ground factor of $G = 0.5$ to represent a mixed ground absorption to NSR as intervening ground is generally formed mainly by a mixture of developed and un-developed land and local business premises and is therefore appropriate. I have taken the source height as being the height of the relevant section of building and a receiver height of 1.5 metres for daytime and 4 metres for night-time operations.

A_{bar} – Barrier Attenuation

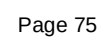
When there is a solid barrier between any noise source and the receiver position the noise level will be reduced. The level of attenuation resulting will depend upon the barrier position, barrier size, receiver position and frequency content relative to the noise source. For the purpose of these calculations, we have included local screening from existing industrial buildings adjacent to the Site as these provide some minor attenuation, which needs to be taken into account.

A_{misc} – Miscellaneous Other Effects

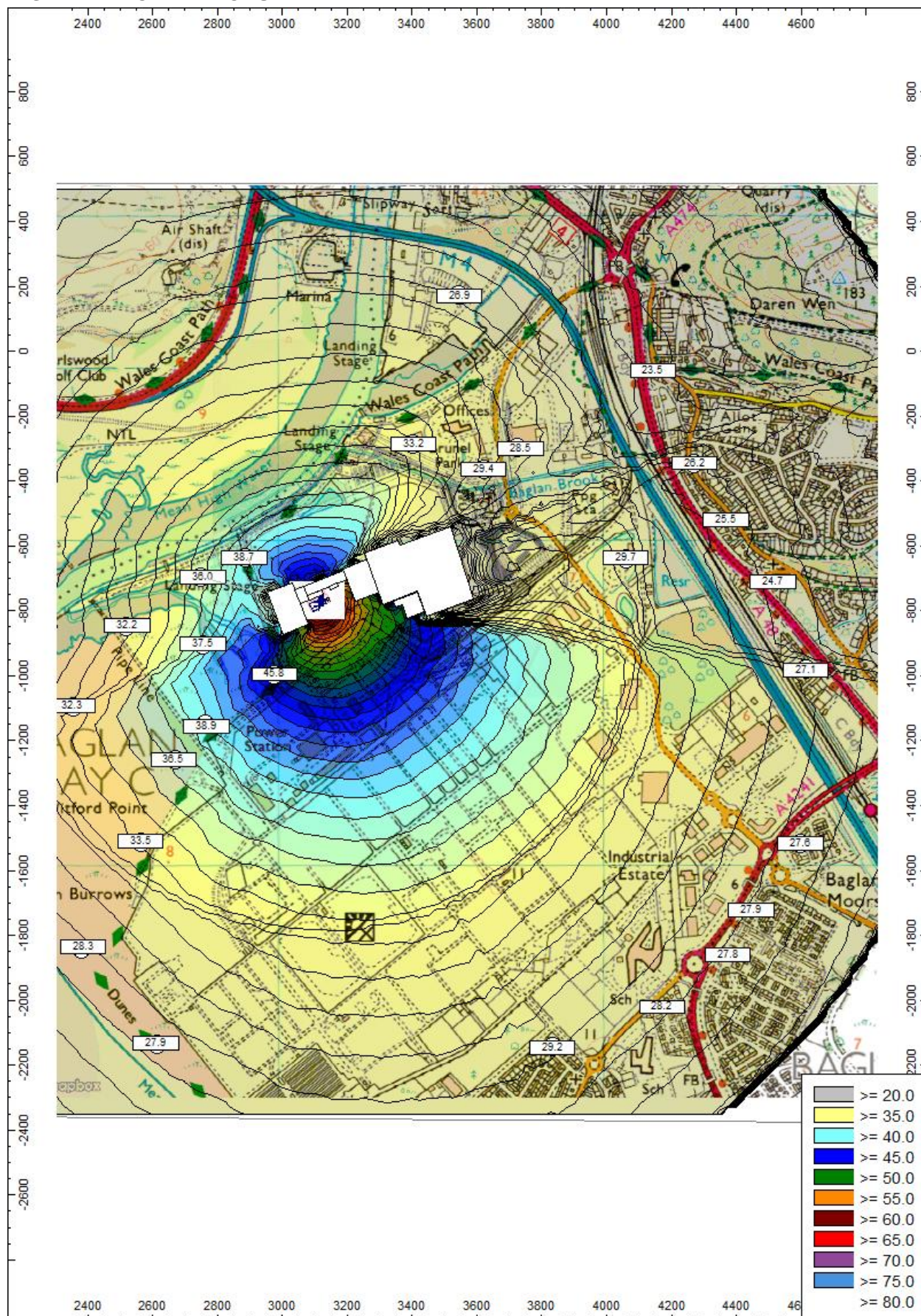
This additional attenuation effect described in ISO9613 allows for the effects of propagation through foliage. I have not taken account of any such effects and in my expert opinion they are unlikely to significantly reduce noise levels below those predicted.

