ACOUSTIC CONSULTANTS LTD

Noise Impact Assessment

Proposed Industrial Development
Dove Valley Park, Derby

Reference: 8726/PR/BL

Client:	*Acoustic Consultant:*
PGFI III Ltd	

Document Control

Version	Revision Description	Date	Author:	Reviewed by:
8018	1st Issue	17/10/19	Pedro Rodrigues, MIOA	Blake Lucas, MIOA
8726	1st Issue, Updates 8018 Report, 17/10/19 – Updated site Layout, EA comments, plant data updated, client comments	20/08/21	Pedro Rodrigues, MIOA	Blake Lucas, MIOA
9532	1st Issue, Updates 8726 Report, 20/08/21 – Updated site Layout, EA comments, plant data updated	09/02/2022	Pedro Rodrigues, MIOA	Blake Lucas, MIOA

The report has been prepared in good faith, with all reasonable skill and care, based on information provided or available at the time of its preparation and within the scope of work agreement with the Client. We disclaim any responsibility to the Client and others in respect of any matters outside the scope of the above. The report is provided for the sole use of the named Client and is confidential to them and their professional advisors. No responsibility is accepted to other parties.

The report limits itself to addressing solely on the noise aspects as included in this report. We provide advice only in relation to noise and acoustics. It is recommended that appropriate expert advice is sought on all the ramifications (e.g. CDM, structural, condensation, fire, legal, etc.) associated with any proposals in this report or as advised and concerning the appointment. It should be noted that noise predictions are based on the current information as we understand it and on the performances noted in this report. Any modification to these parameters can alter the predicted level. All predictions are in any event subject to a degree of tolerance of normally plus or minus three decibels. If this tolerance is not acceptable, then it would be necessary to consider further measures.

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1. Introduction

PGF III Ltd appointed Acoustic Consultants Limited to carry out a noise impact assessment from the proposed industrial development operations at Dove Valley Park, Derby in support of a planning application.

The brief was to monitor existing background sound levels and provide a British Standard 4142:2014 noise impact assessment of activities associated with the proposed industrial operations and associated vehicle delivery movements on the nearby sensitive receivers around the site.

In addition, the noise emission limits required to meet planning condition 18 (Ref. DMPA/2019/1205) at the nearest noise sensitive receivers were also considered in this report. These were found to be more stringent than a typical BS4142:2014 noise impact assessment based on existing background noise levels.

This report also follows the Environmental Agency (EA) published guidance on "Noise impact assessments involving calculations or modelling", published on the 23rd of October 2018 and provides a Noise Management Plan (NMP) based on the EA's "Noise and vibration management: environmental permits" guidance published on the 23rd of July 2021 as requested by the Environmental Agency following the EPR initial application on behalf of PGFI III, and submission of our ACL's noise Impact Assessment Report Ref. 8018 - Dove Valley Park, Derby V1.0, dated 17/10/19.

This report also considers noise related planning condition 18 (Ref. DMPA/2019/1205), which sets the site noise emission limits at the nearest noise sensitive receivers as stated in ACL's noise Impact Assessment Report Ref. 8018 - Dove Valley Park, Derby V1.0, dated 17/10/19.

This report also considers recent updates to the site in terms of building fabric and plant located on the northern elevation of the site and nearest noise sensitive receiver to the west at the nearby Woodlands farm. However, Woodlands farm is located within an industrial area and therefore the background noise levels are expected to be higher than those obtained at the sensitive receivers to the north of the site and at a much higher distance when compared to the nearest industrial units. Therefore, the background noise levels used below to assess the impact of industrial noise upon Woodlands farm is considered to be a worst-case assumption. We can also confirm that Park View which was located within the proposed site boundary has been demolished following its purchase and is not considered a noise sensitive receptor anymore.

The author of this report is a Full Member of the Institute of Acoustics (MIOA) with a recognised acoustic qualification and twelve years' experience within the field of noise and acoustics and as such is suitably qualified and experienced to undertake a British Standard 4142:2014 assessment.

2. The Site & Proposals

The site is located at Land North East of Dove Valley Park, Derby. The proposal is for a "Part single, two-storey facility for the extraction, processing, bottling and distribution of water-based products (combined B2 and B8 use), with associated parking and landscaping".

The nearest noise sensitive residential dwellings are those located to the north on the northern boundary facing Littlemeadow Lane and north west boundary abutting Woodyard Lane.

The receptor Woodlands farm, which is located to the west was also requested by the EA to be considered in the noise impact assessment, however, we would consider that this receiver is subject to higher background noise levels than those obtained at the worst-case receivers to the north. We can also confirm that Park View which was located within the proposed site boundary has been demolished following its purchase and is not considered a noise sensitive receptor anymore.

The main source of noise source currently affecting the site is road traffic in the surrounding road network such as Woodyard Ln, including distant road traffic on A50 (Foston – Hatton – Hilton Bypass) and industrial noise from the existing operations around the site.

It is understood that the development will be constructed in two Phases. This report considers the operation of the whole scheme (Phase 1 & 2).

The existing aerial view and proposed site plan (including Phase 1 & 2) are shown in Figures below.

Figure 1: Aerial Google view of the existing industrial site at Dove Valley Park

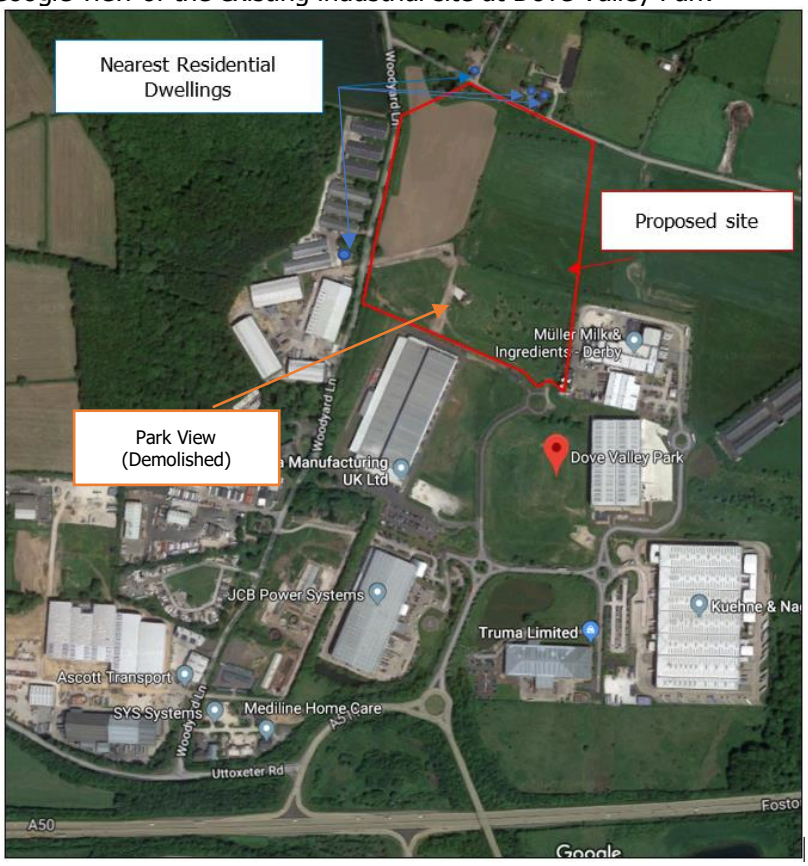


Figure 2: Proposed Site Industrial Site Plan (indicative Site Layout)

