Appendix 23: Noise assessment and Noise Monitoring Scheme

NOISE ENVIRONMENTAL IMPACT ASSESSMENT

Prepared for: WEPA UK Limited

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1.0 Introduction

SLR Consulting Ltd (SLR) has been appointed on behalf of WEPA UK Limited to prepare this Noise Impact Assessment in support of plans for the extension of their existing papermill site in Bridgend.

This report considers the impact of the proposed development upon the noise environment at identified sensitive receptor locations. This chapter describes the scope, relevant legislation, assessment methodology, and the baseline conditions existing at the site and its surroundings. It considers any potential significant effects the proposed development would have on this baseline environment; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been employed.

The impact of the proposed development during its construction has been considered and this has been referenced to the guidance of BS5228-1:2009+A1:2014, *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*. The impact of construction road traffic has been considered with reference to the Design Manual for Roads and Bridges (DMRB) *Noise and Vibration*.

The assessment has also considered the noise impact of the proposed development on the surrounding residential area with reference to BS4142:2014+A1:2019, *Methods for rating and assessing industrial and commercial sound'* in relation to the operation of fixed plant.

Where considered necessary, mitigation measures have been recommended to ensure that identified impacts are kept to a minimum.

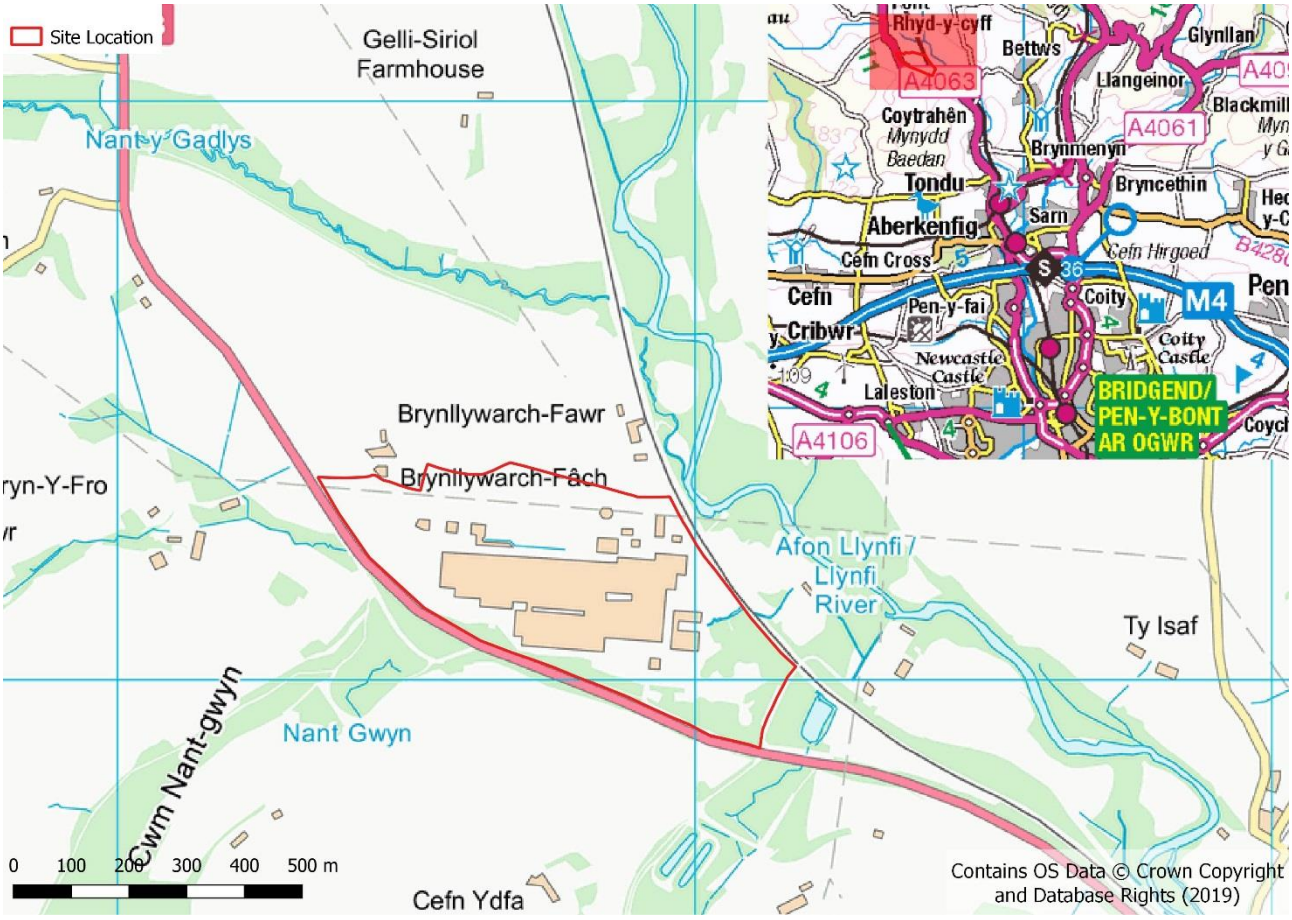
Whilst reasonable effort has been made to ensure that this report is easy to understand, it is necessarily technical in nature. To assist the reader, a glossary of terminology is provided in Appendix 01.

1.1 Existing Site

The proposed development site as shown in Figure 1-1 is located on the site of the existing Bridgend mill site approximately 5 km to the north of Bridgend town centre, in an area bound to the south and to the west by the A4063, to the east by the River Llynfi, and to the north by open farmland.

The site is orientated along its long axis in an approximate west to east direction and it is accessed via the A 4063 (Bridgend Road) between Maesteg and Coytrahen, with traffic generally proceeding south towards the M4.

Figure 1-1
Site Location



1.2 Development Proposals

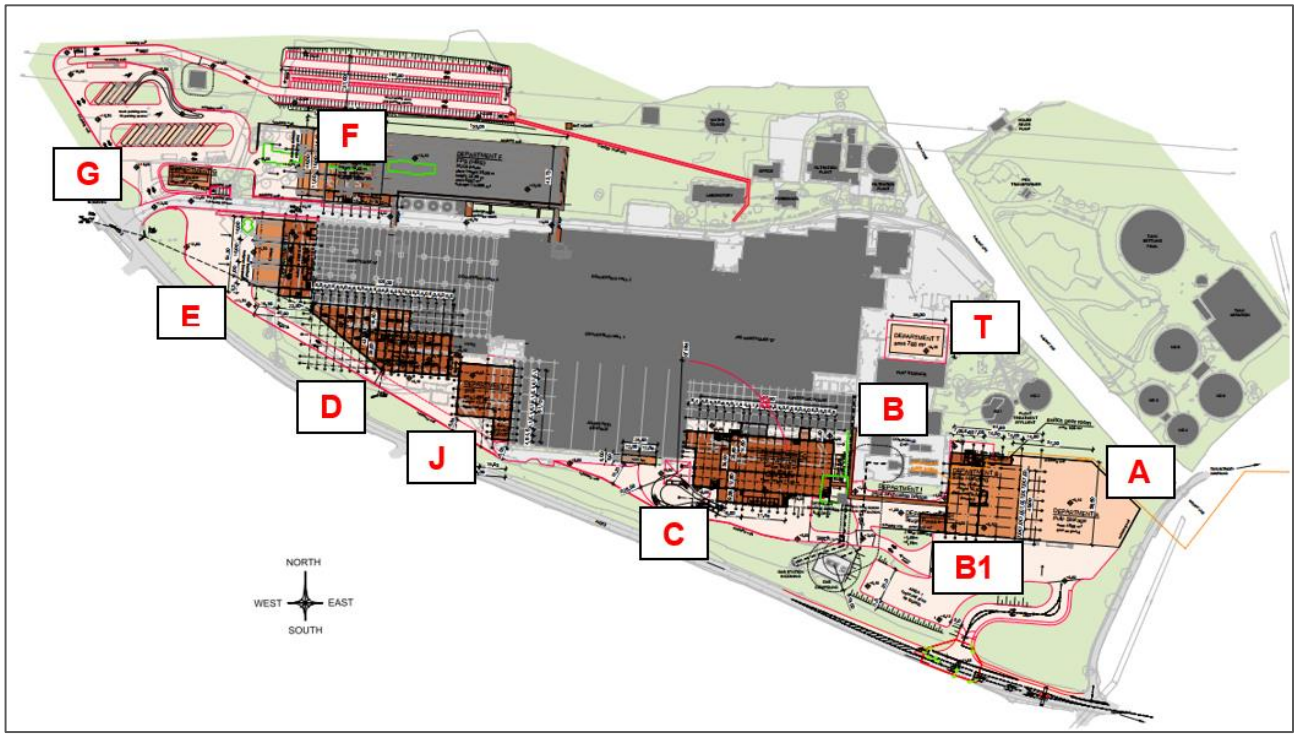
A range of site layouts had been examined before culminating in the final design of the Project. Alternative design options for the Project are limited due to the existing physical site layout as well as the confined conditions of the WEPA premises. The proposed development will include the buildings and areas as listed below and shown in Figure 1-2:

- A - Pulp Storage (south-east)
- B - Bale Handling (south-east)
- B1 - Sludge Press building (south-east)
- I - Pipe Bridge (south-east)
- C - Paper Machine Building (south)
- D - Converting Building (south-west)
- J – New Jumbo Reel Storage (south-west)
- E - Shipping Area (north-west)
- F - Finished Product Storage (north)
- G - Gate House (west)

- T - Storage Area

The existing site has a single point access at the western end of the site which, through the redevelopment of this site, will be upgraded. A new secondary vehicle access is proposed to the south-eastern end of the development site.

Figure 1-2
Site Overview



2.0 Methodology

2.1 Legislation, Guidance and Planning Policy

2.1.1 Guidance

BS5228-1:2009+2014

This standard sets out a methodology for predicting noise levels arising from a wide variety of construction activities and contains tables of sound power levels generated by fixed and mobile plant. Compliance with BS5228-1:2009+A1:2014 is expected as a minimum standard when assessing the impact of construction noise upon the existing noise environment at the closest noise sensitive receptors.

Noise levels generated by construction activities and experienced at local receptors will depend on a number of variables, the most significant of which are likely to be:

- the amount of noise generated by plant and equipment being used, generally expressed as a sound power level;
- the periods of operation of the plant and equipment, known as the 'on-time';
- the distance between the noise source(s) and the closest receptor(s);
- the attenuation due to ground absorption or barrier screening effects; and
- reflection of noise due to the presence of hard vertical surfaces, such as walls.

There is currently no specific EIA assessment criteria for construction site noise; however, BS5228-1:2009 + A1:2014 does provide advice on acceptable noise levels. The 'ABC' method (as detailed in Annex E (E.32) of the standard) is used to determine the appropriate threshold value at the closest receptors. The ABC method is described as follows:

- a threshold value noise level is determined by establishing the existing ambient noise level at each receptor;
- the measured ambient noise level is rounded to the nearest 5dB; and
- the threshold noise value for each receptor is then established from Table E.1 of the standard.

Table E.1 of the standard is reproduced as Table 2-1

Table 2-1
Example Threshold Values for Construction Noise

Assessment Category and Threshold Value Period (L_{Aeq})	Threshold Value, in decibels (dB)		
	Category A [A]	**Category B [B]**	**Category C [C]**
Night-time (23.00 – 07.00)	45	50	55
Evenings and weekends [D]	55	60	65
Daytime (07.00 – 19.00) and Saturdays (07.00 – 13.00)	65	70	75
NOTE 1: A significant effect has been deemed to occur if the total L_{Aeq} noise level, including construction, exceeds the threshold level for the category appropriate to the ambient noise level. **NOTE 2:** If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total L_{Aeq} noise level for the period increases by more than 3dB due to construction activity. **NOTE 3:** Applied to residential receptors only.			
[A] Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values. [B] Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as Category A values. [C] Category C: Threshold values to use when the ambient noise levels (when rounded to the nearest 5dB) are higher than Category A values. [D] 19.00 – 23.00 weekdays, 13.00 – 23.00 Saturdays and 07.00 – 23.00 Sundays.			

For the purposes of this assessment, a daytime threshold value of 65dB L_{Aeq} has been adopted. This is the lowest threshold value for the daytime period and is the L_{Aeq} noise level that should not be exceeded at the closest receptors due to construction activities.

If the threshold value is exceeded, then the effect of construction noise upon the closest receptors may be significant. However, BS5228-1:2009+A1:2014 states that the significance of the effect will depend on, *"other project-specific factors, such as the number of receptors affected and the duration and character of the impact"*.

2.1.2 BS4142:2014+A1:2019

BS4142:2014+A1:2019 is used to assess the potential adverse impact of operational sound, of an industrial nature, at the closest receptors within the context of the existing sound environment. The assessment of impacts contained in BS4142:2014 is undertaken by comparing the rating level, i.e. the specific sound level of the source plus any penalties, to the measured representative background sound level outside the receptor(s).

In accordance with BS4142:2014+A1:2019, the significance of an industrial sound source depends on both the margin by which the rating level exceeds the background sound level and the context in which the sound occurs. It is therefore essential to place the sound in context.

BS4142:2014+A1:2019 (Section 3) provides the following definitions:

- **Ambient Sound**: Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far. Note: The ambient sound comprises the residual sound and the specific sound when present.

- **Ambient Sound Level, $L_a = L_{Aeq,T}$**: Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T.
- **Background Sound Level, $L_{A90,T}$**: A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given interval, T, measured using the time weighting F and quoted to the nearest whole number of decibels.
- Rating **Level, $L_{Ar,Tr}$**: Specific sound level plus any adjustment for the characteristic features of the sound.
- **Specific Sound Level, $L_s = L_{Aeq,T}$**: Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T.
- **Specific Sound Source**: Sound source being assessed.

To account for the acoustic character of sound sources, BS4142:2014+A1:2019 provides the following guidance with respect to the application of penalties to account for, *"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"*.

- ***"Tonality** – For sound ranging from not tonal to predominantly tonal the Joint Nordic Method gives a correction of between 0dB and +6dB for tonality. Subjectively, this can be converted to a penalty of 2dB for a tone which is just perceptible at the noise receptor, 4dB where it is clearly perceptible and 6dB where it is highly perceptible;*
- ***Impulsivity –** A correction of up to +9dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in the sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3dB for impulsivity which is just perceptible at the noise receptor, 6dB where it is clearly perceptible, and 9dB where it is highly perceptible;*
- ***Intermittency –** When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied; and*
- ***Other Sound Characteristics –** Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied."*

BS4142:2014+A1:2019 defines the impact of the specific sound by subtracting the measured background sound level from the rating level Once an initial estimate of the impact is determined, by subtracting the measured background sound level from the rating sound level, BS4142:2014+A1:2019 states that the following should be considered:

- typically, the greater the difference, the greater the magnitude of the impact;
- a difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- a difference of around +5dB is likely to be an indication of an adverse impact, depending on the context; and
- 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. It is an indication that the specific sound source has a low impact, depending on the context.

In addition, BS4142:2014+A1:2019 states:

> *"The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound 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".*

BS4142:2014+A1:2019 also notes that, *"adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact"*.

Finally, BS4142:2014+A1:2019 outlines guidance for the consideration of the context of the potential impact including consideration of the existing residual sound levels, location and/or absolute sound levels.

2.1.3 Calculation of Road Traffic Noise 1988

To undertake a quantitative analysis of the changes in sound levels at existing sensitive receptors as a result of construction-related road traffic, baseline noise levels (BNLs) for 'do nothing' and 'do nothing' construction scenarios have been calculated, with reference to procedures contained within the *Calculation of Road Traffic Noise* (CRTN) 1988.

The CRTN describes procedures for measuring and predicting noise levels from road traffic in terms of the $LA_{10,1hour}$ or $L_{A10,18\ hour}$. The $L_{A10,T}$ is the A-weighted sound level exceeded for 10% of the time, which in this case is the 18 hour period between 06:00 and 24:00 hours. This noise index has been shown to correlate best with resident's expressed dissatisfaction with traffic noise over a wide range of exposures.

The calculation method takes into account a number of variables to calculate the BNL at a reference distance of 10m from the nearside carriageway edge, at 0.5m above the ground. Factors include Annual Average Weekday Traffic 18-hour traffic flow (AAWT), speed, percentage of heavy vehicles, road surface and gradient. The procedures also allow for the calculation of noise levels at specific receptors up to 300m from a road.

The expected changes in sound levels at existing receptors along the A4603 at Coytrahen (the route the majority of the construction traffic will use) that will result from construction traffic have been determined, by comparing 'without construction' and 'with construction' BNLs.

2.1.4 Design Manual for Roads and Bridges – Noise and Vibration

The DMRB provides advice on the magnitude of impacts associated with increases in construction and operational traffic flows and associated noise levels. Tables 3.54a and 3.54b of the DMRB provide guidance for defining the magnitude of road traffic noise change, and Tables 3.58 and 3.60 provide guidance on the assessment of likely significant effects.

2.2 Policy

2.2.1 Planning Policy Wales

Planning Policy Wales (PPW) sets out the Government's planning policies for Wales and how they are expected to be applied. PPW, Technical Advice Notes (TAN's), circulars and policy clarification letters comprise national planning policy. The PPW states that, regarding the location of commercial, industrial and other potentially polluting development, *"Such development should be located in areas where there is low potential for public exposure, or where its impact can be minimised."*

> PWP goes on to advise that, *"Relevant considerations in making planning decisions for potentially polluting development are likely to include: … the risk and impact of potential pollution from the development, insofar as this might lead to the creation of, or worsen the situation in, an air quality management area, a noise action planning priority area or an area where there are sensitive receptors;…".*

With regard to mitigation, PPW advises at Paragraph 6.7.17 that, *"The location of potentially polluting development adjacent to sensitive receptors will be unacceptable where health and amenity impacts cannot be minimised through appropriate design and mitigation measures. It is the overall expectation that levels of pollution should be reduced as far as possible and for this reason the location of potentially polluting development should be taken into account as part of overall strategies in development plans to ensure it can be appropriately located and maximum environmental benefits can be gained through measures such as green infrastructure."*

With regard managing potential environmental risks during construction, Paragraph 6.7.26 advises that, *"Planning authorities must consider the potential for temporary environmental risks, including airborne pollution and surface and subsurface risks, arising during the construction phases of development. Where appropriate planning authorities should require a construction management plan, covering pollution prevention, noisy plant, hours of operation, dust mitigation and details for keeping residents informed about temporary risks."*

2.2.2 Bridgend County Borough Council Local Development Plan 2006-2021

BCBC's Local Development Plan includes the following policies, relevant to noise and development:

- Policy ENV7 Natural Resources and Public Health:

  "Development proposals will only be permitted where it can be demonstrated that they would not cause a new, or exacerbate an existing, unacceptable risk of harm to health, biodiversity and/or local amenity due to: …

  2) Noise pollution; …

  Development in areas currently subject to the above will need to demonstrate mitigation measures to reduce the risk of harm to public health, biodiversity and/or local amenity to an acceptable level."