Mobile Plant Noise Sources

The noise model allows for HGV movement around the site (based on a line source). These are accounted for during the daytime operating period based on 2 HGV movements in and out per hour for the proposed facility. Additional mobile plant is included in the noise model during daytime periods to load the fuel onto the walking floor and offload fuel into the storage bays.



NOISE MAP 2: NOISE CONTOURS OF SITE OPERATIONS (INCLUDING NOISE MITIGATION) - NIGHT-TIME OPERATIONS



APPENDIX 8

VIBRATION TERMINOLOGY

Ground Borne Vibrations

For any source of vibration on or near the surface of the ground, energy propagates away from the source via:

- a) Elastic body (or compression) waves – which radiate energy into the ground in all directions
- b) Surface (or shear) waves – which carry energy along the ground surface, caused when body waves are reflected back into the ground at the ground-surface interface

Thus, at any point away from that source, the ground motion is the sum of all the wave motions at that point. When wave motion has been generated, the waves will be attenuated as they travel away from the source. The two main mechanisms for attenuation are:

- a) Enlargement of the wave front as the distance from the source increases, and
- b) Internal damping of the transmitting medium (the ground)

Ground borne vibration is therefore made up of a combination of different waves, travelling in different directions, at different speeds and at different frequencies. The frequency component of the vibration will affect the rate at which attenuation occurs since the internal damping of the ground is frequency dependent.

Since vibration enters buildings through the foundations, the hard structure of the building is normally affected to a greater degree than by air borne vibration. Often ground borne vibrations are more noticeable when standing or sitting near the middle of suspended wooden floors.

Ground Borne Vibration Measurement Units

Ground borne vibration is caused when the individual particles making up the strata are caused to oscillate by the passage of a pressure wave. The resulting vibration can be summarized in terms of 4 main parameters:

- a) **Velocity** – how fast the particles move when they are oscillating. Since the velocity of these particles continually change as the pressure wave passes the most useful value that is often reported is the maximum or peak particle velocity (PPV). PPVs are usually expressed in terms of ms^{-1} or mms^{-1} .
- b) **Acceleration** – is the rate at which the particle velocity changes during oscillation. It is usually measured in ms^{-2} mms^{-2} or “g’s”. 1g is that acceleration imparted to an object by the earth’s gravitational pull and is approximately 9.81 ms^{-2} .
- c) **Displacement** – is the distance moved by oscillating particles. This is usually very small and measured in mm or even μm .
- d) **Frequency** – is the number of oscillations per second which a particle undergoes due to the passage of a vibration wave. It is measured in cycles per second or Hertz (Hz).

The movement of particles induced to oscillate by vibration waves are usually measured in three mutually perpendicular directions to fully describe the vibration intensity, as particles will be oscillating in three dimensions. These are:

- a) **Longitudinal** – back and forth particle movement in the same direction that the vibration wave is travelling.
- b) **Vertical** – up and down movement perpendicular to the direction the vibration wave is travelling.
- c) **Transverse** – left and right particle movement perpendicular to the direction the vibration wave is travelling.

APPENDIX 9

VIBRATION MONITORING RESULTS

Energy Recovery Centre Site in Near Field Positions Results

External Vibration Levels- Summary

Position	Distance to plant	Type of Plant	Resultant Maximum PPV (mm/sec)	Peak Frequency (Hz)
Air conditioning units	1m	Air conditioning plant	0.07	2Hz
Boiler Room	1m	Boiler Room plant	0.07	18Hz
Ash Building	1m	IBA Processing	0.05	1Hz
Ash Doorway	-	IBA	0.05	21Hz
Inlet to ACC Fans	Below fans	ACC fans	0.09	16Hz
Turbine Room	1m	Turbine	0.1	19Hz
Demin Room	1m	Demin plant	0.07	14Hz
Tipping Hall Doorway	-	Bunker grab	0.05	18Hz
Transformer	5m	Transformer	0.06	23Hz

The above results from the vibration measurements show no significant vibration to be generated by the plant.

Research Data

Measured vibration source levels for construction equipment (adapted from Hanson et al 2006)

Equipment	PPV at 7.6m (mm/s)
Pile driver (impact)	38.6 (upper range)
	16.4 (typical)
Pile driver (sonic)	18.6 (upper range)
	4.3 (typical)
Clam shovel drop (slurry wall)	5.1
Hydromill (slurry wall)	0.2 (in soil)
	0.4 (in rock)
Vibratory roller	5.3
Hoe ram	2.3
Large bulldozer	2.3
Caisson drilling	2.3
Loaded trucks	1.9
Jackhammer	0.9
Small bulldozer	0.1

The New Zealand Transport Agency published a research paper entitled 'Ground Vibration from Road Construction' in May 2012, which includes a table of measured PPV values for different types of plant. The results have been provided below as an extract from the paper for ease of reference.

Vibration Levels from a Range of Construction Activities