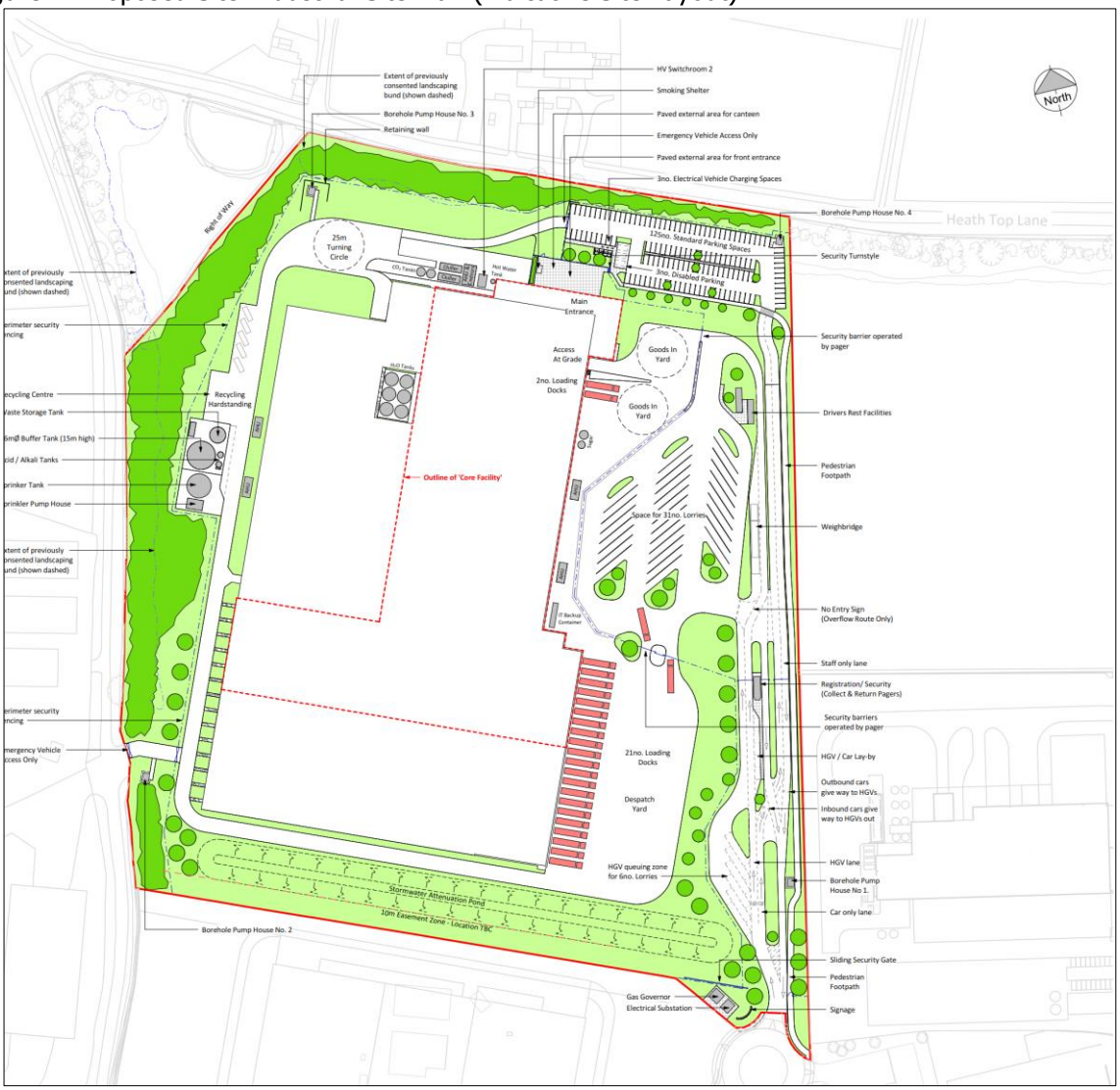
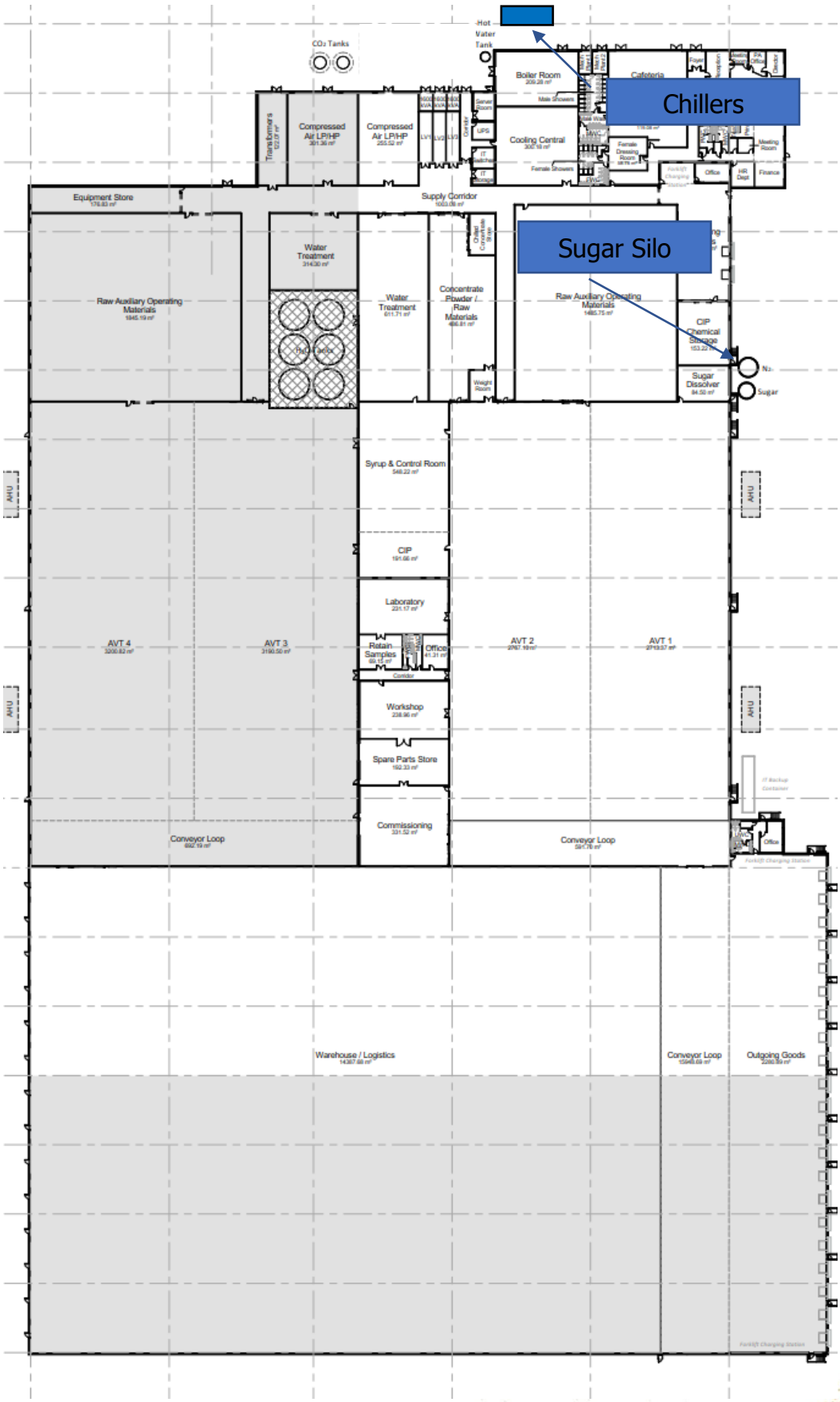