2.3 Scoping Opinion

A Scoping Opinion, dated 12th November 2019, has been received from BCBC's Public Protection Team (Noise) – Shared Regulatory Services. Within the Scoping Opinion, BCBC confirmed that, *"A noise assessment must be undertaken to assess all noise sources to determine the impact of the development. This must include:*

1. A baseline noise survey in accordance with BS4142 - locations and scope of the assessment should be agreed with by this Department.

2. A BS4142 assessment to determine the predicted noise levels at residential receptors from all new noise sources (including the application of any acoustic penalties where warranted) and including increased traffic movements on site. The assessment shall include the cumulative impact from the new and existing development and ensure that the resulting noise rating levels will be 10dB below background. Mitigation measure should be included where these levels are indicated to be exceeded.

3. The noise report shall also include the predicted vibration levels to be experienced at any residential receptor and any low frequency vibration noise itself as I understand that one of the machines is to be connected to the bedrock.

4. Predicted on site construction noise levels at the closest residential receptors and predicted off site.

noise at the properties fronting onto the A4063 at Coytrahen from the substantial number of construction vehicles that will be travelling up and down the A4063 as they pass (the report should include proposed hours of operation for construction noise and proposed hours for the movement of construction vehicles entering and leaving the site).

5. Predicted increase in vehicular noise at the properties fronting onto the A4063 at Coytrahen and at the closest residential receptor to the entrance/exit to the papermills from the increased number of HGV's associated with the development when it will be in full operation, particularly the increase in noise

between 23.00 and 07.00 hours if HGV's will be entering and leaving at night and travelling up and down the valley at night.

It is noted that the results of the construction noise and operational noise assessments, including any required mitigation measures, will be included within the Noise Chapter of the ES for the development."

With regard to item number 3 and the requirement to consider operational vibration levels, the Vibration Assessment has been considered within a separate technical report.

2.4 Assessment Methodology

2.4.1 Study Area

The study area encompasses the four nearest sensitive receptors to the proposed development (for the assessment of construction and operation phases), and receptors located along the A4063 at Coytrahen (for the assessment of construction traffic).

2.5 Sensitivity Criteria

2.5.1 Guidelines for Environmental Noise Impact Assessment

The *Guidelines for* Environmental *Noise Impact Assessment*, produced by the Institute of Environmental Management and Assessment (IEMA), address the key principles of noise impact assessment and are applicable to all development proposals where noise effects are likely to occur. The guidelines state that *"noise measurement and quantification is concerned with the effect of noise which varies significantly with time".*

The guidelines go on to state:

"Measuring in decibels means that a 3dB change is a doubling of the sound energy and a 10dB change is a tenfold increase. For sounds which are very similar in all but magnitude, a change or difference of 1dB is just perceptible under laboratory conditions, 3dB is perceptible under most normal conditions and a 10dB increase appears to be twice as loud".

The IEMA guidelines provide specific support on how noise impact assessment fits within the EIA process. They cover:

- how to scope a noise assessment;
- issues to be considered when defining the baseline noise environment;
- prediction of changes in noise levels as a result of implementing development proposals; and
- definition and evaluation of the significance of the effects of changes in noise levels.

The IEMA guidelines also offer advice on how to establish the baseline noise level and suggest that "it is good practice to measure over short time periods even though the required assessment indicator is to be averaged over a longer period". The guidelines go on to state that monitoring should be avoided when the wind speed exceeds 5m/s, during unusual temperature conditions or when there is significant precipitation – unless these are normal conditions for the area.

In terms of cumulative effects, these are defined within the IEMA guidelines as "those that result from additive impacts caused by other past, present or reasonably foreseeable actions together with the plan, programme or project itself and synergistic effects (in combination) which arise from the reaction between impacts of a development plan, programme or project on different aspects of the environment".

The key terms within this assessment, which are relevant to the EIA process, are Sensitivity, Magnitude and Significance. In accordance with the guidelines, the noise impact, the noise effect and the significance of the effect must be determined.

2.6 Magnitude of Change (Impact)

In accordance with the IEMA guidelines, noise impact may be determined by comparing the predicted noise level with an absolute noise limit value and/or by calculating the change in the noise level.

The impact magnitude of construction noise is determined with reference to the guidance within BS5228-1:2009+A1:2014, as shown in Table 2-2.

Table 2-2
Construction Noise – Impact Magnitude

Magnitude	Definition
Major	Threshold value exceeded by more than 5dB
Moderate	Threshold value exceeded by a value between 3.0 and 4.9dB
Minor	Threshold value exceeded by a value between 1.0 and 2.9dB
Negligible	Threshold value exceeded by a value between 0.1 and 0.9dB
None	Threshold value not exceeded

The impact magnitude of noise associated with the operation of fixed plant is determined with reference to BS4142:2014+A1:2019, as shown in Table 2-3.

Table 2-3
Operational Noise – Impact Magnitude

Magnitude	Definition
Major	Rating level is 10dB or more above the background sound level
Moderate	Rating level is between 5.5 and 9.9dB above the background sound level
Minor	Rating level is between 0.1 and 5.4dB above the background sound level
Negligible	Rating level is between 0 and 9.9dB below the background sound level
None	Rating level is 10dB or more below the background sound level

The impact magnitude of noise associated with construction and development-related traffic is determined with reference to the guidance of DMRB, as shown in Table 2-4.

Table 2-4
Traffic Noise – Impact Magnitude

Magnitude	Definition
Major	Change in $L_{A10,18hr}$ noise level of 5dB or more
Moderate	Change in $L_{A10,18hr}$ noise level between 3.0 and 4.9dB
Minor	Change in $L_{A10,18hr}$ noise level between 1.0 and 2.9dB
Negligible	Change in $L_{A10,18hr}$ noise level between 0.1 and 0.9dB
None	No change in $L_{A10,18hr}$ noise level

2.7 Significance of Effect

Generic noise effects are detailed in Table 7-7 of the IEMA guidelines. Where an adverse impact is identified, the IEMA guidelines present the following generic relationship between noise impact and noise effect:

- **Negligible Impact Noise Effect** – "Noise impacts can be heard but do not cause any change in behaviour or attitude, e.g. turning up volume on television, speaking more loudly, closing windows. Can slightly affect the character of the area but not such that there is a perceived change in the quality of life";
- **Minor Impact Noise Effect** – "Noise impact can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume on television, speaking more loudly, closing windows. Potential for non-awakening sleep disturbance. Affects the character of the area such that there is a perceived change in the quality of life";
- **Moderate Impact Noise Effect** – "Causes a material change in behaviour and/or attitude. e.g. avoiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in difficulty getting back to sleep. Quality of life diminished due to a change in character of the area"; and
- **Major Impact Noise Effect –** "Significant changes in behaviour and/or inability to mitigate the effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening, loss of appetite, significant medically definable harm, e.g. auditory and non-auditory".

The significance of the noise effect will depend on the receptor type and its sensitivity to the noise impact. The sensitivity of the receptor is shown in Table 2-5.

Table 2-5
Sensitivity Criteria for Receptors

Sensitivity	Definition
Very High	Residential properties (night-time) Schools and healthcare buildings (daytime)
High	Residential properties (daytime) SAC, SPA, SSSI (or similar areas of special interest
Medium	Offices and other non-noise producing employment areas
Low	Industrial areas

The sensitivity of the receptor, together with the magnitude of the noise impact, defines the significance of the noise effect as shown in Table 2-6.

Table 2-6
Significance of Noise Effects

Magnitude	Sensitivity Very High	Sensitivity High	Sensitivity Medium	Sensitivity Low
Major	Major	Major	Major	Moderate
Moderate	Major	Moderate	Moderate	Minor
Minor	Moderate	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible
None	None	None	None	None

2.8 Calculation of Construction and Operational Sound Levels

To predict noise levels from the construction and operation of proposed development, the calculation algorithms presented in BS5228:2009+A1:2014 and IS0 9613-2:1996 *Acoustics* – Attenuation *of sound during propagation outdoors – Part 2 General Methods of calculation* will be adhered to.

The sound level predictions in this assessment have been undertaken using a proprietary software-based noise model, CadnaA, which implements the full range of UK calculation methods including the two methods detailed above. The models assume:

- A ground absorption factor of 0.5 (mixed ground);
- Contour Data to include OS terrain data;
- A reflection factor of 2; and
- A daytime receiver height of 1.5m and a night-time receiver height of 4.0m.

2.8.1 Construction Phase

A development of this nature has the potential to generate noise during the construction phase, should appropriate mitigation not be employed. However, disruption due to construction noise is a localised phenomenon, and is both temporary and intermittent in nature.

The techniques available to predict the likely noise effects from construction are necessarily based on information on the type and number of plant that will be used, their location within the site and the length of time they are in operation. At the time of writing, a detailed programme of construction works, hours and likely plant is not available; therefore, the assessment of construction noise has been based on information and data from experience with similar developments.

It is assumed that construction within the site would be restricted between the daytime hours of 07.00 and 19.00 Monday to Friday, and between the hours of 07.00 and 16.00 on Saturdays.

Construction is anticipated to be undertaken in three phases. Units A Pulp Storage, B Bale Handling, B1 Sludge Press, G Gate House H HV Substation/SWGR and M Pipe Bridge will be constructed first, followed by D Converting and E Shipping, and finally F High Bay Storage and Shipping Area, Paved Areas and Parking.

For the purposes of this construction noise assessment, noise levels during four typical construction activities have been determined. The following tables outline the items of plant which are anticipated to be utilised during each activity, the equipment sound power levels (determined from BS 5228:2009+A1:2014), and the expected percentage on-time of each plant item.

- Activity 1: Site Clearance and Enabling Works

- Activity 2: Groundworks
- Activity 3: Substructure Works
- Activity 4: Superstructure Works

It is accepted that the construction activities may vary from the activities presented, but as it would not be feasible to assess all construction configurations, the assessments undertaken in this section of the report are considered a robust representation of anticipated construction noise levels.

Activity 1 - Site Clearance and enabling works: Site clearance and enabling works typically include the installation of site offices, and levelling of the site. Table 2-7 details plant that is typically utilised during site clearance and enabling works.

Table 2-7
Site Clearance and Enabling Works – Plant List

Type of Machinery	Quantity on Site	Sound Power Level, dB	Percentage Use
Large Excavator Mounted Breaker	2	110	20%
Tracked Excavator	2	107	80%
Hand Held Circular Saw	2	109	15%
Spreading Fill	2	109	25%
Vibratory Roller	2	102	30%
Lorry (Unloading)	3	108	40%
Concrete Truck Mixer	1	103	5%
Concrete Crusher	2	110	40%
Road Sweeper	1	104	5%

Activity 2 – Groundworks: Table 2-8 details plant that is typically utilised during groundworks.

Table 2-8
Groundworks – Plant List

Type of Machinery	Quantity on Site	Sound Power Level, dB	Percentage Use
Concrete Truck Mixer	3	103	25%
Piling Rig	1	111	90%
Mewp - Cherry Picker Genie	1	95	30%
Small Breaker	2	110	20%
Compressor	2	106	50%
Poker Vibrator	3	97	15%
Lorry Mounted Concrete Pump	1	109	80%
Concrete Agitator	3	103	80%
Lorry (Unloading)	2	108	40%
Petrol Saw	3	109	20%
Tracked Excavator	2	107	80%

Type of Machinery	Quantity on Site	Sound Power Level, dB	Percentage Use
Hand Held Circular Saw	2	109	35%
Dumper Trucks	2	106	25%
Diesel Jet Washer	1	108	25%
Mobile Crane	1	103	90%
Vibratory Roller	2	102	30%

Activity 3 - Substructure Works: Table 2-9 details plant that is typically utilised during substructure works.

Table 2-9
Substructure Works – Plant List

Type of Machinery	Quantity on Site	Sound Power Level, dB	Percentage Use
Concrete Truck Mixer	2	103	25%
Small Breaker	2	110	20%
Compressor	2	106	70%
Lorry (Unloading)	2	108	40%
Petrol Saw	2	109	40%
Tracked Excavator (Rubber Tracks)	2	107	80%
Dumper Trucks	2	106	25%
Vibratory Roller	2	102	30%
Poker Vibrator	2	97	40%
Mobile Crane	1	103	100%
Telescopic Forklift (17m) JCB 540	2	107	80%
Hand Tools (Hammers)	8	98	80%

Activity 4 - Superstructure Works: It is envisaged that this phase would include the erection of buildings. Table 2-10 details the plant that is typically utilised during this phase.

Table 2-10
Superstructure Works – Plant List

Type of Machinery	Quantity on Site	Sound Power Level, dB	Percentage Use
Concrete Truck Mixer	2	103	25%
Mewp-Cherry Picker Genie	2	95	60%
Lorry (unloading)	3	108	20%
Petrol Saw	2	109	40%
Tracked Excavator (rubber tracks)	2	107	70%
Dumper Trucks	2	106	25%
Poker Vibrator	2	97	40%
Mobile Crane Operation	2	103	90%

Type of Machinery	Quantity on Site	Sound Power Level, dB	Percentage Use
Telescopic Forklift (17m) JCB 540	1	107	80%
Hand Tools (hammers)	8	98	40%
Concrete Pump (pumping)	2	112	70%

In order to model barrier attenuation from local topography, topographical data has been incorporated into the CadnaA noise model. Barrier attenuation from existing buildings within the site has also been considered.

2.8.2 Operational Phase

Proposed noise sources proposed as part of the development are shown in Table 2-11, together with sound level data.

Table 2-11
Operational Plant Sound Levels

Noise Source	dB										Data Source
	L_{Aeq}	31.5Hz	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	8KHz	
Paper Machine (Dept C)	112.6	102.5	100.2	103.7	109.0	100.0	102.0	98.9	100.8	98.1	Measured on site by SLR (internal)
Dept C Roof Exhausts (8no.)	80.0	-	-	-	-	-	-	-	-	-	Provided by Client
Dept C Vacuum Exhaust (2no.)	85.0	-	-	-	-	-	-	-	-	-	
HGV	89.8	89.7	88.4	87.5	81.7	83.0	85.6	84.4	78.7	70.6	Measured on site by SLR
Car Passby (Access, Internal Road and Carpark)	73.7	-	-	-	-	-	-	-	-	-	SLR historically measured
Car Door Slam (Car Park)	88.5	-	-	-	-	-	-	-	-	-	
Bin Drag (Dept B)	103.7	101.4	110.4	102.9	99.9	99.8	97.0	98.5	92.4	83.0	Measured on site by SLR
Loading	91.0	84.7	80.6	81.8	77.1	78.5	72.5	71.5	68.1	59.0	
Clamp Truck	99.2	109.1	103.4	98.1	92.1	97.6	94.2	91.2	87.4	81.7	
Baler	84.7	100.2	87.0	89.8	89.0	81.0	76.6	74.6	69.9	65.8	
Forklift	78.3	83.0	88.4	81.5	76.3	76.7	71.8	69.9	66.9	59.4	
Conveyor	78.4	79.1	80.2	81.7	77.7	75.8	73.4	70.4	63.0	53.7	SLR historically measured

Internal HGV and additional car movements have been informed by information provided by the Client. For the daytime one-hour reference period, peak hour flows have been used. To account for the 15-minute reference period and the potential for traffic flows to occur unevenly throughout one hour, HGV flows within the model have been increased by 50%.

Internal HGV movements are shown in Table 2-12. It is noted that only 'Finished Goods' and 'Pallets' HGV movements will occur during the night-time period.

Table 2-12
Internal HGV Movements

Area	Incoming HGV	Outcoming HGV	Internal Movements for Finished Goods Delivery	Total Daily Movements	Hourly Movements	Hourly for Model (round up)	Night-time Hourly = Hourly Movements + 50%
Cellulose Pulp	21	15	6	35	1.47	2	
Cellulose Pulp- Internal Movements for FG Delivery				6	0.24	1	
Raw material PM	2	2	0	2	0.08	1	
Jumbo reel purchase	0	0	0	0		0	
Raw material CV	5	5	0	10	0.42	1	
Pallets	8	0	8	8	0.33	1	1
Pallets- Internal Movements for FG Delivery				8	0.33	1	
Finished goods (Dept F)	56	71	/	127	5.29	6	8

3.0 Baseline Conditions

3.1 Current Baseline

3.1.1 Baseline Noise Survey

Noise-sensitive receptors are detailed in Table 3-1 and are shown on the plan in Appendix 02. All receptors are identified as residential properties.

Table 3-1
Noise Sensitive Receptors

NSR ID	NSR Name	Direction from Red Line Boundary	Approximate Distance from Red Line Boundary	Assessment Phase/Activity
NSR01	Brynllywarch Farm	North	65m	Construction Operation
NSR02	Brynsiriol Farm	Northwest	75m	Construction Operation
NSR03	Cefn Ydfa Farm	South	400m	Construction Operation
NSR04	Ty Isaf	Northeast	490m	Construction Operation
NSR05	Coytrahen	Southeast	1600m	Construction Traffic

A baseline noise survey was undertaken during January 2020, to measure the prevailing acoustic environment at the receptor locations shown in Table 3-1. The survey locations are described as follows and are shown in Appendix 03:

- **Location NSR01** – within the garden of the residential property at Brynllywarch Farm.
- **Location NSR02** – within the garden of the residential property at Brynsiriol Farm.
- **Location NSR04** – within the garden of the residential property at Ty Isaf.
- **Location NSR05 -** representative of residential properties along the A4063 at Coytrahen.