Figure 3: Proposed Site Industrial Site Plan (Phase 1(white colour) & 2 (light grey colour))



3. Planning and Noise

3.1. Planning Conditions (Ref. DMPA/2019/1205)

The proposed Dove Valley development (Ref. DMPA/2019/1205) received planning permission on the 21st October 2019, subject to the following 'noise' related conditions:

"17. The design and construction of the proposed building shall be capable of achieving sound insulation performance index Rw of 40dB which shall be maintained for the life of the approved development. Alternatively, prior to the construction of the main building in whole or in part, a noise mitigation scheme that specifies provisions for the control of noise emanating from noise sources within the proposed building shall be submitted to and approved in writing by the Local Planning Authority. The noise mitigation scheme shall be maintained as approved for the lifetime of the development.

Reason: In the interests of protecting the amenity of the area and adjoining occupiers."

"18. The level of noise emitted from the site shall not exceed 44dB LAeq(1 hour) between 07:00 to 23:00 hours and 41 dB LAeq(15mins) between the hours of 23:00 to 07:00, as measured at the nearest noise sensitive receptor. Where access to the nearest sound sensitive property is not possible, measurements shall be undertaken at an appropriate location and corrected to establish the noise levels at the nearest sound sensitive property.

Reason: In the interests of protecting the amenity of the area and adjoining occupiers."

Planning Condition 17 has been addressed by the applicant and relates to relates to the laboratory sound insulation index performance of the building fabric.

To meet planning condition 18, the level of noise emitted from the site will need to meet the above daytime and night time noise limits at the nearest noise sensitive receivers as stated in ACL's noise Impact Assessment Report Ref. 8018 - Dove Valley Park, Derby V1.0, dated 17/10/19.

In addition, by complying with the planning condition 18 specific noise level limits, we would also consider that the resultant noise rating levels $L_{Ar,T}$ at the nearest noise sensitive receivers will be acceptable and therefore a BS4142:2014 noise impact assessment will result in a low significant impact. The assessment in accordance with BS4142:2014 is understood to be an EA requirement; see below.

3.2. Environmental Agency Requirements

It is understood that as part of the EPR initial application on behalf of PGFI III, ACL's noise Impact Assessment Report (Ref. 8018 - Dove Valley Park, Derby V1.0, dated 17/10/19) has been submitted and the Environmental Agency (EA) have requested further information relating to noise modelling exercise previously carried out which is required to follow the EA published guidance on "Noise impact assessments involving calculations or modelling", published on the 23rd of October 2018.

The EA also requested that a noise management plan should be included in the submission and should take into account the results of the noise assessment carried out and detailing the measures taken on site to ensure noise is minimised. We have been requested to follow 'H3 guidance' on noise management plans, however, it is understood that this guidance has now been replaced by a new EA guidance entitled "Noise and vibration management: environmental permits" published on the 23rd of July 2021.

Further comments have been received by the EA following the submission of ACL's 8726 Report, 20/08/21 which aimed to address the above previous received EA's comments.

The noise related comments are as follows:

- *"In accordance with our guidance on noise impact assessment data requirements you must submit your model input data in QSI data exchange format files where you have used noise modelling- please supply this data in the correct format. This is required so our modelling specialists can carry out their audit.*
- *Submit a separate noise management plan in line with our guidance on noise, please see the noise management plan template attached which you may find useful.*
- *Please also amend your noise impact assessment to take into account the nearby Woodlands farm and confirm that Park View which is now within the site boundary has been removed as a sensitive receptor due to its purchase (if this is the case)."*

This report in an update to the previous submitted report 8726 Report, 20/08/21. It includes the additional noise sensitive receptor Woodland Farm as requested by the EA and also revises the noise model of the site and BS4142:2014 assessment previously carried following additional information received about additional plant/ revised plant in respect to the chillers/ condenser units locations and noise data. Indoor noise levels previously used and assumed to be sound power noise levels were revised and are now understood to relate to sound pressure indoor noise levels obtained indoors in a similar site in Germany.

A separate noise management report (NMP) will be provided separately and in line with the EA's requests above and NMP template report recently submitted to us.

3.2.1. Noise impact assessments involving calculations or modelling (EA)

The Environmental Agency (EA) have requested further information relating to the carried-out noise modelling exercise which is required to follow the EA published guidance on "Noise impact assessments involving calculations or modelling", published on the 23rd of October 2018. This document is reproduced below. Most of the requested elements are provided not only on the report but also on the excel summary sheet and noise modelling CadnaA software file attached to this report.

"The Noise Impact Assessment involving calculations or modelling states the following:

If you need to give the Environment Agency a noise impact assessment that uses computer modelling or spreadsheet calculations you must include the information listed in this guidance. This includes general information such as descriptions of your site and detailed noise data, usually displayed in tables.

You must also:

- *clearly state any assumptions used in the computer model or spreadsheet*
- *submit all noise modelling files or spreadsheet calculations*
- *submit noise model input data in QSI data exchange format files where you have used noise modelling*
- *submit the numerical noise data (except the terrain data - this is not required) in a clearly labelled and concise spreadsheet*

If you do not provide all the information we need to process your application we may have to ask you for it. This will delay your application.

We do not require assessments of off-site traffic or construction noise.

GENERAL INFORMATION YOU MUST PROVIDE

You must provide a description of:

- *the site location and layout*
- *your proposed activities and sources of any noise*
- *local receptors and reasons for selection*
- *your noise remediation approach*

You must also provide a:

- *map showing the site and surrounding area including receptors*
- *site plan including the site boundary*

You must also provide a:

- *full noise survey report if you have carried out a BS4142 assessment*

- *description of the noise mitigation measures you propose using and supporting evidence, such as the manufacturer's engineering specification for items that mitigate noise emissions, or calculations of the screening effect of barriers*

NOISE DATA YOU MUST PROVIDE

You must provide the following information. You must use 1 metre resolution National Grid references for all location data.