It is noted that it was agreed with BCBC to include a noise survey location at NSR03. However, at the time of the survey, access to this receptor and other nearby representative receptors was not available. For the purposes of the assessment, baseline noise levels measured at Location NSR04 have been considered as representative of NSR03.

The equipment used for the baseline noise survey is detailed in Table 3-2. All sound level meters were calibrated before and after the measurements using an acoustic calibrator and no significant drifts were observed. The calibration chain is traceable via the United Kingdom Accreditation Service to national standards held at the National Physical Laboratory.

Table 3-2
Survey Equipment

Survey Location	Survey Equipment	Serial Number
NSR01	Cirrus CR:171B Type 1 Sound Level Meter	G061094
	Cirrus CR:515 Acoustic Calibrator	81268
NSR02	Cirrus CR:171B Type 1 Sound Level Meter	G080288
	Cirrus CR:515 Acoustic Calibrator	83349
NSR04	Rion NL-52 Type 1 Sound Level Meter	00331823
	Rion NC-74 Acoustic Calibrator	34336013
NSR05	Norsonic NOR140 Type 1 Sound Level Meter	1403012
	Norsonic 1251 Acoustic Calibrator	31872

The survey was largely unattended; however, weather conditions were noted to be conducive for noise monitoring, being dry with wind speeds below 5m/s during the whole survey period except for the morning of Monday 6th January when heavy rain occurred. Screen shots taken from relevant weather websites for the Bridgend area are shown in Appendix 04.

Observations of the prevailing soundscape and context were made during the installation and removal of the sound level meter at each survey location, and these are described as follows:

- **Location NSR01** –Audible sound sources included distant road traffic, bird song, sound from existing site operations (stack), train passbys and high-altitude aircraft.
- **Location NSR02** – Audible sound sources included distant road traffic, sound from existing operations at the site during absence of road traffic and birdsong.
- **Location NSR04** – Audible sound sources included distant road traffic, bird song, sound from existing site operations (stack) and high-altitude aircraft.
- **Location NSR05-** Audible sound sources included road traffic and bird song.

Measurements at each survey location were logged every 15-minutes and included both weekday and weekend periods. Each microphone was place 1.5m above the ground in free-field conditions, i.e. at least 3.5m from the nearest vertical reflecting surface.

The following noise level indices were recorded during the survey, which was undertaken from approximately 10:15 on Friday 3rd January to approximately 12.00 on Monday 6th January 2020.

- L_{Aeq} – the A-weighted equivalent continuous noise level over the measurement period, T;
- L_{A90} – the A-weighted noise level exceeded for 90% of the measurement period. This parameter is often used to describe background noise;
- L_{A10} – the A-weighted noise level exceeded for 10% of the measurement period. This parameter is often used to describe road traffic noise; and
- L_{AFmax} – the maximum A-weighted noise level during the measurement period.

Based on the observations made, it is considered that the measured noise levels are representative of the prevailing noise climate at locations representative of the closest receptors and have therefore been considered as such for the purposes of the assessment.

A summary of the measured noise levels for Locations NSR01, NSR02, NSR04 and NSR05 is provided in Table 3-3. The table shows the prevailing daytime and night-time ambient noise levels (L_{Aeq}), and the median L_{A10}, median L_{A90} and the highest L_{AFmax} values are also shown. As rain occurred on the 6th January, these results have been stricken from Table 3-3 and have not been used within the assessment.

Table 3-3
Summary of Measured Noise Levels, dB

Receptor	Date	Period	$L_{Aeq,T}$	Median L_{A90}	Mode L_{A90}	Average L_{A90}
NSR01	03/01/20	Daytime	46.6	43.1	43.9	43.4
	03/01/20- 04/01/20	Night-time	42.7	40.8	40.8	40.9
	04/01/20	Daytime	45.3	42.6	42.6	42.7
	04/01/20- 05/01/20	Night-time	43.0	41.5	41.6	41.5
	05/01/20	Daytime	45.6	43.1	42.8	43.3
	05/01/20- 06/01/20	Night-time	44.2	42.7	42.7	44.2
	06/01/20	Daytime	~~47.2~~	~~45.1~~	~~45.3~~	~~45.1~~
NSR02	03/01/20	Daytime	55.8	50.3	49.0	49.5
	03/01/20- 04/01/20	Night-time	47.3	35.9	36.3	36.6
	04/01/20	Daytime	54.4	48.7	52.0	47.9
	04/01/20- 05/01/20	Night-time	48.5	37.4	37.8	37.2
	05/01/20	Daytime	54.6	48.5	50.4	47.3
	05/01/20- 06/01/20	Night-time	48.5	41.3	41.3	42.9
	06/01/20	Daytime	~~56.0~~	~~51.3~~	~~53.5~~	~~51.8~~
NSR04	03/01/20	Daytime	50.9	45.6	45.7	45.4
	03/01/20- 04/01/20	Night-time	44.2	41.5	41.9	41.4
	04/01/20	Daytime	49.2	45.6	45.8	45.1
	04/01/20- 05/01/20	Night-time	44.5	41.4	42.4	41.4
	05/01/20	Daytime	50.9	45.9	44.2	44.8
	05/01/20- 06/01/20	Night-time	42.1	36.5	35.5	38.3
	06/01/20	Daytime	~~42.1~~	~~36.5~~	~~35.5~~	~~38.3~~
NSR05	03/01/20	Daytime	55.5	46.4	38.0	44.4
	03/01/20- 04/01/20	Night-time	48.8	34.3	34.2	34.6
	04/01/20	Daytime	55.0	44.1	46.3	43.0
	04/01/20- 05/01/20	Night-time	49.2	34.5	33.8	34.6
	05/01/20	Daytime	56.2	43.8	43.8	43.9
	05/01/20- 06/01/20	Night-time	50.5	36.2	35.8	37.8
	06/01/20	Daytime	~~57.4~~	~~47.7~~	~~46.1~~	~~48.2~~

3.2 Baseline Levels to be Utilised

Measured baseline sound levels used within the assessment of noise from construction and operational phases of the development are shown in Table 3-4.

Daytime $L_{Aeq,T}$ sound levels are the measured average weekday $L_{Aeq,T}$ levels, for use within noise assessment.

Daytime and night-time $L_{A90,T}$ sound levels are the measured average median weekend levels, for use within the operational noise assessment.

Table 3-4
Baseline Sound Levels, dB

NSR ID	NSR Name	Period	$L_{A90,T}$	$L_{Aeq,T}$
NSR01	Brynllywarch Farm	Daytime	43.0	46.6
		Night-time	41.1	-
NSR02	Brynsiriol Farm	Daytime	49.0	55.8
		Night-time	36.6	-
NSR03	Cefn Ydfa Farm	Daytime	46.0	50.9
		Night-time	41.4	-
NSR04	Ty Isaf	Daytime	46.0	50.9
		Night-time	41.4	-
NSR05	Coytrahen	Daytime	-	55.5
		Night-time	-	-

4.0 Assessment of Effects

4.1 Construction Phase Effects

Construction noise levels have been calculated for the nearest development phase to receptors NSR01, NSR02, NSR03 and NSR04. Table 4-1 presents the highest daytime noise levels expected from the simultaneous operation of all anticipated plant during all assumed phases of the construction programme.

Table 4-1
Predicted Construction Noise Levels – Daytime, dB L_{Aeq}

NSR ID	NSR Name	Site Clearance	Groundworks	Substructure	Superstructure
NSR01	Brynllywarch Farm	58.5	57.7	57.2	58.1
NSR02	Brynsiriol Farm	62.9	61.7	60.8	62.1
NSR03	Cefn Ydfa Farm	57.0	57.0	56.2	55.9
NSR04	Ty Isaf	53.5	53.2	52.2	52.5

The predicted construction noise levels in Table 4-1 are shown to be below the adopted daytime criterion of 65dB L_{Aeq} for all receptors. This criterion has been determined with reference to the ABC method contained in BS5228:2009+A1:2014 as shown in Table 2-1 of this report.

With reference to Table 2-2, this results in no noise impact since the adopted daytime threshold value of 65dB L_{Aeq} is not predicted to be exceeded. For daytime operations, the sensitivity of the receptors is defined as high, resulting in a significance of noise effects of 'None', with reference to Table 2-5.

Specific mitigation measures to reduce noise from construction activities are therefore not required.

4.2 Construction Traffic

The construction traffic assessment is based on a worst-case scenario construction traffic flow of a maximum of 40 hourly HGV movements along the A4063 at Coytrahen, between 7am and 7pm. Baseline road traffic flows have been derived from traffic count data contained within the Transport Assessment.

Traffic flows along the A4063 at Coytrahen, for 'do nothing' (DN) and 'do nothing' (DS) construction scenarios are shown in Table 4-2, together with the predicted BNLs at 10m from the carriageway.

Table 4-2
Construction Traffic Assessment

Road Link	AAWT 18-hour		% HGV		Speed (kph)	BNL (dB)		Change (dB)
	DN	DS	DN	DS		DN	DS	
A4063 Coytrahen	14,767	15,247	6%	9.1%	74	72.2	72.9	0.7

The results in Table 4-2 show that the difference in BNLs between DN and DS scenarios ($L_{A10\,18hour}$) is predicted to result in an increase in sound levels of 0.7 dB adjacent to the A4063, and therefore at NSR05 and receptors along the A4063.

With reference to Table 2-4, the magnitude of noise impacts from construction traffic at NSR05 and other receptors along the A4063 at Coytrahen is predicted to be 'Negligible'. With reference to Table 2-6, the significance of noise effects associated with construction traffic is therefore 'Negligible'.

Specific mitigation measures to reduce noise from construction traffic are therefore not required.

4.3 Operational Phase Effects

The predicted sound levels from the operational phase, without mitigation, at the noise sensitive receptor locations are shown in Table 4-3 below. Screen shots from the daytime and night-time noise models are provided in Appendix 05.

Daytime sound levels have been predicted to 1.5m above ground level, the approximate height of a ground floor window. Night-time sound levels have been predicted to 4.0m above ground level, the approximate height of a first-floor window, except for NSR02 where night-time sound levels have been predicted at 1.5m as the dwelling is a bungalow.

The predictions have also assumed and taken into account the following;

- The internal sound level from the existing paper machine as measured within the existing Jupiter building has been applied to the whole proposed Department C building, i.e. the measured sound level has been applied to area (roof) and vertical (wall) sources within the model.
- The front section of the Department C building which does not house the paper machine will have an internal reverberant noise level of 85dB (A), in-line with the upper action value contained in the Control of Noise at Work Regulations 2005 produced by the HSE.
- The Department B baler will be fully enclosed. The enclosure will provide a sound insulation value Rw of 40dB(A) (as stated within information provided by the Client).
- Three conveyors will be located externally within the canopied area of Department B.
- The conveyors would be screened by a 10m high steel sheet on the northern and southern boundaries of the canopied area.
- All elements of the walls and roof of Department C will provide a sound insulation value Rw of 50dB(A) (as stated within information provided by the Client).
- The walls and roof of Department F will provide a sound insulation value Rw of 40dB(A) (as stated within information provided by the Client).
- Any ‘bin dragging’ (as observed on-site) as part of the pulp storage/bale handling extension will take place for 30 seconds in any one hour, during daytime hours only (as observed on-site).
- One electric clamp truck (60 movements per hour), one diesel clamp truck for unloading (20 movements per hour) and one baler will operate within Department B at any one time, during the daytime.
- One electric clamp truck (60 movements per hour) and one baler will operate within Department B at any one time, during the night-time.
- One forklift will be operating within the Department F warehouse building.
- One forklift will be operating within the Department F shipping building.
- Roof extract heights and sound levels as per information provided by the Client.
- Roof extracts will operate for 100% of the time.

Table 4-3
Predicted Operational Specific Sound Levels, Free-Field dB

Location	Period	Predicted Sound Level, $L_{Aeq,T}$
NSR01	Daytime	31.2
	Night-Time	27.6
NSR02	Daytime	26.5
	Night-Time	27.4
NSR03	Daytime	32.4
	Night-Time	30.5
NSR04	Daytime	30.8
	Night-Time	29.2

With the inclusion of the following penalties, the rating level of the proposed development at the noise sensitive receptors assessed are detailed in Table 4-4. In accordance with BS4142:2014+A1:2019 the noise levels have been rounded to the nearest whole number.

- Tonal Penalty: 2dB; Tonal sound from the proposed development is expected to be just perceptible, based on observations of existing operations at site and at all the receptor locations during the daytime and night-time.
- Impulsive Penalty: 0dB. It is anticipated that none of the proposed sound sources would be impulsive. No impulsivity penalty is required.
- Intermittency: 3dB. Over the reference time of 1-hour during the day, and 15-minutes during the night, if the site is operating it is expected that noise could be intermittent at receptors NSR02 due to nearby proposed HGV and loading operations. No adjustment has been made for intermittency at receptors NSR01, NSR03 and NSR 04 due to distance and screening by the intervening buildings.
- Other sound characteristics: 0dB. It is anticipated that none of the noise sources would have any sound characteristics that differ to those already existing at the site.
- **Total penalty**: 5dB at NSR02 and 2dB at NSR's 01, 03 and 04.

The penalties described above have been added to the predicted sound levels shown in Table 4-3 to derive the rating levels at each of the nearest noise-sensitive receptors.

The rating levels have then been compared to the derived background sound levels to calculate the assessment levels, and then assessed accordingly.

The results of the BS4142:2014+A1:2019 assessment is shown in Table 4-4. It is noted that rating levels and the background sound levels have been rounded to the nearest decibel.

Table 4-4
BS4142 Assessment without Mitigation, dB

Receptor	Period	Predicted Specific Sound Level, $L_{Aeq,T}$	Predicted Rating Level, $L_{Ar,T}$	Derived Background Sound Level L_{A90}	Predicted Rating Level, $L_{Ar,T}$ - Background Sound Level L_{A90} Difference (Assessment Level)
NSR01	Daytime	31	33	43	-10
	Night-Time	28	30	41	-11
NSR02	Daytime	27	32	49	-17
	Night-Time	27	32	37	-5
NSR03	Daytime	32	34	46	-12
	Night-Time	31	33	41	-8
NSR04	Daytime	31	33	46	-13
	Night-Time	29	31	41	-10

The results in Table 4-4 show that the magnitude of noise impacts associated with the operation of the proposed development is predicted to be:

- 'None' at all assessed Receptors during the daytime;
- 'None' at Receptors NSR01 and NSR04 during the night-time; and
- 'Negligible' at Receptors NSR02 and NSR03 during the night-time.

With reference to Tables 2-3 and 2-6, the results in Table 4-4 also show that the significance of noise effects associated with the operation of the proposed development is predicted to be:

- 'None' at all assessed Receptors during the daytime;
- 'None' at Receptors NSR01 and NSR04 during the night-time; and
- 'Negligible' at Receptors NSR02 and NSR03 during the night-time.

With reference to Section 2.3, the LPA requires noise rating levels to be 10dB below the background sound level. The results in Table 4-4 show that the daytime noise rating levels at all receptors are predicted to be at least 10dB below the background level during the daytime. Predicted rating levels therefore comply with the LPA criteria, and mitigation is not required to reduce sound levels further during the daytime period.

The noise rating levels at Receptors NSR01and NSR04 are predicted to be at least 10dB below the background level during the night-time. Predicted rating levels at these receptors therefore comply with the LPA criteria.

The noise rating level at Receptor NSR03 is predicted to be 8dB below the background level during the night-time. At NSR03, the Department C building contributes significantly to the specific sound level. Within the sound predictions, the internal sound level from the existing paper machine as measured within the existing Jupiter building has been applied to the whole proposed Department C building, leading to likely over prediction of sound levels. As the sound contribution from Department C can expected to be lower in actuality, the rating level is predicted to be 8dB below the background level and impact significance has been determined as 'Negligible', it is considered that mitigation measures to reduce sound levels further at receptor NSR03 are not necessary.

The noise rating level at Receptor NSR02 is predicted to be 5dB below the background level during the night-time. As the difference between the rating level and the background level is 5dB, mitigation will be required to reduce the rating level sufficiently to satisfy the requirement. Mitigation measures are outlined in the next section of this assessment.

5.0 Mitigation

5.1 Construction Noise Mitigation

The assessment has shown that specific mitigation measures to reduce sound levels during the construction phase are not required.

Notwithstanding the above, several safeguards exist in order to control and minimise the effects of construction noise, and these would apply during the construction phase. These include:

- European Commission (EC) Directives and United Kingdom (UK) Statutory Instruments to control noise emissions from construction plant;
- The guidance within BS5228-1:2009+A1:2014 on the control of noise from construction sites; and
- Section 60 of the Control of Pollution Act 1974, which gives local authorities the power to control noise from construction sites.

The adoption of Best Practicable Means is usually the most effective means of controlling noise from construction sites. Experience has shown that by implementing these measures, typical noise levels from construction activities could be reduced by 5dB or more. Furthermore, problems concerning noise from construction works can sometimes be avoided by taking a considerate and neighbourly approach with local residents.

As construction activities would be temporary in nature, and noise levels have been predicted for a worst-case scenario, no specific mitigation measures are considered necessary.

5.2 Operational Noise Mitigation

The assessment has shown that mitigation measures will be required to achieve acceptable sound levels at NSR02.

To identify a suitable mitigation strategy, Cadna-A noise modelling has been used to test and identify suitable mitigation measures to be implemented, as follows:

- Installation of a 6m high acoustically sound barrier to provide screening between the proposed Department F and Receptor NSR02.
- A reduction of 50% in peak hour HGV movements (as shown within the 'Hourly for Model' column in Table 2-11) during the night-time period.
- External loading of no more than one vehicle at a time, i.e. although more than one vehicle may be parked for loading, external noise sources used for the loading of multiple vehicles must not operate concurrently.

The predicted night-time sound levels of the operational phase at the noise sensitive receptor locations, with mitigation measures in place, are shown in Table 5-1 below. Screen shots from the night-time noise model are shown in Appendix 05.

Table 5-1
BS4142 Assessment with Mitigation, dB

Receptor	Assessment	Predicted Specific Sound Level, $L_{Aeq,T}$	Predicted Rating Level, $L_{Ar,T}$	Derived Background Sound Level L_{A90}	Predicted Rating Level, $L_{Ar,T}$ - Background Sound Level L_{A90} Difference (Assessment Level)
NSR01	Night-Time	28	30	41	-11
NSR02		21	26	37	-11
NSR03		31	33	41	-8
NSR04		29	31	41	-10

The results in Table 5-1 show that, with reference to Table 2-6, with the implementation of the proposed mitigation strategy, the significance of noise effects associated with the operation of the proposed development is predicted to be 'None' at Receptors NSR01, NSR02 and NSR04, and 'Negligible at NSR03.

6.0 Residual Effects

The results in Table 5-1 show that, with the implementation of the proposed mitigation strategy to attenuate operational sound, the significance of effects will be 'Negligible' or 'None'.

No residual effects are therefore expected to result, a summary of the construction and operational noise effects is shown in Table 7-1 overleaf.

7.0 Summary of Effects

Table 7-1
Noise Chapter Summary and Residential Impacts

Receptor	Characterisation of the Impact	Sensitivity of Receptors	Worst Case Impact Magnitude	Worst Case Potential Significance and Nature of Effect	Additional Mitigation	Worst Case Residual Impact Magnitude	Worst Case Residual Significance and Nature of Effect
NSR01 Brynllywarch Farm	Construction	High day Very high night	None	None	No	None	None
	Operational – Fixed Plant & On-site Traffic		None	None	No	None	None
	Operational – Off Site Traffic		N/A	N/A	N/A	N/A	N/A
NSR02 Brynsiriol Farm	Construction	High day Very high night	None	None	No	None	None
	Operational – Fixed Plant & On-site Traffic		Negligible	Negligible	Yes	None	None
	Operational – Off Site Traffic		N/A	N/A	N/A	N/A	N/A
NSR03 Cefn Ydfa Farm	Construction	High day Very high night	None	None	No	None	None
	Operational – Fixed Plant & On-site Traffic		Negligible	Negligible	No	Negligible	Negligible
	Operational – Off Site Traffic		N/A	N/A	N/A	N/A	N/A
NSR04 Ty Isaf	Construction	High day Very high night	None	None	No	None	None
	Operational – Fixed Plant & On-site Traffic		None	None	No	None	None
	Operational – Off Site Traffic		N/A	N/A	N/A	N/A	N/A
NSR05 Coytrahen	Construction	High day Very high night	Negligible	Negligible	No	Negligible	Negligible
	Operational – Fixed Plant & On-site Traffic		N/A	N/A	N/A	N/A	N/A
	Operational – Off Site Traffic		N/A	N/A	N/A	N/A	N/A

8.0 Conclusions

SLR Consulting Ltd (SLR) has been appointed on behalf of WEPA UK Limited to prepare this Noise Impact Assessment in support of plans for the extension of their existing papermill site in Bridgend.

This report has considered the impact of the proposed development upon the noise environment at identified sensitive receptor locations.

This report has described the scope, relevant legislation, assessment methodology, and the baseline conditions existing at the site and its surroundings. It considers any potential significant effects the proposed development would have on this baseline environment; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been employed.

The impact of the proposed development during its construction has been considered and this has been referenced to the guidance of BS5228-1:2009+A1:2014 and the DMRB. The predicted noise levels from the assumed construction plant for the construction of the development are shown to be below the adopted daytime criterion of 65dB L_{Aeq} at the closest receptors. This is also the case for the total daytime construction noise level, if all construction phases are assumed to be operating concurrently.

As this is unlikely to be the case, the total predicted noise levels are therefore the highest noise levels predicted for the construction phase. The predicted noise levels from the assumed construction traffic are shown to lead to no impact at the closest receptors.

The significance of effects during the construction phase at all receptors are predicted to be 'None'. The significance of effects due to construction traffic are predicted to be 'Negligible'. Specific mitigation measures to reduce sound levels during construction are therefore not required.

The assessment has also considered the noise impact of the proposed development on the surrounding residential area with reference to BS4142:2014+A1:2019 for the operation of fixed plant and on-site vehicle movements.

The significance of effects during the operational phase during the daytime are predicted to be 'None' at all receptors. The significance of effects during the operational phase during the night-time the are predicted to be 'Negligible' at two receptors.

Suitable mitigation measures have therefore been tested and specified where necessary. With the implementation of the recommended mitigation strategy, the significance of effects is reduced to 'Negligible' at one receptor and 'None' at all other receptors.

It is therefore considered that, with the implementation of the mitigation measures, noise should not pose a material constraint to the proposed development.

APPENDIX 01

Glossary

GLOSSARY OF TERMINOLOGY

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

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

Sound Levels Commonly Found in the Environment

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

Acoustic Terminology

dB (decibel) — The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ($2x10^{-5}$Pa).

dB(A) — A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

L_{Aeq} — L_{Aeq} is defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.

L_{A10} & L_{A90} — If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{A10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{A90} is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L_{A10} index to describe traffic noise.

L_{AFmax}	L_{AFmax} is the maximum A - weighted sound pressure level recorded over the period stated. L_{AFmax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{Aeq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.

APPENDIX 02

Receptor Location Plan


NSR02
NSR01
NSR04
NSR03
A4063
NSR05
Coytrahen

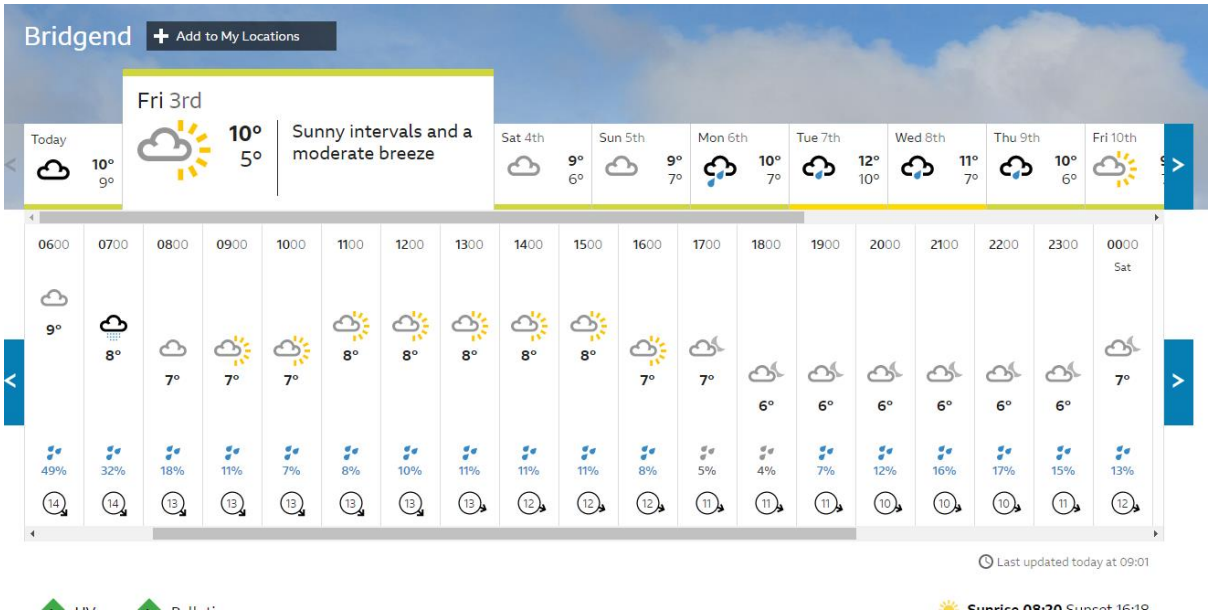
APPENDIX 03

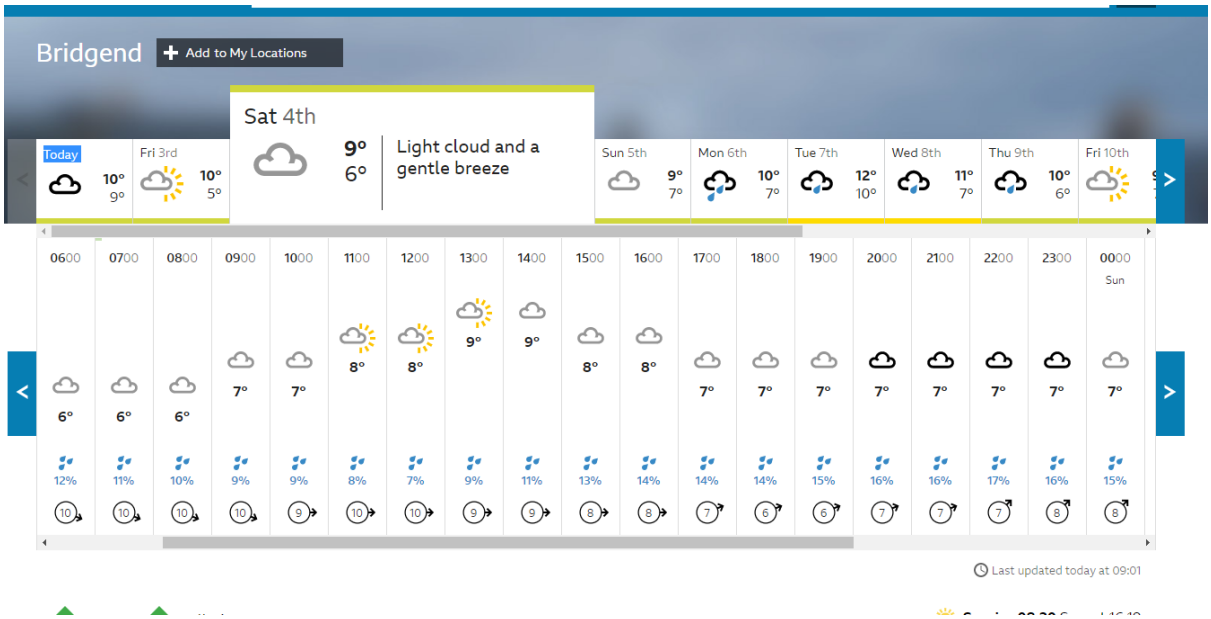
Noise Survey Location Plan

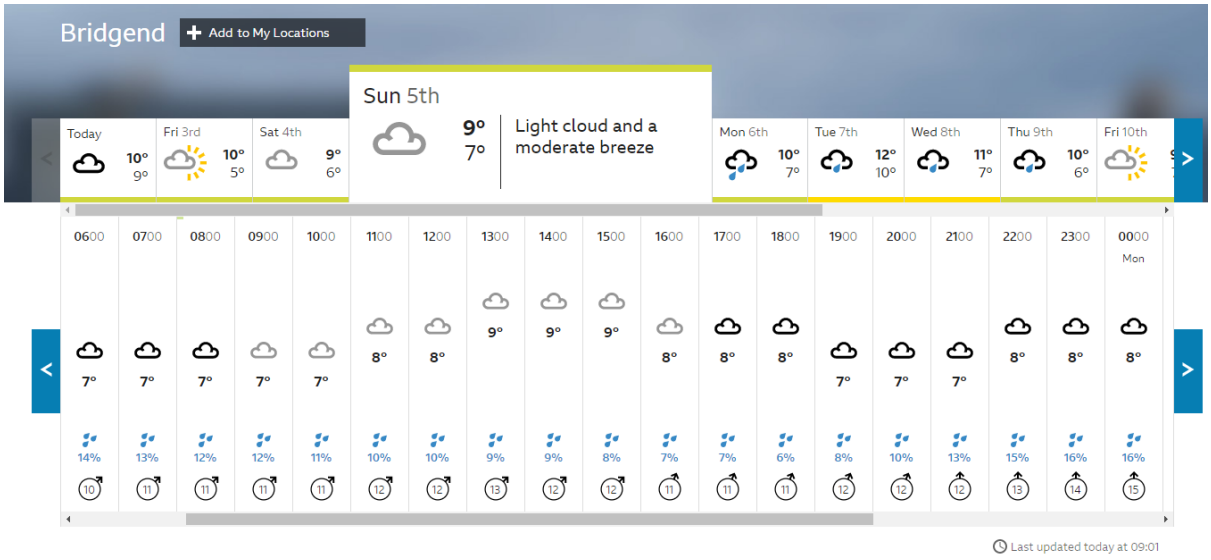

NSR02
NSR01
NSR04
A4063
NSR05
Coytrahen

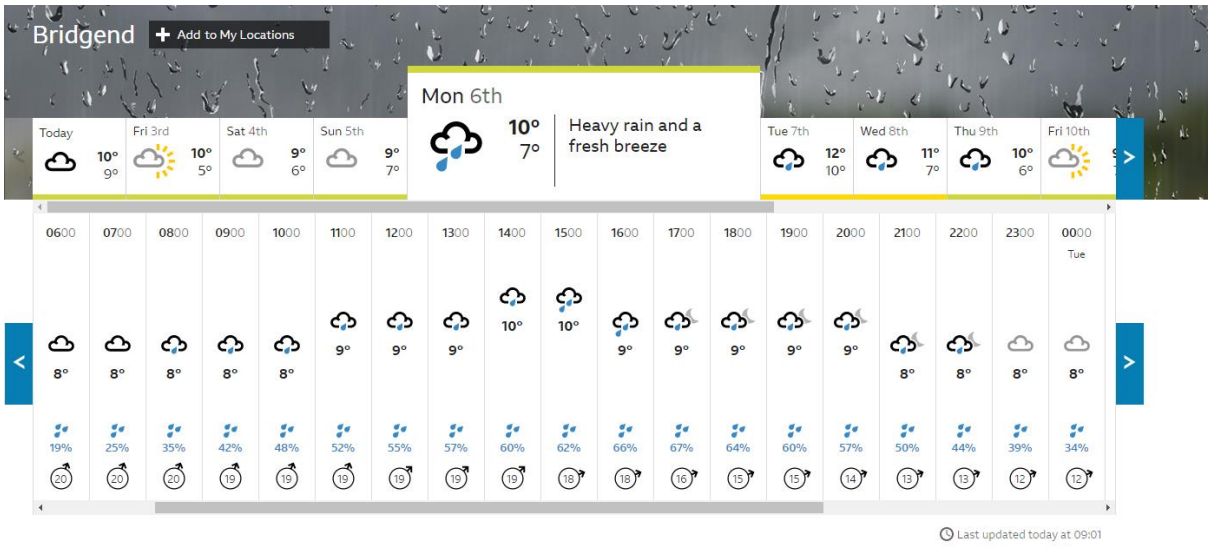
APPENDIX 04

Weather Data


Bridgend
Add to My Locations
Fri 3rd
10°
5°
Sunny intervals and a moderate breeze
Today 10° 9°
Sat 4th 9° 6°
Sun 5th 9° 7°
Mon 6th 10° 7°
Tue 7th 12° 10°
Wed 8th 11° 7°
Thu 9th 10° 6°
Fri 10th
0600 9° 49% 14
0700 8° 32% 14
0800 7° 18% 13
0900 7° 11% 13
1000 7° 7% 13
1100 8° 8% 13
1200 8° 10% 13
1300 8° 11% 13
1400 8° 11% 12
1500 8° 11% 12
1600 7° 8% 12
1700 7° 5% 11
1800 6° 4% 11
1900 6° 7% 11
2000 6° 12% 10
2100 6° 16% 10
2200 6° 17% 10
2300 6° 15% 11
0000 Sat 7° 13% 12
Last updated today at 09:01


Bridgend
Add to My Locations
Sat 4th
9°
6°
Light cloud and a gentle breeze
Today 10° 9°
Fri 3rd 10° 5°
Sun 5th 9° 7°
Mon 6th 10° 7°
Tue 7th 12° 10°
Wed 8th 11° 7°
Thu 9th 10° 6°
Fri 10th
0600 6° 12% 10
0700 6° 11% 10
0800 6° 10% 10
0900 7° 9% 10
1000 7° 9% 9
1100 8° 8% 10
1200 8° 7% 10
1300 9° 9% 9
1400 9° 11% 9
1500 8° 13% 8
1600 8° 14% 8
1700 7° 14% 7
1800 7° 14% 6
1900 7° 15% 6
2000 7° 16% 7
2100 7° 16% 7
2200 7° 17% 7
2300 7° 16% 8
0000 Sun 7° 15% 8
Last updated today at 09:01


Bridgend
Add to My Locations
Today 10° 9°
Fri 3rd 10° 5°
Sat 4th 9° 6°
Sun 5th
9° 7°
Light cloud and a moderate breeze
Mon 6th 10° 7°
Tue 7th 12° 10°
Wed 8th 11° 7°
Thu 9th 10° 6°
Fri 10th
0600 7° 14% 10
0700 7° 13% 11
0800 7° 12% 11
0900 7° 12% 11
1000 7° 11% 11
1100 8° 10% 12
1200 8° 10% 12
1300 9° 9% 13
1400 9° 9% 12
1500 9° 8% 12
1600 8° 7% 11
1700 8° 7% 11
1800 8° 6% 11
1900 7° 8% 12
2000 7° 10% 12
2100 7° 13% 12
2200 8° 15% 13
2300 8° 16% 14
0000 Mon 8° 16% 15
Last updated today at 09:01


Bridgend
Add to My Locations
Today 10° 9°
Fri 3rd 10° 5°
Sat 4th 9° 6°
Sun 5th 9° 7°
Mon 6th
10° 7°
Heavy rain and a fresh breeze
Tue 7th 12° 10°
Wed 8th 11° 7°
Thu 9th 10° 6°
Fri 10th
0600 8° 19% 20
0700 8° 25% 20
0800 8° 35% 20
0900 8° 42% 19
1000 8° 48% 19
1100 9° 52% 19
1200 9° 55% 19
1300 9° 57% 19
1400 10° 60% 19
1500 10° 62% 18
1600 9° 66% 18
1700 9° 67% 16
1800 9° 64% 15
1900 9° 60% 15
2000 9° 57% 14
2100 8° 50% 13
2200 8° 44% 13
2300 8° 39% 12
0000 Tue 8° 34% 12
Last updated today at 09:01

APPENDIX 05

Noise Model Outputs

ASPECT HOUSE
ASPECT BUSINESS PARK
BENNERLEY ROAD
NOTTINGHAM. NG6 8WR
T: 01159 647280
F: 01159 751576
www.slrconsulting.com