Fixed and mobile plant

You must provide the following information for fixed and mobile plant:

- *grid references*
- *referenced or derived sound power levels (preferably octave band, for derived provide the measurements and calculations)*
- *heights*
- *directivities*
- *operating times*

Noise emitting buildings

You must provide the following information for noise emitting buildings:

- *corner grid references*
- *heights*
- *octave band reverberant sound pressure calculations or measurements*
- *referenced octave band transmission coefficients*

façade and roof emissions

You must also account for aperture emissions, providing:

- *grid references*
- *dimensions*
- *sound power levels*
- *opening times*

Site traffic

You must provide the following information about site traffic:

- *grid references for site roads*
- *vehicle sound power levels*
- *traffic numbers*
- *traffic speed*

Site buildings

For site buildings, whether acoustically emitting or not, provide:

- *corner grid references*
- *heights*

Off-site buildings

For any off-site buildings that may affect sound levels at receptors (through screening, reflection or diffraction), provide:

- *corner grid references*
- *heights*

Site acoustic barriers

You must provide the following information about site acoustic barriers:

- *grid references at ends*
- *construction details*
- *thicknesses*
- *heights*

Terrain data

Where you are relying on screening by buildings or barriers for noise attenuation you must provide accurate elevations (height above sea level) and heights (above ground) for:

- *sources*
- *barriers or buildings*
- *receptors*

Use high resolution spot heights or contours.

You should incorporate the terrain data into the model. Do not submit separate copyrighted terrain files.

Receptors

You must provide the following information about any receptors:

- *grid references*
- *addresses or other identification*
- *number of storeys (estimate sound pressure levels for each storey)*
- *sensitivity*
- *BS4142 background LA90*

- *specific and rating levels for site activities*
- *rationale for applying or not applying acoustic penalties*
- *numerical impacts*

3.2.2. **Noise and vibration management: environmental permits**

The purpose of this guidance is as follows:

"Environmental permits have conditions that require operators to control pollution – this includes controlling noise and vibration. The Environment Agency, Scottish Environment Protection Agency (SEPA), Natural Resources Wales and Northern Ireland Environment Agency have produced this guidance to help holders and potential holders of permits apply for, vary, and comply with their permits. When we use the term 'environment agencies' in this guidance we mean these 4 organisations.

This guidance covers:

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

This guidance replaces these documents which have been withdrawn:

- *Environment Agency Horizontal Guidance for Noise (H3) parts 1 and 2*
- *SEPA's Guidance on the control of noise at PPC installations"*

With regards to Noise Managements Plans, the guidance states the following:

"NOISE MANAGEMENT PLANS (NMP)

Compliance with a good NMP is an excellent way of demonstrating that your site operations are properly controlled.

NMPs should demonstrate your competence and commitment to controlling noise pollution. It should be clear that you understand the noise pollution potential of any process, and that you have systems in place to manage that risk effectively.

Having a NMP does not mean we will consider you are using all the appropriate measures needed. If your regulator thinks your NMP is not sufficient for its purpose, they may suggest improvements.

You should regularly review your NMP, typically once a year. Your review should also consider land use around the facility and any future developments that may increase the impact.

The scope and level of detail in your NMP should be enough to show that you are effectively managing noise emissions from your premises. All NMPs should, as a minimum, include:

- *"a clear statement that you understand and accept your responsibilities for controlling noise impact, and that you will regularly review the effectiveness of your NMP*
- *a commitment that either you, or your contractors or subcontractors, will make sure that any noise control equipment is designed, operated and maintained appropriately so it controls noise effectively at all times*
- *a risk assessment of noise problems from normal and abnormal situations, including worst case scenarios due to, for example, weather, temperature, breakdowns and accidents*
- *details of the appropriate controls (both physical and management) needed to manage the identified risks*
- *confirmation of the level of monitoring that should be in place*
- *details of the actions you will take, contingencies, and responsibilities, when problems arise (it is particularly important that you include expected actions resulting from exceptional circumstances or where serious pollution may occur)*
- *confirmation of the procedures in place to consider reducing or stopping operations to avoid serious noise pollution*
- *a procedure for engaging with neighbours to minimise their concerns and respond to complaints"*

If the environment agencies consider certain aspects of your NMP do not meet the expected standard, or it does not have all the appropriate measures needed, you should review and amend the plan.

If you do not do this, we may impose a requirement or restriction on your site operations. We would do this in a way that gives you the right to appeal (for example, by varying your permit to add site specific improvement conditions or a prescriptive condition).

We may refuse (or require improvements to) an application if you submit a sub-standard NMP as part of an application.

For permit holders, if original measures are operating as designed, but are still not completely solving the problem, then you will be given reasonable time to propose and implement improvements that will solve the problem.

The environment agencies will set out any requirements in writing. If you do not act, or supply requested information, within the specified timescale this is likely to be a breach of permit conditions or the regulations.

What is a reasonable timescale to find a solution and amend the NMP will depend on how significant the problem is and how technically difficult the solutions are. Major site modifications may take months or more than a year to complete. But you should

present the initial proposals and subsequent detailed plans in a timely manner, either in weeks or months, as appropriate.

No NMP can cover every eventuality. Even if you follow your plan, noise pollution may sometimes occur. This would usually indicate that you need to put in place further appropriate measures.

If a noise pollution incident occurs and your NMP does not meet the expected standard, we will take this into account in our enforcement decisions. It will be more difficult for you to demonstrate you were using appropriate measures in any subsequent enforcement action.

Whilst we accept that no NMP can cover every eventuality, noise emissions from your premises are always your responsibility. We may still consider immediate enforcement if:

- *you are not doing something you said you would do in your NMP*
- *you have not specified, designed, operated, maintained or managed a measure in the NMP appropriately*
- *there is a risk of serious impact on human health or the environment*

If you need to carry out rapid action to solve a noise problem, it is possible that the action may contravene something previously written in your NMP. We would prefer you to take the action to solve the problem. You will be given reasonable time to update your NMP after the event.

You may not need a NMP if we agree your site has a permanently low noise impact. However, if problems arise, we may change our assessment and require you to write one.

Incident Management Plan

Your permit may require you to have an accident or incident management plan. You can include noise-related incidents in this because it is where staff would look in an emergency. However, if the site has a NMP, it may be more appropriate to cover noise related incidents in the NMP as long as it identifies:

- *the appropriate response to a situation*
- *who is responsible for taking preventative action, and taking action after an incident*

The environment agencies expect you to identify environmentally critical plant and maintain a list of required spares. This will make sure vital equipment can be repaired quickly.

Where any incident occurs with the potential to significantly affect the environment, Articles 7 and 8 of the Industrial Emissions Directive (and corresponding UK legislation) require operators to take immediate action to limit the environmental consequences.

Your ultimate control measure when problems arise is to reduce or stop operations to avoid serious noise pollution. Your NMP should include a clear statement of the situations in which this could occur and how you will manage them.

NMPs should identify the points in the operation where significant noise pollution may occur, and where you can impose throughput restrictions or stop production. Where continuous throughput is critical to a business, operators must demonstrate that they have suitable measures in place that will prevent the need to reduce or stop production. For example, you may have redundancy built in to your process so you always have standby plant available to use if there is a problem with the primary equipment."

4. Assessment Methodology

4.1. British Standard 2014:2014+A1:2019

For industrial and commercial noise, the most relevant guidance is provided within British Standard 4142:2014+A1:2019. The methods described in the British Standard use outdoor sound levels to assess the likely effects of sound upon people who might be inside or outside a dwelling or other premise used for residential purposes.

The initial estimate principle is that of establishing the 'difference' between the 'rating level' and the 'background sound level'. The 'rating level' is the 'specific sound level' of the source over a period of one hour during the day (07:00 to 23:00 hours) and over a period of 15 minutes during the night (23:00 to 07:00 hours). Clause 9 entitled 'Rating Level' states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level."

An acoustic character correction should be added to the 'specific sound level' if it exhibits any tonality, impulsivity, other specific characteristics and/or intermittency at the assessment location. The value of the character correction varies, dependent on the prominence of the character of the sound source at the assessment location. In Clause 11 of the Standard, entitled 'Assessment of the Impacts', it states:

"Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (see Clause 8) from the rating level (see Clause 9), and consider the following.

- *Typically, the greater this difference, the greater the magnitude of the impact.*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
- *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."*

Based on the initial assessment outcomes of BS4142, and depending on context, it is our opinion that the NOEL, LOAEL and SOAEL levels stated in the Noise Policy Statement for England would generally fall within the following categories when considered in conjunction with the effect levels of the NPPG Noise.

Table 1: BS4142 Difference in Relation to Effect Levels

BS4142 Assessment Difference	Corresponding Effect Level*	Action*
≤-10 dB	No Observed Effect	No specific measures required
-9.9 dB to 0 dB	No Observed Adverse Effect	No specific measures required
	Lowest Observed Adverse Effect Level	
0.1 dB to 5 dB	Observed Adverse Effect	Mitigate and reduce to a minimum
	Significant Observed Adverse Effect Level	
5.1 dB to 10 dB	Significant Observed Adverse Effect	Avoid
≥10.1 dB	Unacceptable Adverse Effect	Prevent

* BS4142 states that "where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration". Therefore, the assessment levels and effect levels above are not definitive and can be modified due to context.

It should be noted that the numerical outcome only represents the initial estimate of impact, as stated in the first paragraph of Clause 11, and that contextual matters should be considered before determining what the potential impact is. This paragraph states:

> *The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.*
>
> *Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (see Clause 8) from the rating level (see Clause 9).*
>
> *NOTE 1 More than one assessment might be appropriate.*

The second part of Clause 11 sets out three contextual matters that should be taken into account once the initial numerical estimate has been determined. It is important to note that the three listed are not exhaustive and all pertinent factors should be considered.

4.2. British Standard 8233:2014

British Standard 8233:2014 entitled 'Guidance on sound insulation and noise reduction for buildings' came into effect on 28th February 2014 and supersedes British Standard 8233:1999. In the section of the Foreword entitled 'Information about this document', it outlines the principal changes to the previous version. The changes relevant to new student development are as follows:

Publication in England of the National Planning Policy Framework in March 2012, with the concurrent withdrawal of numerous individual planning guidance and policy statement documents, including those specifically relating to noise.

Section 7.7.2 Table 4 of the British Standard provides internal ambient noise levels for dwellings from noise sources 'without a specific character' and these are based on existing guidelines issued by the World Health Organisation in 1999.

The British Standard guideline states that noise levels should not exceed those as noted in Table 4 of the British Standard, and this is summarised below:

Table 2: British Standard 8233:2014 Internal Noise Criteria

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

5. Noise Monitoring

A partially attended noise monitoring exercise was undertaken between the 08th October and 10th October 2019 to determine the existing environmental ambient noise levels at the proposed site.

5.1. Monitoring Equipment

Sound Pressure Levels were measured using a Sound Level Meter with a half-inch condenser microphone, using the 'fast' setting. The equipment is checked regularly using a Quality System meeting the requirements of British Standard EN ISO/IEC 17025:2005 and in accordance with British Standard EN 10012:2003 and traceable to the National Standards.

This equipment was checked and calibrated as noted below and the certificates are available for inspection upon request. Table 3 below provides the equipment and calibration status.

Table 3: Equipment and Calibration Status

Equipment Description / Manufacturer / Type	Serial Number	Date of Calibration	Calibration Certification Number
SLM, NTI, XL2	A2A-11053-E0	17/04/18	28365
Pre-Amp, NTI, MA220	5871	17/04/18	28365
Microphone, NTI, MC230A	9276	16/04/18	28364
Calibrator, Larson Davis, CAL200	12605	16/04/18	283673

The measuring system was checked for calibration before and after the tests and no significant drift was detected.

5.2. Weather Conditions

During the measurement the weather was partially dry with occasional periods of rain during the daytime period an average temperature of approximately 9-13 degrees Celsius. Wind speeds during the night time period were calm with average speeds below 5 m/s. During the daytime period, there were occasions where wind speeds were slightly above 5 m/s. Nevertheless, weather conditions are not expected to have adversely affected the measured noise data.

5.3. Baseline Noise Monitoring Procedure

A partially attended baseline noise monitoring exercise was undertaken between 13:30 hours on the 08th of October 2019 and 12:00 hours on the 10th of October 2019 at the monitoring location shown on figure below. The microphone was situated on a tripod at a height of 1.5 metres above the ground, in a free-field position.