BRIDGEND PAPER MILL

NOISE ASSESSMENT

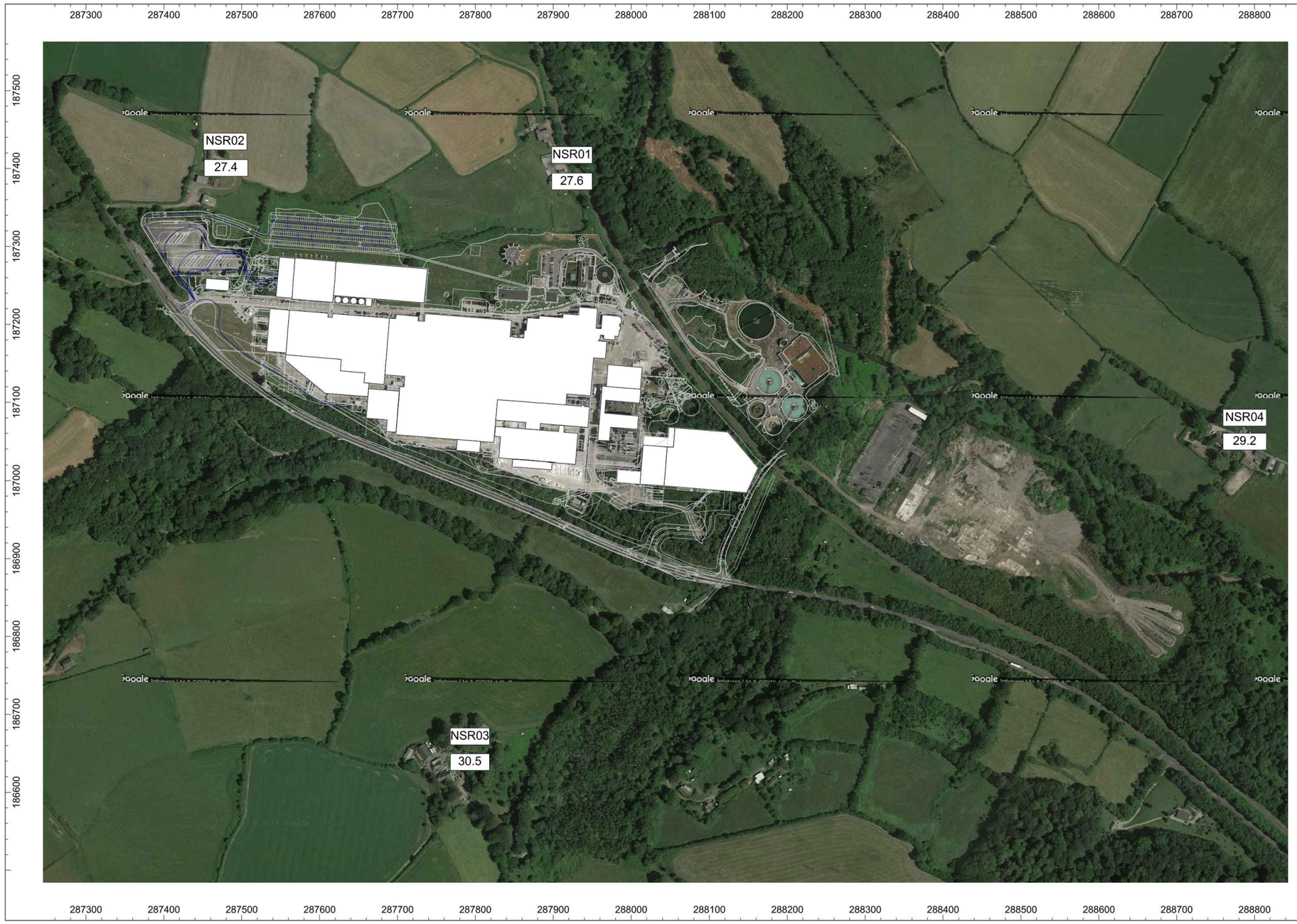
DAY-TIME LAeq,T SPECIFIC SOUND LEVELS (dB) WITHOUT MITIGATION

DRAWING 1

Scale	Date
NTS @ A3	JANUARY 2020

DBR/AN

425.09898.00001.0002.22.001-003.0 Drawing1-3.dwg



425.09898.00001.0002.22.001-003.0 Drawing1-3.dwg

SLR global environmental solutions
ASPECT HOUSE
ASPECT BUSINESS PARK
BENNERLEY ROAD
NOTTINGHAM. NG6 8WR
T: 01159 647280
F: 01159 751576
www.slrconsulting.com

BRIDGEND PAPER MILL

NOISE ASSESSMENT

NIGHT-TIME LAeq,T SPECIFIC SOUND LEVELS (dB) WITHOUT MITIGATION

DRAWING 2

Scale	Date
NTS @ A3	JANUARY 2020

DBRAIN

425.09898.00001.0002.22.001-003.0 Drawing1-3.dwg

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BRIDGEND PAPER MILL

NOISE ASSESSMENT

NIGHT-TIME LAeq,T SPECIFIC SOUND LEVELS (dB) WITH MITIGATION

DRAWING 3

Scale	Date
NTS @ A3	JANUARY 2020

DBR/AN

EUROPEAN OFFICES

United Kingdom

AYLESBURY
T: +44 (0)1844 337380

BELFAST
T: +44 (0)28 9073 2493

BRADFORD-ON-AVON
T: +44 (0)1225 309400

BRISTOL
T: +44 (0)117 906 4280

CARDIFF
T: +44 (0)29 2049 1010

CHELMSFORD
T: +44 (0)1245 392170

EDINBURGH
T: +44 (0)131 335 6830

EXETER
T: + 44 (0)1392 490152

GLASGOW
T: +44 (0)141 353 5037

GUILDFORD
T: +44 (0)1483 889800

LONDON
T: +44 (0)203 805 6418

MAIDSTONE
T: +44 (0)1622 609242

MANCHESTER
T: +44 (0)161 872 7564

NEWCASTLE UPON TYNE
T: +44 (0)191 261 1966

NOTTINGHAM
T: +44 (0)115 964 7280

SHEFFIELD
T: +44 (0)114 245 5153

SHREWSBURY
T: +44 (0)1743 23 9250

STIRLING
T: +44 (0)1786 239900

WORCESTER
T: +44 (0)1905 751310

Ireland

DUBLIN
T: + 353 (0)1 296 4667

France

GRENOBLE
T: +33 (0)6 23 37 14 14

Mr Steve Barwick
Bridgend Paper Mills
Llangynwyd
CF34 9RS

Anchem
LABORATORIES LIMITED
Registered Office:
D'Arcy Business Park
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Neath, SA10 6EJ
Tel: 01792 323223
Fax: 01792 323236
e-mail: info@anchem.co.uk
www.anchem.co.uk
Company No. 4768038

Bridgend Paper Mills

Environmental/Ambient Noise Assessment of Site

16th to 17th July 2015

Reference

Your Ref. Mr Steve Barwick

Our Ref. ALL44365/15/RJL

Date. 21st August 2015

Reference Number 74883

Authorised by:

Mr R J Lethbridge BSc

Reviewed by:

Contents:

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2.0 Introduction.

3.0 Aims & Objectives.

4.0 Site Observations.

5.0 Methodology & Instrumentation.

6.0 Results.

7.0 Discussion & Observations.

8.0 Conclusions.

9.0 Recommendations & Suggested Action Plan.

10.0 Uncertainty.

11.0 References.

12.0 Glossary of Terms.

13.0 Appendices.

1.0 Executive Summary

This document constitutes an environmental/ambient noise assessment undertaken by Mr R J Lethbridge (Certified as Competent by The Institute of Acoustics, 2015) of Anchem Laboratories Ltd for Mr Steve Barwick of Bridgend Paper Mill, Bridgend. The assessment has been carried out as part of a five yearly assessment of prevailing ambient noise levels.

This report should be used in conjunction with all other information you hold to assist in resolving any issues arising from the noise levels produced by the factory site, and our findings were as follows:

- In general a slight trend in reduction of ambient noise levels can be seen with the exception of the Loading Yard by Main Entrance (74883/3), where the influence of road noise is dominant and it is likely that the levels of traffic were much higher than recorded in 2011.
- Any assessment of the likelihood to cause complaints would be better served by measuring at the sensitive receptor locations with residual & background measurements taken at an alternative site or during a planned shutdown of the plant.
- On the day of monitoring all production was seen to be fairly typical of normal production, with the only exceptions being a partial shutdown in the morning due to process problems.

2.0 Introduction

At the request of Mr Steve Barwick of Bridgend Paper Mill, Bridgend, Mr R J Lethbridge (BSc, Certified as Competent by The Institute of Acoustics, 2015) of Anchem Laboratories Ltd undertook an assessment of environmental noise arising from the Bridgend Paper Mill at the perimeter locations (Appendix 1) of the Bridgend site during both the day (07:00 to 23:00) & night time (23:00 to 07:00):

1. East corner of Effluent Plant (N 51° 34.305/W 003° 36.854).
2. Contractors Storage Area (N 51° 34.229/W 003° 37.058).
3. Loading Yard by Main Entrance (N 51° 34.319/W 003° 37.476).
4. Field next to Hedgerow (N 51° 34.400/W 003° 37.364).
5. Adjacent to Spidertank (N 51° 34.404/W 003° 37.116).

Locations were based on previous locations used in 2011 with the exception the measurements were carried out based on the requirements set out in BS 4142:2014 – Methods for rating and assessing industrial and commercial sound, with the specific exception of residual & background noise levels.

3.0 Aims & Objectives

The objectives of the survey were:

- To assess levels of ambient noise during normal production both during the day and night at the perimeter of the factory to provide a record of prevailing ambient noise levels.
- To compare measured levels against previous measurements made on the 7th and 8th March 2011.

Although measurements have been taken using methodology based on BS 4142, no actual assessment of the likelihood of complaints from nearby sensitive receivers (residential developments) has been undertaken, it is understood the Northwood Wepa Ltd has not received complaints regarding noise and as such that noise levels beyond the site boundary are of such a level that residential locations are not adversely affected.

4.0 Site Observations

Northwood WEPA is a large industrial factory specialising in the manufacture of bathroom tissue and kitchen towel for the UK & Ireland market.

The site is located in the countryside away from any major industrial, commercial or residential developments, with only a small number of farms and residential properties in the area. A main road (A4063) runs along the Southern perimeter whilst the river Llynfi and the Cardiff/Maesteg branch railway line run along the North eastern perimeter (See Appendix 1).

The site operates continuously 24 hours a day, 7 days a week with the only shutdowns being due to breakdowns, and annually at Christmas time.

5.0 Methodology & Instrumentation

Noise measurements were obtained utilising a Cirrus Optimus Green integrating sound level meter mounted on a tripod.

Sound Level Meter	Cirrus Research, Optimus Green Integrating Sound Level Meter (type 1). Serial No. G056156. Verification Due: 21/08/2015.
Microphone	Cirrus Research, Optimus Green Integrating Sound Level Meter (type 1), CR:171B, Serial No. G056156. Verification Due: 21/08/2015.
Acoustic Calibrator	Cirrus Research, CR: 515 Type 1 Acoustic Calibrator, Serial No. 52594. Verification Due: 21/08/2015.
Anemometer	WM-200, 10802, A/S520.
Thermometer	WM-200, 10802, A/S520.
Tape Measure	B&Q, A/S521

Table 1: Instrumentation

Methodology utilised has been based on BS 4142:2014

In accordance with BS 4142:2014, to minimise the influence of reflections, measurements were taken at least 3.5m from the nearest reflective surface at a height of 1.5m.

The noise level meter was field calibrated prior to use at 93.7dB (1KHz) and checked again after all measurements were taken, a drift of less than 0.3dB was deemed satisfactory.

Weather conditions were assessed during each measurement utilising a portable barometer, wind speed anemometer and temperature sensors.

Measurements of the ambient noise levels were taken at each of the specified locations, measurement of residual and background sound levels was not possible at the locations as the factory runs continuously.

All locations were visited both during the day and at night, during which observational data including weather data was obtained.

Calibration of the meters was carried out acoustically at the start and end of the measurement period.

6.0 Results

6.1 Daytime Results (07:00 to 23:00)

Ref	Location	Measured Ambient sound level, $L_{Aeq(60min)}$	Comments Including sound sources
74883/1	East Corner Effluent Plant	55.8	Effluent plant Archimedes screw and water flow dominant with some distant train noise.
74883/2	Contractors Storage Area	56.4	Gas turbine boilers dominant with some steam noise from Jupiter, also road traffic to rear & general site traffic.
74883/3	Main Entrance	66.0	Dominant noise is road traffic with some site traffic, general factory noise only noticeable when road traffic low.
74883/4	Field Adjacent to Hedgerow	53.0	General factory noise, fans etc. including Jupiter, also distant road noise, site traffic and occasional steam release.
74883/5	Adjacent "Spidertank"	52.3	Site traffic, water discharge, factory hum, occasional train passing and steam release from Jupiter.

Ref	Time	Temperature, ˚C	Prevailing Wind Directions	Wind Speed, mph	Cloud Cover, %	Comments
74883/1	14:03	25	SSE	<1	98	-
74883/2	13:10	22	ESE	1	100	Some slight drizzle at start.
74883/3	16:08	20	SE	2.5	70	-
74883/4	15:32	24	SE	4	60	-
74883/5	14:46	25	SE	1	60	-

Table 2: Prevailing weather conditions, measured on the 16th July 2015

6.2 Night Time Results (23:00 – 07:00)

Ref	Location	Measured Ambient sound level, $L_{Aeq(15min)}$	Comments Including sound sources
74883/1	East Corner Effluent Plant	55.7	Effluent plant Archimedes screw and water flow dominant, small stream to rear noticeable.
74883/2	Contractors Storage Area	55.4	Gas turbine boilers dominant with some road traffic to rear.
74883/3	Main Entrance	46.8	General factory noise "hum" from factory with occasional road traffic.
74883/4	Field Adjacent to Hedgerow	50.1	Jupiter line steam vent, occasional road noise.
74883/5	Adjacent Spidertank	51.1	Jupiter Line, Water flowing from treatment area, light steam discharge.

Ref	Time	Temperature, ˚C	Prevailing Wind Directions	Wind Speed, mph	Cloud Cover, %	Comments
74883/1	23:01	24	SE	<1	98	-
74883/2	23:26	23	None	<1	100	-
74883/3	00:33	20	SE	<1	100	-
74883/4	00:13	22	SE	2	100	-
74883/5	23:46	22	SE	<1	100	-

Table 3: Prevailing weather conditions, measured on the 16th – 17th July 2015.

6.3 Comparison against previous data from 2011.

Location	Previous ambient sound level, LAeq(15min), Day/Night		Current measured ambient sound level, LAeq(15min), Day/Night	
74883/1	55.5	56.6	55.8	55.7
74883/2	52.9	49.1	56.4	55.4
74883/3	57.5	37.1	66.0	46.8
74883/4	59.6	63.6	53.0	50.1
74883/5	-	-	52.3	51.1

Previous data 2011, current data 2015.

7.0 Discussion & Observations

On the day of monitoring all production was seen to be fairly typical of normal production, with the only exceptions being a partial shutdown in the morning due to process problems.
The plant runs continuously 24/7 with the only planned shutdowns at Christmas time. The following observations were made at each location:

- Effluent Plant (74883/1)
  Accessed by crossing the rail line, this area is fairly isolated with the main sounds coming from the operation of the treatment plant itself with occasional trains passing and the nearby river & streams. This was very similar at night with only a reduction in trains being of any significance.
- Contractors Storage Yard (74883/2)
  Located adjacent to the turbine gas boiler systems and the main road, both of which dominate the perceived sounds as well as the Jupiter line which is perceptible in the background.
- Loading Yard by main entrance (74883/3)
  During the day the main sounds come from the main road which dominate over other sounds such as general factory noise. This was seen to drop off at night with reduced traffic as we would expect.
- Field next to hedgerow (74883/4)
  The main distinctive sounds were of general factory noise, fans etc. with the Jupiter line being noticeable including some steam release and distant road noise.
- Adjacent to Spidertank (74883/5)
  During the day the main sounds come from the water intake treatment pumps etc. with site traffic also being distinct. Some train noise was noticeable as well as steam discharge for brief periods of time from the Jupiter line.

From discussions with the client it was evident that there was no history of complaints from residents living nearby.

Examination of the previous report issued in 2011 by an alternative consultancy had utilised background readings taken with the factory operational and no measurement of residual noise. With no justification for this approach, it cannot be considered to have been carried out fully in accordance with BS4142.

8.0 Conclusions

In general a trend in reduction of ambient noise levels can be seen with the exception of the Loading Yard by Main Entrance (74883/3), where the influence of road noise is dominant and it is likely that the levels of traffic were much higher than recorded in 2011.

Measurement of residual & background noise levels to assess the likelihood of complaint would require measurements to be taken when the factory was not operational, or at an alternative location away from the factory, both of which were not deemed practical on this occasion.

Any assessment of the likelihood to cause complaints would be better served by measuring at the sensitive receptor locations with residual & background measurements taken at an alternative site.

9.0 Recommendations & Suggested Action Plan

Bridgend Paper Mill is currently doing much manage the issue of environmental noise by:

- Carrying out five yearly ambient noise monitoring.

There are however, a number of recommendations that can improve the way in which Bridgend Paper Mill deals with the issue of noise propagating from the site:

- For the purposes of assessment of the likelihood to cause complaint we would strongly advise that measurements be taken at the sensitive receptor locations, i.e. the residential properties/farms most likely to be affected by noise from Northwood Wepa. This should be influenced by any record of complaints received.
- Residual/background levels of noise would be best determined during a planned shutdown of the plant.

10.0 Uncertainty

In general the noise emitted from the factory was continuous in nature with little variation other than occasional site noises from steam events, site traffic etc.

As such 30 minute measurements were deemed representative during the day of the 1 hour reference period and the level of uncertainty in measurement to be low.

11.0 References

- BS 4142:2014 Methods for rating and assessing industrial and commercial sound, ISBN 978 0 580 80051 1. Fourth Edition, October 2014.
- BOHS – Clear & concise report writing: Guidance for occupational hygienists (Issue 1.0; Dec 2011)

12.0 Glossary of Terms

- *Acoustic Environment* – sound from all sound sources as modified by the environment.
- *Ambient Sound* – totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near & far.
- *Ambient Sound Level, ($L_a = L_{Aeq,T}$)* – equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time usually composed of sound from many sources near & far, at the assessment location over a given time interval (typically 1 hour daytime and 15 mins at night).
- *Background Sound Level, ($L_{A90,T}$)* – A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.
- *Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$* – value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, $T = t_2 - t_1$, has the same mean-squared sound pressure as a sound that varies with time, and is given by:

$$L_{Aeq,T} = 10Log_{10}\left\{\left(\frac{1}{T}\right)\int_{t1}^{t2}\left[\frac{p_A(t)^2}{{p_0}^2}\right]dt\right\}$$

Where: p_0 is the reference sound pressure (20 μPa)
$P_A(t)$ is the instantaneous A-weighted sound pressure level (Paq) at time t

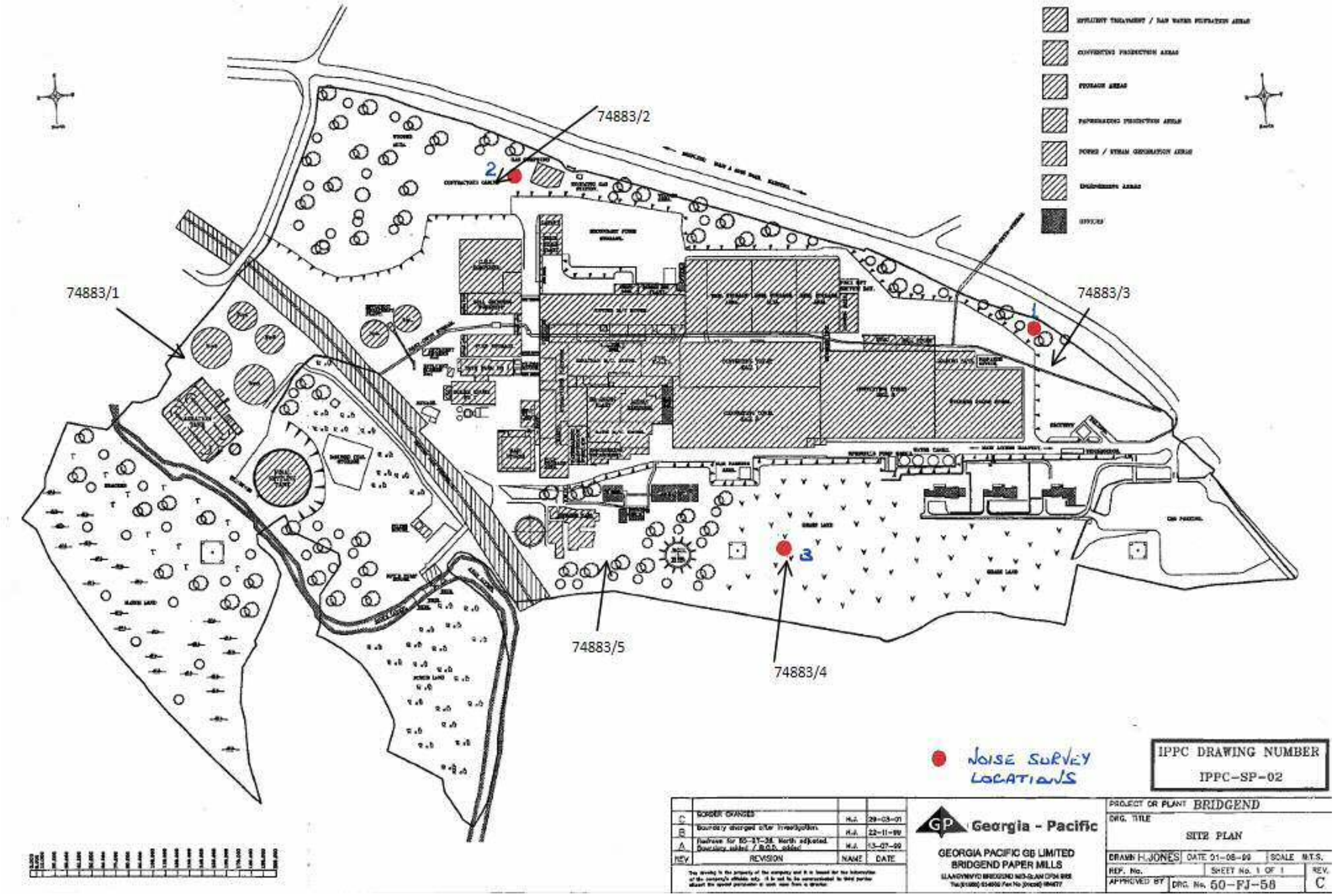
- *Measurement time interval, T_m – total time over which measurements are taken.*
- *Rating level, $L_{Ar,Tr}$* – specific sound level plus any adjustment for the characteristic features of the sound.
- *Reference time interval, T_r* – specified interval over which the specific sound level is determined, (*1 hour during the day from 07:00 to 23:00 and a shorter period of 15 mins at night from 23:00 to 07:00*).
- *Residual sound* – ambient sound remaining at the assessment location when the specific sound source is supressed to such a degree that it doesn't contribute to the ambient sound.
- *Residual sound level, $L_r = L_{Aeq,Tr}$* – equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T.
- *Specific sound level, $L_s = L_{Aeq,\ Tr}$* – equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r.

- *Specific sound source* – sound source being assessed.

Appendix 1

Site Plan Showing Location of Measurements

(1 Page)



REV	REVISION	NAME	DATE
C	BORDER CHANGED	H.J.	29-03-01
B	Boundary changed after investigation	H.J.	22-11-99
A	Railway to SS-27-38 North adjusted. Boundary added / B.G.D. added	H.J.	13-07-99

This drawing is the property of the company and is issued for the information of the company's officials only. It is not to be communicated to third parties without the special permission in each case from a director.

Georgia - Pacific

GEORGIA PACIFIC GB LIMITED
BRIDGEND PAPER MILLS
LLANGYNWYD BRIDGEND MID GLAM CF34 9XE
Tel (01656) 654600 Fax No (01656) 654677

IPPC DRAWING NUMBER
IPPC-SP-02

PROJECT OR PLANT BRIDGEND
DRG. TITLE
SITE PLAN

DRAWN H.JONES	DATE 01-06-99	SCALE N.T.S.	
REF. No.	SHEET No. 1 OF 1		REV. C
APPROVED BY	DRG. No. 50-FJ-58		

Appendix 2

Site Measurements

(10 Pages)

Cirrus Research plc

Anchem LABORATORIES LIMITED

Measurement Summary Report

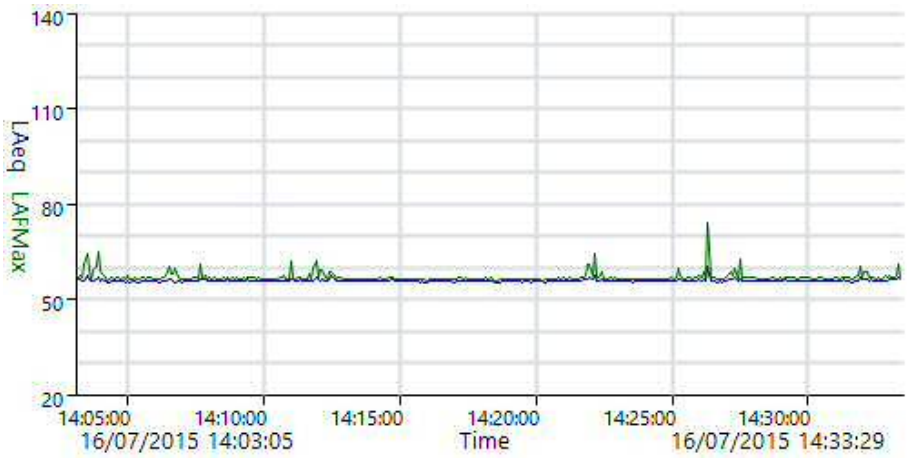
Name	74883/1 Day			
Time	16/07/2015 14:03:05	**Person**	**Place**	**Project**
Duration	00:30:24		Effluent Treatment	Ambient Noise
Instrument	G056156, CR:171B			

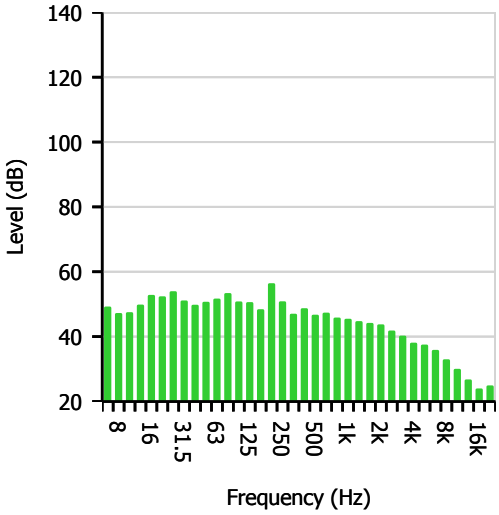
Calibration

Before	16/07/2015 14:02	Offset	0.09 dB	**After**	16/07/2015 15:27	Offset	0.34 dB

Basic Values	
LAeq	55.8 dB
LAE	88.4 dB
LAFMax	74.2 dB

Statistical Levels (Ln)	
LAF1	57.4 dB
LAF5	56.4 dB
LAF10	56.2 dB
LAF50	55.6 dB
LAF90	55.2 dB
LAF95	55.1 dB
LAF99	54.8 dB





Notes

East Corner Effluent Plant
Daytime
N 51 34.305, W 003 36.854

Report ID

Cirrus Research plc

Anchem LABORATORIES LIMITED

Measurement Summary Report

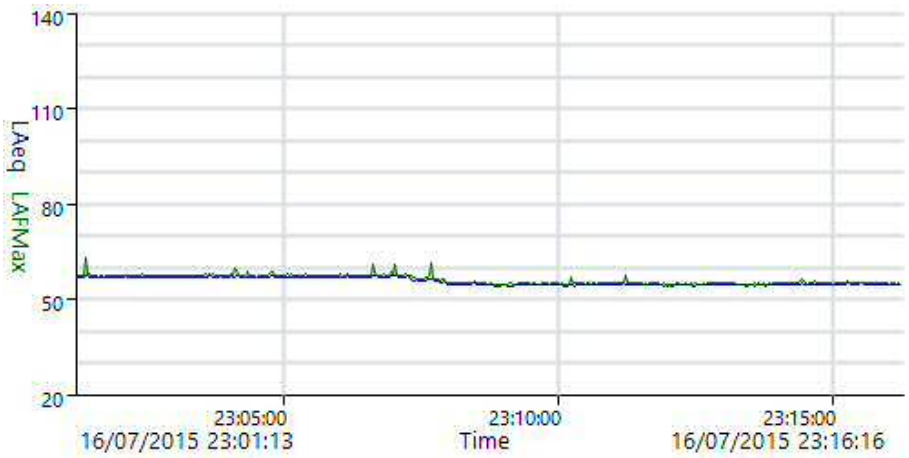
Name	74883/1 Night			
Time	16/07/2015 23:01:13	**Person**	**Place**	**Project**
Duration	00:15:03		Effluent Treatment	Ambient Noise
Instrument	G056156, CR:171B			

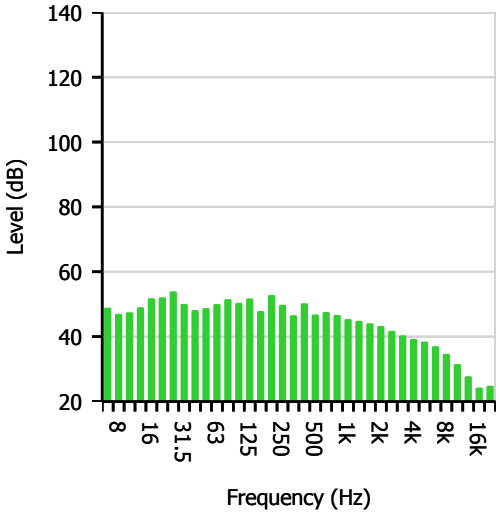
Calibration

Before	16/07/2015 22:33	Offset	0.19 dB	**After**	Offset

Basic Values	
LAeq	55.7 dB
LAE	85.3 dB
LAFMax	63.0 dB

Statistical Levels (Ln)	
LAF1	57.5 dB
LAF5	57.2 dB
LAF10	57.1 dB
LAF50	54.8 dB
LAF90	54.2 dB
LAF95	54.1 dB
LAF99	54.0 dB





Notes

East Corner Effluent Plant Nightime

Report ID

Cirrus Research plc

Anchem LABORATORIES LIMITED

Measurement Summary Report

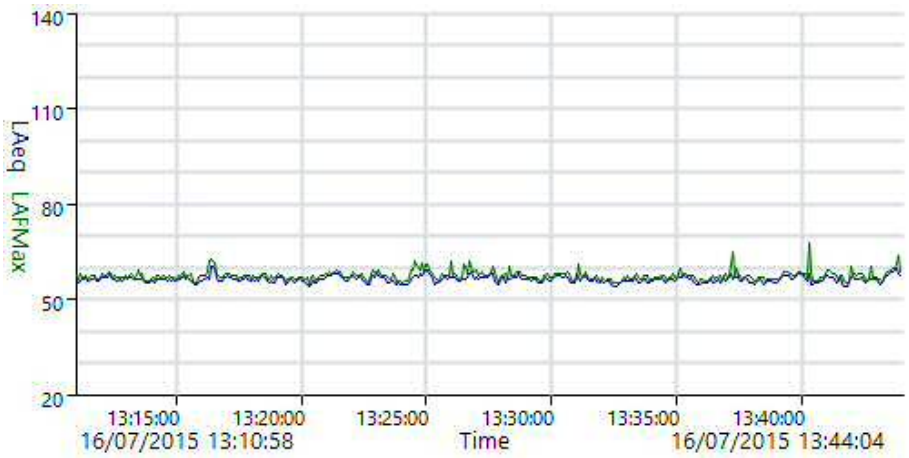
Name	74883/2 Day			
Time	16/07/2015 13:10:58	**Person**	**Place**	**Project**
Duration	00:33:06		Contractors Storage	Ambient Noise
Instrument	G056156, CR:171B			

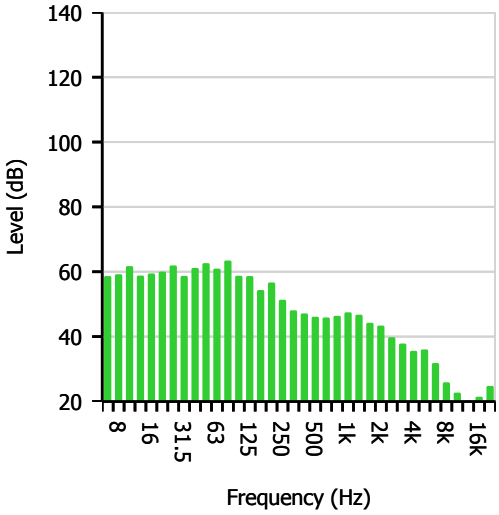
Calibration

Before	16/07/2015 13:09	Offset	0.13 dB	**After**	16/07/2015 14:02	Offset	0.09 dB

Basic Values	
LAeq	56.4 dB
LAE	89.4 dB
LAFMax	67.6 dB

Statistical Levels (Ln)	
LAF1	59.6 dB
LAF5	58.0 dB
LAF10	57.5 dB
LAF50	56.1 dB
LAF90	54.8 dB
LAF95	54.5 dB
LAF99	54.1 dB





Notes

Contractors Storage Area
N 51 34.229
W 003 37.058

Report ID

Cirrus Research plc

Anchem LABORATORIES LIMITED

Measurement Summary Report

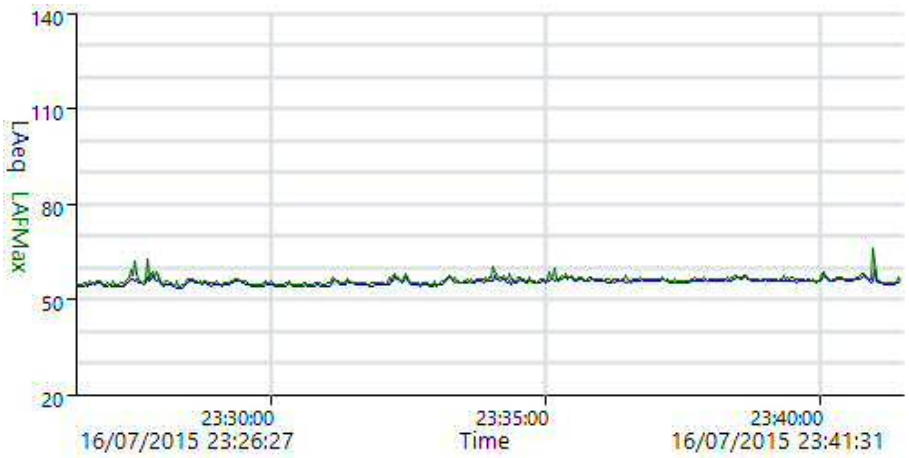
Name	74883/2 Night				
Time	16/07/2015 23:26:27	**Person**		**Place**	**Project**
Duration	00:15:04			Contractors Storage	Ambient Noise
Instrument	G056156, CR:171B				

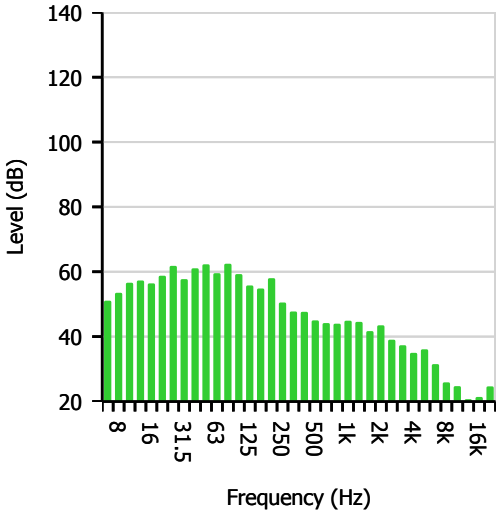
Calibration

Before	16/07/2015 22:33	Offset	0.19 dB	**After**	Offset

Basic Values	
LAeq	55.4 dB
LAE	85.0 dB
LAFMax	65.9 dB

Statistical Levels (Ln)	
LAF1	57.4 dB
LAF5	56.6 dB
LAF10	56.2 dB
LAF50	55.3 dB
LAF90	54.0 dB
LAF95	53.8 dB
LAF99	53.4 dB