Figure 4: Baseline Noise Monitoring Location

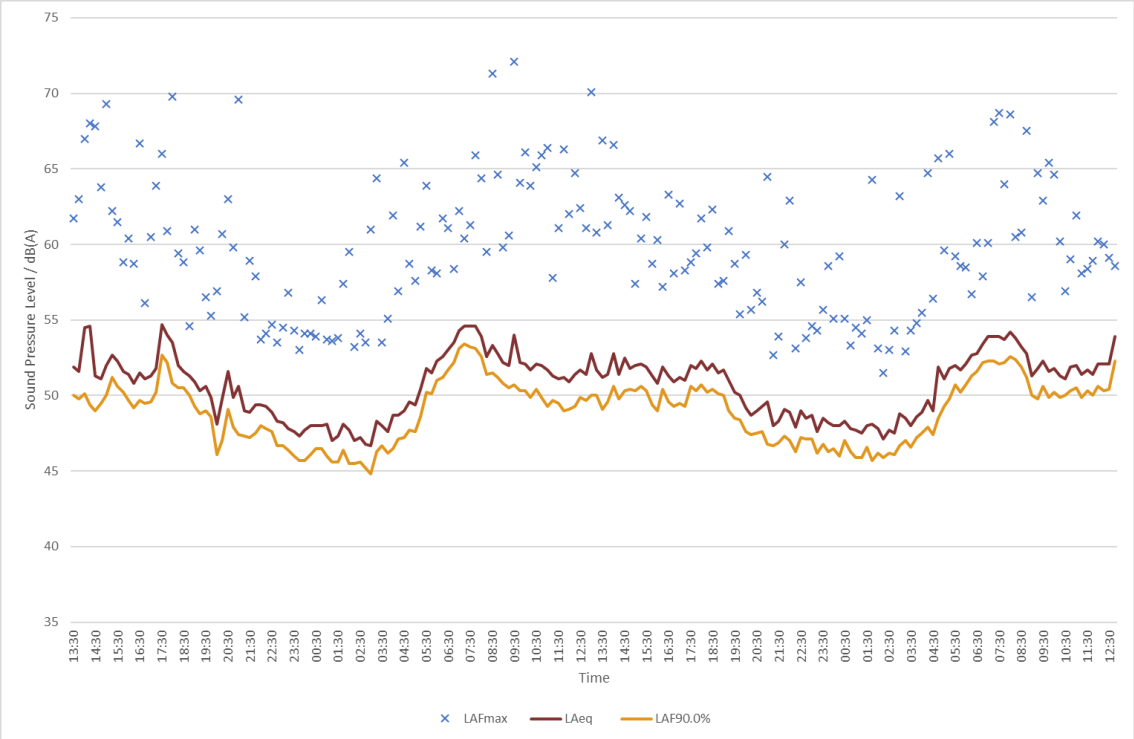
Borehole operations were taking place on site at Borehole Location No.1; see Figure 2 above.

These operations have started on Wednesday 9th October2019 and are understood to run only during the daytime period between 10:00 and 17:00 hours. Nevertheless, the noise impact from the borehole operations at the measurement location were considered negligible when compared to the surrounding noise sources and therefore this measurement location and measured background sound levels can be considered representative of the nearest noise sensitive receivers. This is also shown in Chart 1 and summary result table below, where the variation in noise was considered consistent and similar throughout the whole survey period.

5.4. Measured Levels

The variation in A-weighted baseline background sound levels and equivalent noise levels are provided in Chart 1 below. The tabular data is available upon request.

Chart 1: Measured Baseline Noise Levels (Free-Field Levels)



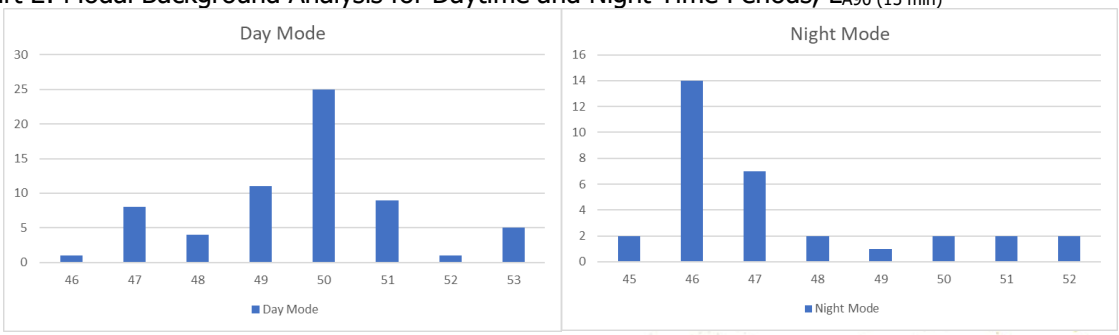
From the measured data, we have determined the following design background sound level and equivalent noise level over the monitoring period for the assessment proposed critical operational periods. The levels are free-field levels.

Table 4: Summary of Measured Noise Levels (free-field levels)

Parameter	$L_{A90(15min)}$		$L_{Aeq(15min)}$	
	Range	Mode	Range	Mode
Daytime (07:00 – 23:00 hours)	46 - 53	50	48 - 55	52
Night Time (23:00 – 07:00 hours)	45 - 52	46	47 - 54	48

We would consider the above modal background sound levels and equivalent noise levels to be typical for the noise-sensitive receivers during the operational assessment critical hours. The modal analysis for background L_{A90} is also provided below.

Chart 2: Modal Background Analysis for Daytime and Night Time Periods, $L_{A90\ (15\ min)}$



6. Noise Modelling

To determine noise levels across the site, noise modelling has been undertaken using computer modelling package Cadna:A by DataKustik and the measured data noted above. The software predicts industrial noise using the general method of calculation from ISO 9613-1.

6.1. Proposed Industrial Operations

The Mitteldeutsche Erfrischungsgetränke (MEG) group of companies, a subsidiary of the Schwarz Group, is proposing to build a beverage production at the Dove Valley Park, Derby site.

It is understood that the proposed plant and operations that will take place at the new proposed industrial site will be very similar to the current ones taking place at the existing sites in Germany.

For this reason, plant noise levels have been supplied to us by the PGF III's European acoustic consultant. Sound levels provided below are understood to be sound pressure levels obtained at the distance of 1 metre from the source indoors, according to PGF III's European acoustic consultant.

Figure 6 below presents the expected noise sources and indoor sound power levels at in each unit/ area of the proposed industrial site. The sound pressure levels are based on sound level measurements obtained at MEG Löningen GmbH & Co. KG (Germany) in 2017 and carried out by ZECH Ingenieurgesellschaft, a similar site and building with similar sources and levels according to the client. These Noise Source codes are shown in Figure 5 and are also identified on Figure 6 below. External plant noise sources have also been provided by the client to us. This might however still change, however, noise levels assumed are expected to be representative of a worst case scenario.

All the meters used in the measurements carried out at the MEG Löningen GmbH & Co. KG (Germany) site were understood to be calibrated (DKD German Calibration Service) and using a precision sound level meter of class 1. The weather conditions were also considered to be acceptable and are expected to have adversely affected the measured noise data.

This layout plan of Figure 5 is understood to be now out of date and was recently updated to the proposed layout plan shown above in Figure 3. Nevertheless, the noise levels indoors and types of rooms are still considered to be same and therefore these levels were applied to the new layout. All sources are understood to run continuously over 24 hours.

Figure 5: Proposed ground floor layout plan and plant – Out of date layout plan, showing noise sources from Figure 6 associated with each room/ area and applied in the proposed layout used in the noise model.