Notes

Contractors storage area nightime

Report ID

Cirrus Research plc

Anchem LABORATORIES LIMITED

Measurement Summary Report

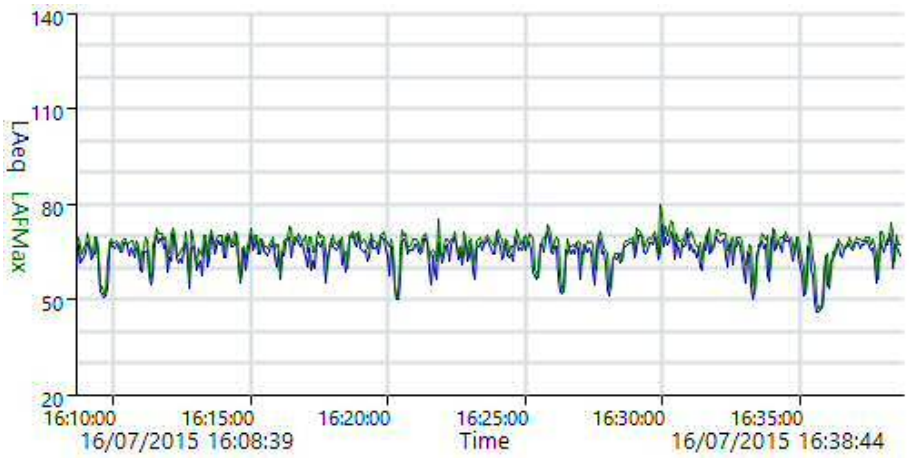
Name	74883/3 Day			
Time	16/07/2015 16:08:39	**Person**	**Place**	**Project**
Duration	00:30:05		Loading Yard By	Ambient Noise
Instrument	G056156, CR:171B			

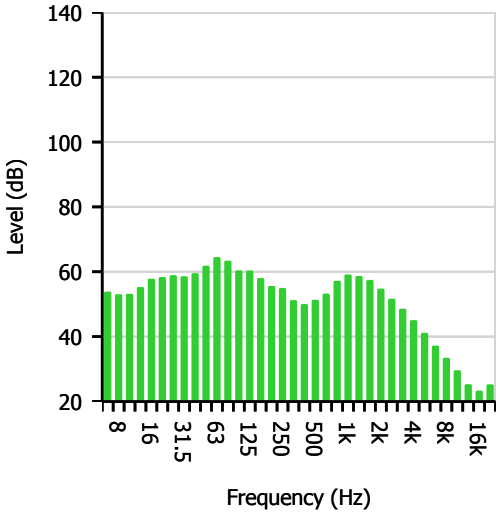
Calibration

Before	16/07/2015 15:27	Offset	0.34 dB	**After**	16/07/2015 22:33	Offset	0.19 dB

Basic Values	
LAeq	66.0 dB
LAE	98.6 dB
LAFMax	79.6 dB

Statistical Levels (Ln)	
LAF1	71.3 dB
LAF5	69.8 dB
LAF10	69.0 dB
LAF50	65.3 dB
LAF90	56.0 dB
LAF95	52.9 dB
LAF99	48.6 dB





Notes

Loading yard by main entrance plant fully running Daytime

Report ID

Cirrus Research plc

Anchem LABORATORIES LIMITED

Measurement Summary Report

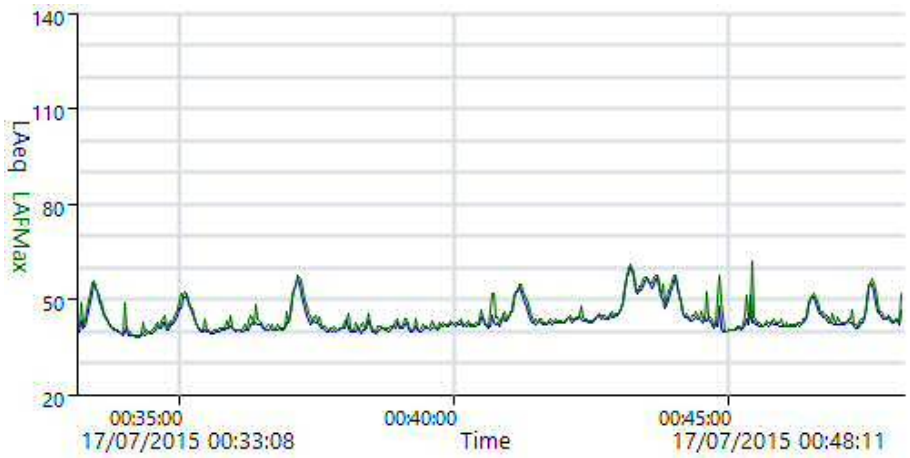
Name	74883/3 Night			
Time	17/07/2015 00:33:08	**Person**	**Place**	**Project**
Duration	00:15:03		Loading Yard By	Ambient Noise
Instrument	G056156, CR:171B			

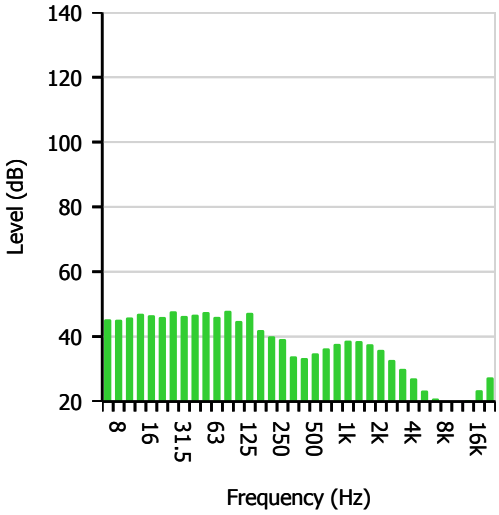
Calibration

Before	16/07/2015 22:33	Offset	0.19 dB	**After**	Offset

Basic Values	
LAeq	46.8 dB
LAE	76.4 dB
LAFMax	61.9 dB

Statistical Levels (Ln)	
LAF1	56.8 dB
LAF5	53.6 dB
LAF10	50.9 dB
LAF50	42.0 dB
LAF90	39.8 dB
LAF95	39.3 dB
LAF99	38.3 dB





Notes

74883/12 Loading yard by entrance nightime

Report ID

Cirrus Research plc

Anchem LABORATORIES LIMITED

Measurement Summary Report

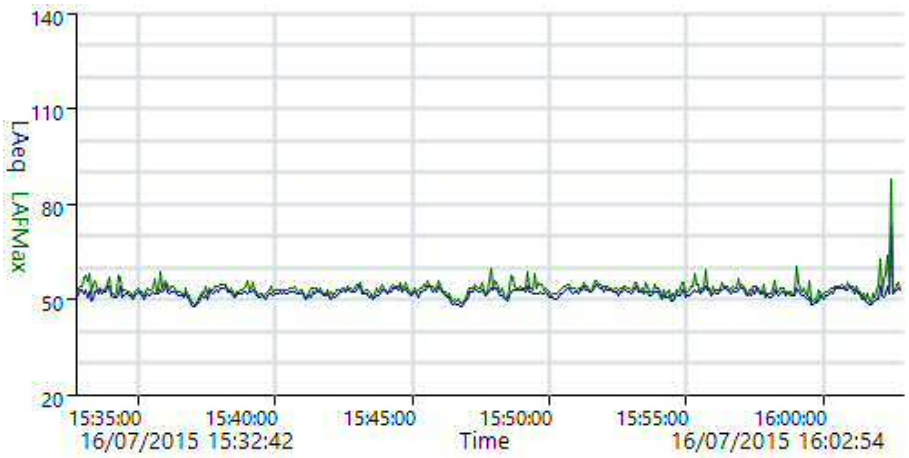
Name	74883/4 Day			
Time	16/07/2015 15:32:42	**Person**	**Place**	**Project**
Duration	00:30:12		Field Close To	Ambient Noise
Instrument	G056156, CR:171B			

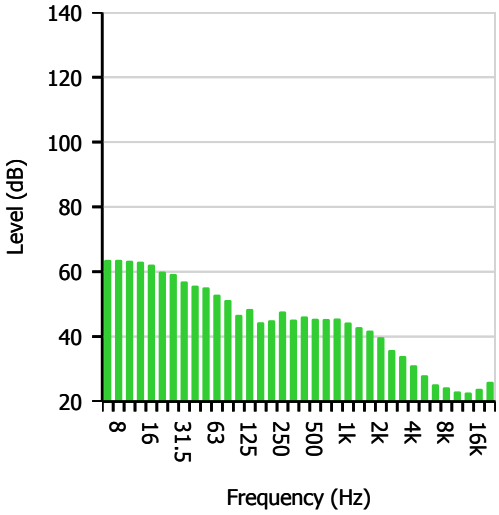
Calibration

Before	16/07/2015 15:27	Offset	0.34 dB	**After**	16/07/2015 22:33	Offset	0.19 dB

Basic Values	
LAeq	53.0 dB
LAE	85.6 dB
LAFMax	87.5 dB

Statistical Levels (Ln)	
LAF1	54.8 dB
LAF5	53.7 dB
LAF10	53.3 dB
LAF50	51.8 dB
LAF90	49.9 dB
LAF95	49.0 dB
LAF99	47.9 dB





Notes

Field next to hedgerow with plant fully running

Report ID

Cirrus Research plc

Anchem LABORATORIES LIMITED

Measurement Summary Report

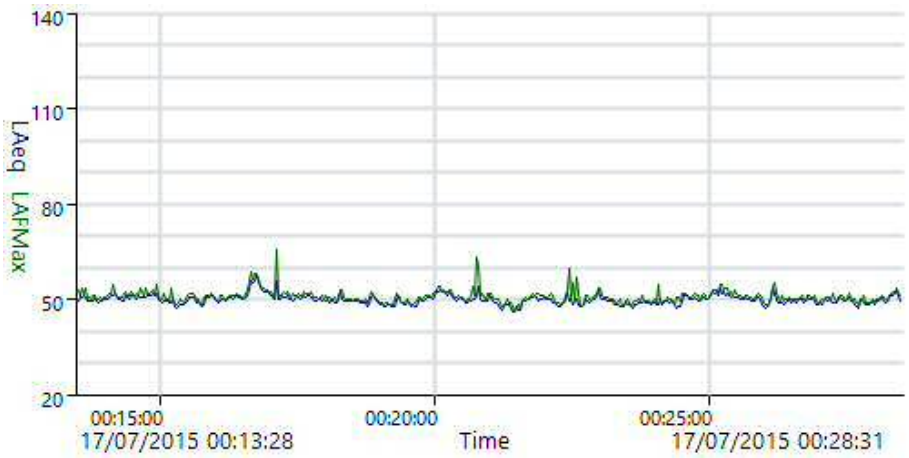
Name	74883/4 Night			
Time	17/07/2015 00:13:28	**Person**	**Place**	**Project**
Duration	00:15:03		Field Close To	Ambient Noise
Instrument	G056156, CR:171B			

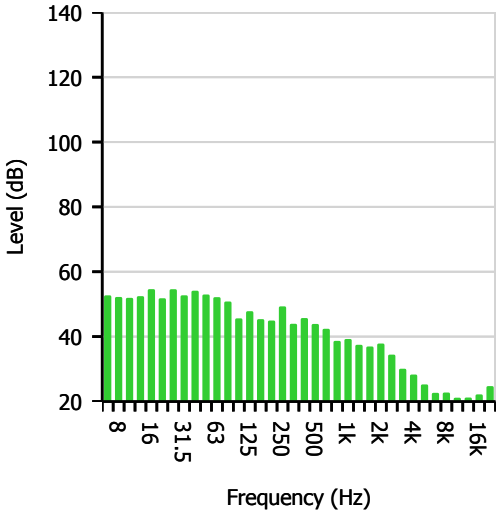
Calibration

Before	16/07/2015 22:33	Offset	0.19 dB	**After**	Offset

Basic Values	
LAeq	50.1 dB
LAE	79.7 dB
LAFMax	65.7 dB

Statistical Levels (Ln)	
LAF1	54.7 dB
LAF5	52.1 dB
LAF10	51.4 dB
LAF50	49.7 dB
LAF90	48.0 dB
LAF95	47.5 dB
LAF99	46.7 dB





Notes

74883/11 Field next to hedgerow nightime

Report ID

Cirrus Research plc

Anchem LABORATORIES LIMITED

Measurement Summary Report

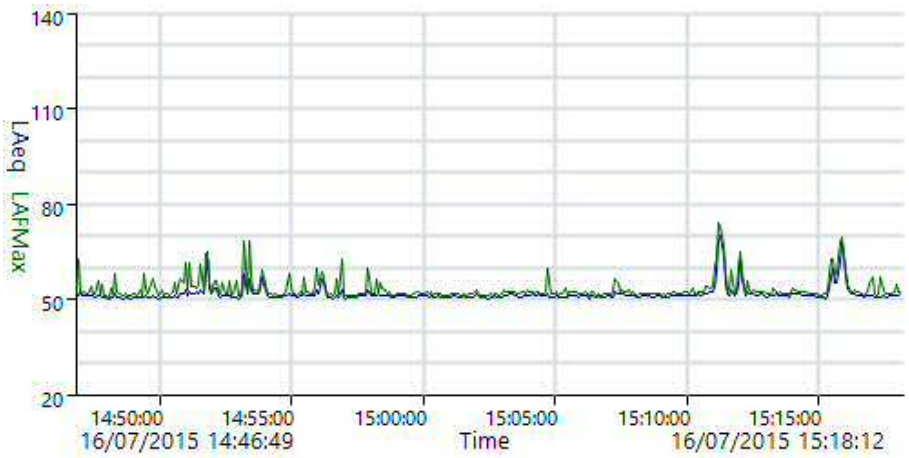
Name	74883/5 Day				
Time	16/07/2015 14:46:49	**Person**	**Place**	**Project**	
Duration	00:31:23		Adjacent Spidertank	Ambient Noise	
Instrument	G056156, CR:171B				

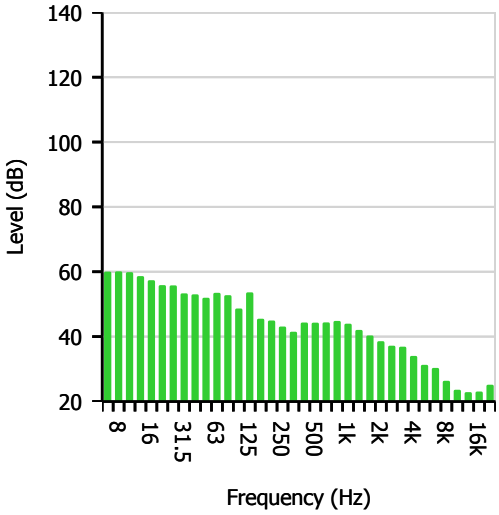
Calibration

Before	16/07/2015 14:02	Offset	0.09 dB	**After**	16/07/2015 15:27	Offset	0.34 dB

Basic Values	
LAeq	52.3 dB
LAE	85.1 dB
LAFMax	74.0 dB

Statistical Levels (Ln)	
LAF1	60.1 dB
LAF5	52.7 dB
LAF10	51.9 dB
LAF50	50.9 dB
LAF90	50.3 dB
LAF95	50.1 dB
LAF99	49.8 dB





Notes

Spidertank Daytime
N 51 34.404
W 003 37.116

Report ID

Cirrus Research plc

Anchem LABORATORIES LIMITED

Measurement Summary Report

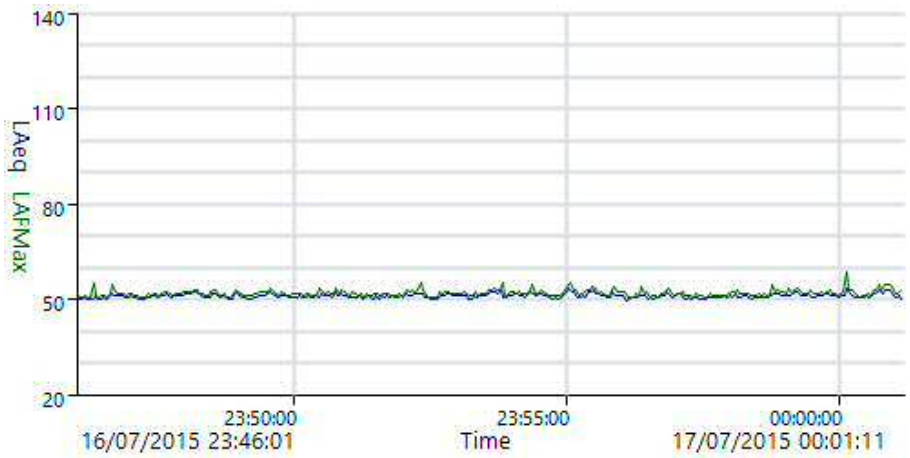
Name	74883/5 Night				
Time	16/07/2015 23:46:01	**Person**		**Place**	**Project**
Duration	00:15:10			Adjacent Spidertank	Ambient Noise
Instrument	G056156, CR:171B				

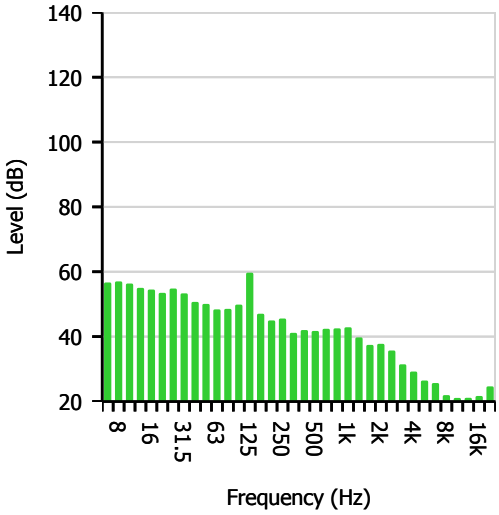
Calibration

Before	16/07/2015 22:33	Offset	0.19 dB	**After**	Offset

Basic Values	
LAeq	51.1 dB
LAE	80.7 dB
LAFMax	58.7 dB

Statistical Levels (Ln)	
LAF1	53.2 dB
LAF5	52.3 dB
LAF10	51.9 dB
LAF50	50.9 dB
LAF90	50.1 dB
LAF95	49.9 dB
LAF99	49.7 dB





Report ID

Appendix 3

Calibration Certificates for Instrumentation

(12 Pages)

Certificate of Calibration

Cirrus Research plc
dedicated to noise measurement

Equipment Details

Instrument Manufacturer	Cirrus Research plc
Instrument Type	CR:171B
Description	Sound Level Meter
Serial Number	G056156

Calibration Procedure

The instrument detailed above has been calibrated to the publish test and calibration data as detailed in the instrument hand book, using the techniques recommended in the latest revisions of the International Standards IEC 61672-1:2002, IEC 60651:1979, IEC 60804:2001,IEC 61260:1995, IEC 60942:1997, IEC 61252:1993, ANSI S1.4-1983, ANSI S1.11-1986 and ANSI S1.43-1997 where applicable.
Sound Level Meters: All Calibration procedures were carried out by subsitituting the microphone capsule with a suitable electrical signal, apart from the final acoustic calibration.