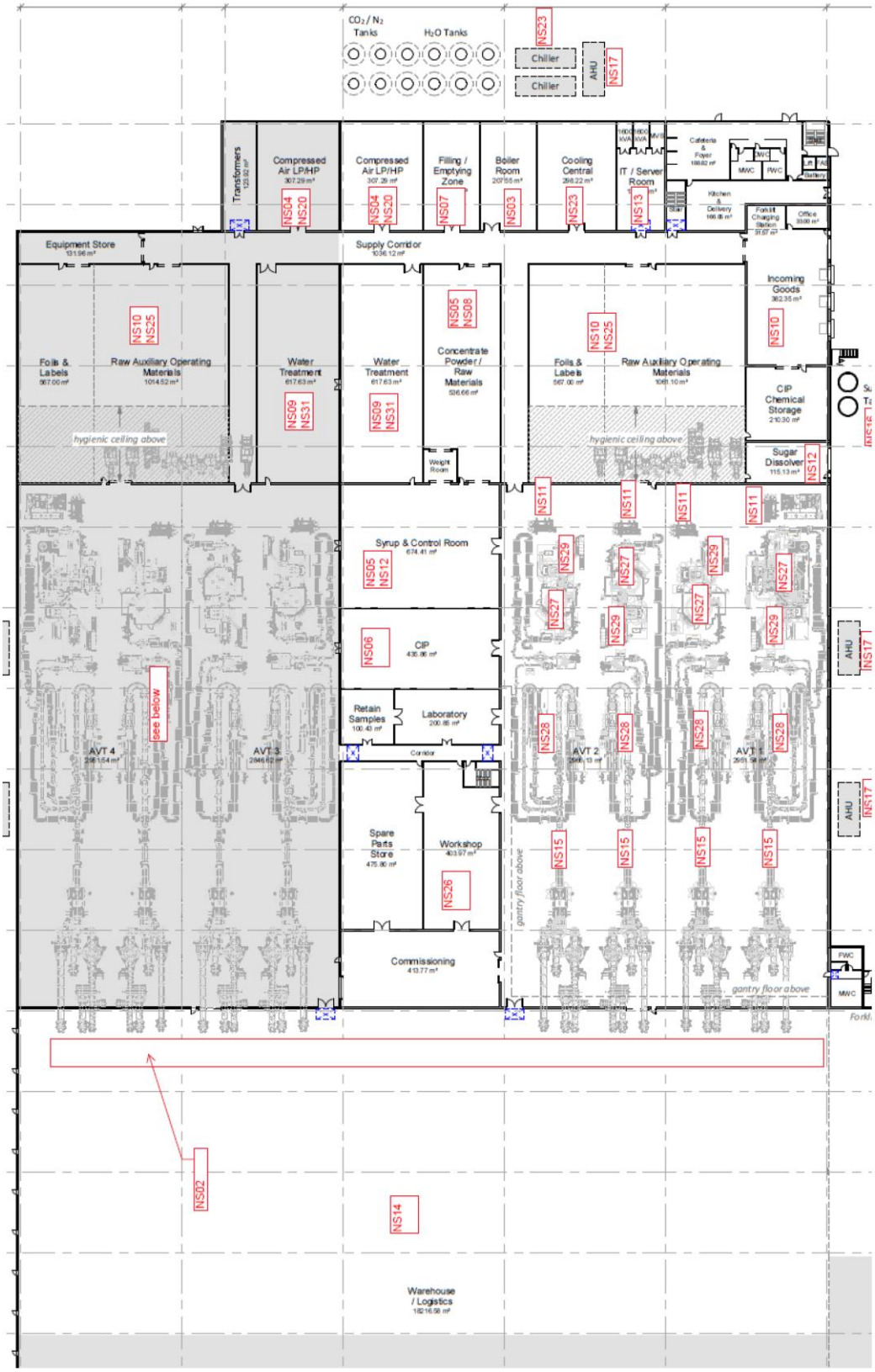


Figure 6: Proposed plant, respective sound power levels, and operating times

Noise Source Code	Unit / Area	Sound Pressure Level dB(A) at 1 metre
NS02	Warehouse, telpher	89
NS03	Steam / boiler room	69
NS04	Compressed air, LP	86
NS05	Process technology, general	63
NS06	Process technology, CIP	69
NS07	Process technology, valve island	85
NS08	Pulver solution	63
NS09	Water house	68
NS10	Incoming warehouse, raw auxiliary operating materials	70
NS11	filling and packing line, mixer & flash pasteurizer	85
NS12	Sugar dissolver	80
NS13	Low voltage distribution	80
NS14	Warehouse, general	63
NS15	Filling and packing line, general	85
NS16	Sugar delivery	89
NS17	ventilating systems	60
NS20	Compressed air, hp	85
NS23	Chiller	90
NS25	Filling and packing line, preform supply	79
NS26	Workshop, general	80
NS27	Filling and packing line, filling unit	90
NS28	Filling and packing line, foil shrinking unit	83
NS29	Filling and packing line, blowing station	87
NS31	Water treatment	84

Based on the current proposed layout, and noise sources associated with each area as shown in Figure 5 and Figure 6, we have predicted and considered the following operational indoor noise sources in our model. The cumulative sound pressure noise levels below were used to predict the indoor noise levels in each unit/ area that will then be used in the model as a horizontal (roof) / vertical (Wall/ Plant) area source.

Table 5: Proposed Indoor/ Outdoor Noise Sources

Room's Name (as stated in proposed layout)	Noise Source(s) Code	Resultant Sound Pressure Level dB(A) at 1 metre
Warehouse & Logistics	NS14+NS02	89
Conveyor Loop + Outgoing Goods	NS14	63
NS26-Workshop	NS26	80
NS06 - CIP	NS06	69
Syrup & Control Room	NS12+NS05	80
Raw Auxiliary Operating	NS25+NS10	80

Water Treatment	NS31+NS09	84
Water Treatment	NS31+NS09	84
Concrete Powder / Raw Materials	NS08+NS05	66
Folls & Labels + Raw Aux Operating Materials	NS10+NS25	80
Incoming Goods	NS10	70
Sugar Dissolver	NS12	80
Compressed Air LP/HP	NS20++NS04	89
Compressed Air LP/HP	NS20+NS04	89
Boiler Room	NS03	69
Cooling Central	NS23	85
Server Room (wall only)	NS13	80
AVT 1+AVT 2	NS11 (x4) +NS15 (X4) + NS27 (x4) + NS29 (X4)	100
AVT 3 +AVT 4	NS11 (x4) + NS15 (X4) +NS27 (x4) + NS29 (X4)	100

6.2. Industrial Noise Levels

6.2.1. Predicted Industrial Indoor Noise Levels

Based on the supplied plant sound pressure indoor noise levels above, we have predicted the cumulative indoor noise levels expected within each room of the building. The rooms were considered reflective (average alfa of 0.1) and dimensions are based on the supplied Stride Treglown architectural drawings. Calculations also assume plant to be at the centre of the room (Q=2). Predicted indoor plant noise levels are shown below in Table 6; calculations for each room are provided in more detail in Appendix 2. All levels below operate continuously over 24 hours.

Table 6: Predicted indoor noise levels

Room area	Predicted Indoor Sound Pressure Level (dBA)
Warehouse & Logistics	70
Conveyor Loop + Outgoing Goods	49
NS26-Workshop	74
NS06 - CIP	63
Syrup & Control Room	72
Raw Auxiliary Operating	69
Water Treatment	76
Water Treatment	77
Concrete Powder / Raw Materials	58
Folls & Labels + Raw Aux Operating Materials	69
Incoming Goods	63
Sugar Dissolver	77
Compressed Air LP/HP	83
Compressed Air LP/HP	84
Boiler Room	65

Cooling Central	85
Server Room (wall only)	77
AVT 1+AVT 2	87
AVT 3 +AVT 4	87

6.2.2. Proposed Industrial External Plant Noise Levels

The proposed plant is understood to comprise Air Conditioning DAIKIN units and Air Handling Unit Dalair Ltd. The plant type and relevant manufacturer's noise data is provided in more detail in Appendix 3 and was provided to us by Hoare Lea's M&E Engineers. This plant might however change and is not confirmed at this stage; however, it should provide an indication of the levels affected by future installed condenser units of similar operational level.