Calibration Traceability

The equipment detailed above was calibrated against the calibration laboratory standards held by Cirrus Research plc. These are traceable to International Standards {A.0.6}. The standards are:

Microphone Type	B&K4180	Serial Number	1893453	Calibration Ref.	S 6009
Pistonphone Type	B&K4220	Serial Number	613843	Calibration Ref.	S 5964

Calibrated by T. A. Goodhill

Calibration Date	21 August 2014
Calibration Certificate Number	221259

This Calibration Certificate is valid for 12 months from the date above.

Cirrus Research plc, Acoustic House, Bridlington Road, Hunmanby, North Yorkshire, YO14 0PH
Telephone: +44 (0) 1723 891655 Fax: +44 (0) 1723 891742
Email: sales@cirrusresearch.co.uk

Certificate of Calibration

Cirrus Research plc
dedicated to noise measurement

Equipment Details

Instrument Manufacturer	Cirrus Research plc
Instrument Type	RC:110A
Description	DoseBadge Reader
Serial Number	54753

Calibration Procedure

The instrument detailed above has been calibrated to the publish test and calibration data as detailed in the instrument hand book, using the techniques recommended in the latest revisions of the International Standards IEC 61672-1:2002, IEC 60651:1979, IEC 60804:2001,IEC 61260:1995, IEC 60942:1997, IEC 61252:1993, ANSI S1.4-1983, ANSI S1.11-1986 and ANSI S1.43-1997 where applicable.
Sound Level Meters: All Calibration procedures were carried out by subsitituting the microphone capsule with a suitable electrical signal, apart from the final acoustic calibration.

Calibration Traceability

The equipment detailed above was calibrated against the calibration laboratory standards held by Cirrus Research plc. These are traceable to International Standards {A.0.6}. The standards are:

Microphone Type	B&K4180	Serial Number	1893453	Calibration Ref.	S 6009
Pistonphone Type	B&K4220	Serial Number	613843	Calibration Ref.	S 5964

Calibrated by T. A. Goodhill

Calibration Date	21 August 2014
Calibration Certificate Number	221248

This Calibration Certificate is valid for 12 months from the date above.

Cirrus Research plc, Acoustic House, Bridlington Road, Hunmanby, North Yorkshire, YO14 0PH
Telephone: +44 (0) 1723 891655 Fax: +44 (0) 1723 891742
Email: sales@cirrusresearch.co.uk

Certificate of Calibration

Cirrus Research plc
dedicated to noise measurement

Equipment Details

Instrument Manufacturer	Cirrus Research plc
Instrument Type	CR:110A
Description	Dosemeter
Serial Number	CA3402

Calibration Procedure

The instrument detailed above has been calibrated to the publish test and calibration data as detailed in the instrument hand book, using the techniques recommended in the latest revisions of the International Standards IEC 61672-1:2002, IEC 60651:1979, IEC 60804:2001,IEC 61260:1995, IEC 60942:1997, IEC 61252:1993, ANSI S1.4-1983, ANSI S1.11-1986 and ANSI S1.43-1997 where applicable.
Sound Level Meters: All Calibration procedures were carried out by subsitituting the microphone capsule with a suitable electrical signal, apart from the final acoustic calibration.

Calibration Traceability

The equipment detailed above was calibrated against the calibration laboratory standards held by Cirrus Research plc. These are traceable to International Standards {A.0.6}. The standards are:

Microphone Type	B&K4180	Serial Number	1893453	Calibration Ref.	S 6009
Pistonphone Type	B&K4220	Serial Number	613843	Calibration Ref.	S 5964

Calibrated by T. A. Goodhil

Calibration Date	21 August 2014
Calibration Certificate Number	221249

This Calibration Certificate is valid for 12 months from the date above.

Cirrus Research plc, Acoustic House, Bridlington Road, Hunmanby, North Yorkshire, YO14 0PH
Telephone: +44 (0) 1723 891655 Fax: +44 (0) 1723 891742
Email: sales@cirrusresearch.co.uk

Certificate of Calibration

Cirrus Research plc
dedicated to noise measurement

Equipment Details

Instrument Manufacturer	Cirrus Research plc
Instrument Type	CR:110A
Description	Dosemeter
Serial Number	CA3404

Calibration Procedure

The instrument detailed above has been calibrated to the publish test and calibration data as detailed in the instrument hand book, using the techniques recommended in the latest revisions of the International Standards IEC 61672-1:2002, IEC 60651:1979, IEC 60804:2001,IEC 61260:1995, IEC 60942:1997, IEC 61252:1993, ANSI S1.4-1983, ANSI S1.11-1986 and ANSI S1.43-1997 where applicable.
Sound Level Meters: All Calibration procedures were carried out by subsitituting the microphone capsule with a suitable electrical signal, apart from the final acoustic calibration.

Calibration Traceability

The equipment detailed above was calibrated against the calibration laboratory standards held by Cirrus Research plc. These are traceable to International Standards {A.0.6}. The standards are:

Microphone Type	B&K4180	Serial Number	1893453	Calibration Ref.	S 6009
Pistonphone Type	B&K4220	Serial Number	613843	Calibration Ref.	S 5964

Calibrated by T. A. Goodhill

Calibration Date	21 August 2014
Calibration Certificate Number	221250

This Calibration Certificate is valid for 12 months from the date above.

Cirrus Research plc, Acoustic House, Bridlington Road, Hunmanby, North Yorkshire, YO14 0PH
Telephone: +44 (0) 1723 891655 Fax: +44 (0) 1723 891742
Email: sales@cirrusresearch.co.uk

Certificate of Calibration

Cirrus Research plc
dedicated to noise measurement

Equipment Details

Instrument Manufacturer	Cirrus Research plc
Instrument Type	CR:110A
Description	Dosemeter
Serial Number	CA3406

Calibration Procedure

The instrument detailed above has been calibrated to the publish test and calibration data as detailed in the instrument hand book, using the techniques recommended in the latest revisions of the International Standards IEC 61672-1:2002, IEC 60651:1979, IEC 60804:2001,IEC 61260:1995, IEC 60942:1997, IEC 61252:1993, ANSI S1.4-1983, ANSI S1.11-1986 and ANSI S1.43-1997 where applicable.
Sound Level Meters: All Calibration procedures were carried out by subsitituting the microphone capsule with a suitable electrical signal, apart from the final acoustic calibration.

Calibration Traceability

The equipment detailed above was calibrated against the calibration laboratory standards held by Cirrus Research plc. These are traceable to International Standards {A.0.6}. The standards are:

Microphone Type	B&K4180	Serial Number	1893453	Calibration Ref.	S 6009
Pistonphone Type	B&K4220	Serial Number	613843	Calibration Ref.	S 5964

Calibrated by T. A. Goodhill

Calibration Date	21 August 2014
Calibration Certificate Number	221251

This Calibration Certificate is valid for 12 months from the date above.

Cirrus Research plc, Acoustic House, Bridlington Road, Hunmanby, North Yorkshire, YO14 0PH
Telephone: +44 (0) 1723 891655 Fax: +44 (0) 1723 891742
Email: sales@cirrusresearch.co.uk

Certificate of Calibration

Cirrus Research plc
dedicated to noise measurement

Equipment Details

Instrument Manufacturer	Cirrus Research plc
Instrument Type	CR:110A
Description	Dosemeter
Serial Number	CA3407

Calibration Procedure

The instrument detailed above has been calibrated to the publish test and calibration data as detailed in the instrument hand book, using the techniques recommended in the latest revisions of the International Standards IEC 61672-1:2002, IEC 60651:1979, IEC 60804:2001,IEC 61260:1995, IEC 60942:1997, IEC 61252:1993, ANSI S1.4-1983, ANSI S1.11-1986 and ANSI S1.43-1997 where applicable.
Sound Level Meters: All Calibration procedures were carried out by subsitituting the microphone capsule with a suitable electrical signal, apart from the final acoustic calibration.

Calibration Traceability

The equipment detailed above was calibrated against the calibration laboratory standards held by Cirrus Research plc. These are traceable to International Standards {A.0.6}. The standards are:

Microphone Type	B&K4180	Serial Number	1893453	Calibration Ref.	S 6009
Pistonphone Type	B&K4220	Serial Number	613843	Calibration Ref.	S 5964

Calibrated by T. A. Goodhill

Calibration Date	21 August 2014
Calibration Certificate Number	221252

This Calibration Certificate is valid for 12 months from the date above.

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Email: sales@cirrusresearch.co.uk

Certificate of Calibration

Cirrus Research plc
dedicated to noise measurement

Equipment Details

Instrument Manufacturer	Cirrus Research plc
Instrument Type	CR:110A
Description	Dosemeter
Serial Number	CA4451

Calibration Procedure

The instrument detailed above has been calibrated to the publish test and calibration data as detailed in the instrument hand book, using the techniques recommended in the latest revisions of the International Standards IEC 61672-1:2002, IEC 60651:1979, IEC 60804:2001,IEC 61260:1995, IEC 60942:1997, IEC 61252:1993, ANSI S1.4-1983, ANSI S1.11-1986 and ANSI S1.43-1997 where applicable.
Sound Level Meters: All Calibration procedures were carried out by subsitituting the microphone capsule with a suitable electrical signal, apart from the final acoustic calibration.

Calibration Traceability

The equipment detailed above was calibrated against the calibration laboratory standards held by Cirrus Research plc. These are traceable to International Standards {A.0.6}. The standards are:

Microphone Type	B&K4180	Serial Number	1893453	Calibration Ref.	S 6009
Pistonphone Type	B&K4220	Serial Number	613843	Calibration Ref.	S 5964

Calibrated by T. A. Goodhill

Calibration Date	21 August 2014
Calibration Certificate Number	221253

This Calibration Certificate is valid for 12 months from the date above.

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Certificate of Calibration

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Equipment Details

Instrument Manufacturer	Cirrus Research plc
Instrument Type	CR:110A
Description	Dosemeter
Serial Number	CA4499

Calibration Procedure

The instrument detailed above has been calibrated to the publish test and calibration data as detailed in the instrument hand book, using the techniques recommended in the latest revisions of the International Standards IEC 61672-1:2002, IEC 60651:1979, IEC 60804:2001,IEC 61260:1995, IEC 60942:1997, IEC 61252:1993, ANSI S1.4-1983, ANSI S1.11-1986 and ANSI S1.43-1997 where applicable.
Sound Level Meters: All Calibration procedures were carried out by subsitituting the microphone capsule with a suitable electrical signal, apart from the final acoustic calibration.

Calibration Traceability

The equipment detailed above was calibrated against the calibration laboratory standards held by Cirrus Research plc. These are traceable to International Standards {A.0.6}. The standards are:

Microphone Type	B&K4180	Serial Number	1893453	Calibration Ref.	S 6009
Pistonphone Type	B&K4220	Serial Number	613843	Calibration Ref.	S 5964

Calibrated by T. A. Goodhill

Calibration Date	21 August 2014
Calibration Certificate Number	221254

This Calibration Certificate is valid for 12 months from the date above.

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Certificate of Calibration

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dedicated to noise measurement

Equipment Details

Instrument Manufacturer	Cirrus Research plc
Instrument Type	CR:110A
Description	Dosemeter
Serial Number	CA4500

Calibration Procedure

The instrument detailed above has been calibrated to the publish test and calibration data as detailed in the instrument hand book, using the techniques recommended in the latest revisions of the International Standards IEC 61672-1:2002, IEC 60651:1979, IEC 60804:2001,IEC 61260:1995, IEC 60942:1997, IEC 61252:1993, ANSI S1.4-1983, ANSI S1.11-1986 and ANSI S1.43-1997 where applicable.
Sound Level Meters: All Calibration procedures were carried out by subsitituting the microphone capsule with a suitable electrical signal, apart from the final acoustic calibration.

Calibration Traceability

The equipment detailed above was calibrated against the calibration laboratory standards held by Cirrus Research plc. These are traceable to International Standards {A.0.6}. The standards are:

Microphone Type	B&K4180	Serial Number	1893453	Calibration Ref.	S 6009
Pistonphone Type	B&K4220	Serial Number	613843	Calibration Ref.	S 5964

Calibrated by T. A. Goodhill

Calibration Date	21 August 2014
Calibration Certificate Number	221255

This Calibration Certificate is valid for 12 months from the date above.

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Certificate of Calibration

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Equipment Details

Instrument Manufacturer	Cirrus Research plc
Instrument Type	CR:110A
Description	Dosemeter
Serial Number	CA4501

Calibration Procedure

The instrument detailed above has been calibrated to the publish test and calibration data as detailed in the instrument hand book, using the techniques recommended in the latest revisions of the International Standards IEC 61672-1:2002, IEC 60651:1979, IEC 60804:2001,IEC 61260:1995, IEC 60942:1997, IEC 61252:1993, ANSI S1.4-1983, ANSI S1.11-1986 and ANSI S1.43-1997 where applicable.
Sound Level Meters: All Calibration procedures were carried out by subsitituting the microphone capsule with a suitable electrical signal, apart from the final acoustic calibration.

Calibration Traceability

The equipment detailed above was calibrated against the calibration laboratory standards held by Cirrus Research plc. These are traceable to International Standards {A.0.6}. The standards are:

Microphone Type	B&K4180	Serial Number	1893453	Calibration Ref.	S 6009
Pistonphone Type	B&K4220	Serial Number	613843	Calibration Ref.	S 5964

Calibrated by T. A. Goodhill

Calibration Date	21 August 2014
Calibration Certificate Number	221256

This Calibration Certificate is valid for 12 months from the date above.

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Certificate of Calibration

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Equipment Details

Instrument Manufacturer	Cirrus Research plc
Instrument Type	CR:110A
Description	Dosemeter
Serial Number	CA4502

Calibration Procedure

The instrument detailed above has been calibrated to the publish test and calibration data as detailed in the instrument hand book, using the techniques recommended in the latest revisions of the International Standards IEC 61672-1:2002, IEC 60651:1979, IEC 60804:2001,IEC 61260:1995, IEC 60942:1997, IEC 61252:1993, ANSI S1.4-1983, ANSI S1.11-1986 and ANSI S1.43-1997 where applicable.
Sound Level Meters: All Calibration procedures were carried out by subsitituting the microphone capsule with a suitable electrical signal, apart from the final acoustic calibration.

Calibration Traceability

The equipment detailed above was calibrated against the calibration laboratory standards held by Cirrus Research plc. These are traceable to International Standards {A.0.6}. The standards are:

Microphone Type	B&K4180	Serial Number	1893453	Calibration Ref.	S 6009
Pistonphone Type	B&K4220	Serial Number	613843	Calibration Ref.	S 5964

Calibrated by T. A. Goodhill

Calibration Date	21 August 2014
Calibration Certificate Number	221257

This Calibration Certificate is valid for 12 months from the date above.

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Certificate of Calibration

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Equipment Details

Instrument Manufacturer	Cirrus Research plc
Instrument Type	CR:110A
Description	Dosemeter
Serial Number	CA4503

Calibration Procedure

The instrument detailed above has been calibrated to the publish test and calibration data as detailed in the instrument hand book, using the techniques recommended in the latest revisions of the International Standards IEC 61672-1:2002, IEC 60651:1979, IEC 60804:2001,IEC 61260:1995, IEC 60942:1997, IEC 61252:1993, ANSI S1.4-1983, ANSI S1.11-1986 and ANSI S1.43-1997 where applicable.
Sound Level Meters: All Calibration procedures were carried out by subsitituting the microphone capsule with a suitable electrical signal, apart from the final acoustic calibration.

Calibration Traceability

The equipment detailed above was calibrated against the calibration laboratory standards held by Cirrus Research plc. These are traceable to International Standards {A.0.6}. The standards are:

Microphone Type	B&K4180	Serial Number	1893453	Calibration Ref.	S 6009
Pistonphone Type	B&K4220	Serial Number	613843	Calibration Ref.	S 5964

Calibrated by T. A. Goodhill

Calibration Date	21 August 2014
Calibration Certificate Number	221258

This Calibration Certificate is valid for 12 months from the date above.

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Appendix 4

Certificate of Competence

(1 Page)

Institute of Acoustics

Certificate of Competence in Environmental Noise Measurement

This is to certify that

Robert John Lethbridge

has completed a course of instruction approved by the Institute of Acoustics and designed to enable the candidate to undertake environmental noise measurements in a competent manner and has achieved a satisfactory performance in the written and practical examinations thereof and that this fact has been recorded in a Register kept by the Institute for this purpose.

Education Committee Chairman

Institute Secretary

Date 15 May 2015

Centre University of the West of England

Reference Number EF362

For the purposes of Credit Transfer or Professional Development this Certificate may be considered to be equivalent to 25 points or hours

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