It is understood that plant has only been selected for Phase 1 of the project. No plant has been proposed currently for Phase 2, however, it is anticipated that the roof plant applied will be the same or very similar as for Phase 1. For this reason, we have duplicated the proposed Phase 1 plant located on the roof area above production rooms (AHU and supply/ extract fans) in the Phase 2 roof area. The location of the external Sugar Silo and Chillers are shown in more detail in Figure 12.

Below we show a list of the proposed plant areas (Phase 1 only) as shown in supplied Hoare Lea drawings. It also shown the proposed external Silo and Chiller as supplied by the client.

Table 7: Number and Type of External plant currently proposed (Phase 1) & assumed (Phase 2)

Source Type/ Drawing Code	Location	Number of Units	Sound Power Levels (PWL)
Air Handling Unit (Dalair Ltd) / (AHU – X)	Roof	9 Units+6 Extra Assumed (Phase 2)	See Appendix 11.2.4 (2)
Extract Fans (Dalair Ltd) / (EF)	Roof	5 Units +1 Extra Assumed (Phase 2)	See Appendix 11.2.4 (2)
Supply Fans (Dalair Ltd) / (SF)	Roof	2 Units + 1 Extra Assumed (Phase 2)	See Appendix 11.2.4 (2)
Condenser Units (Daikin) (COND-X)	External, GF, North	12 Units	See Appendix 11.2.4 (2)
Sugar Silo's Filter	External, GF (Eastern Elevation)	1 Unit (9.3 metres height above ground, approximately roof height)	94 (3)
Sugar Silo's Dry Air Generator (assumed 2 metres height)	External, GF (Eastern Elevation)	1 Unit	88 (3)
Sugar Silo's Injector (assumed 2 metres height)	External, GF (Eastern Elevation)	1 Unit	97 (3)
Chiller (1No. Area source used)	External, GF, North	1 No, comprising multiple units occupying an area of approximately 13 x 2.5 metres	82 (1)

(1) Based on a sound power level of 90dB(A) at 32°C (worst case of supplied provided); At 30°C, sound power noise levels are understood to be 82dB(A), (Sound pressure level of approximately 74dB(A) at 1 metre)

(2) Manufacturer's Sound Power Noise Levels were used, which is considered to be the absolute value that a sound source generates – worst case
(3) Sound Power Level used based on provided Sound Pressure Noise Levels at 1 metre from source

Figure 7: Proposed roof plant above production Area – Phase 1 (AHU & Extract/ Supply Fans)

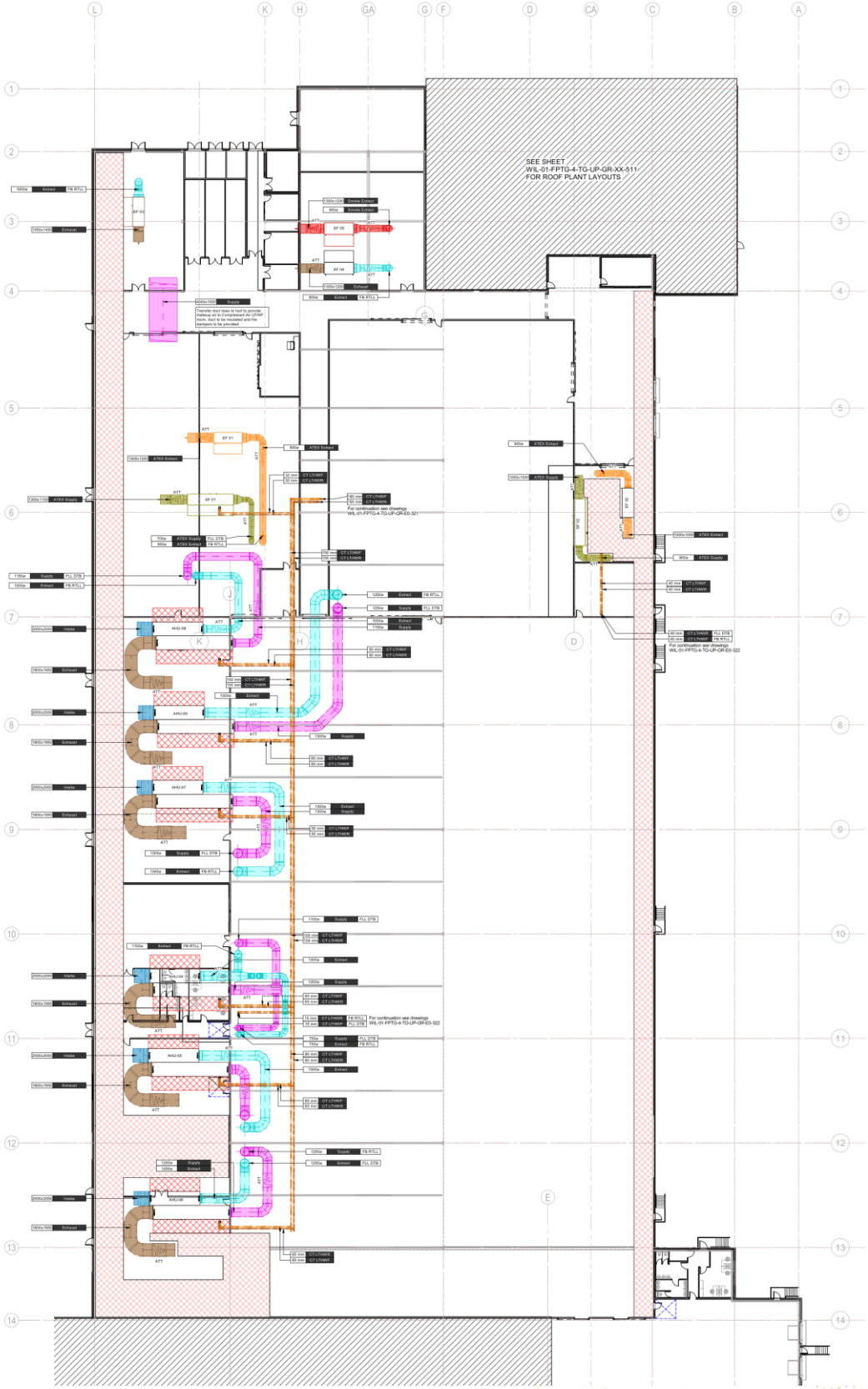


Figure 8: Proposed roof plant above Office Area (North Eastern Corner) – Phase 1 (AHU units) (1/3)

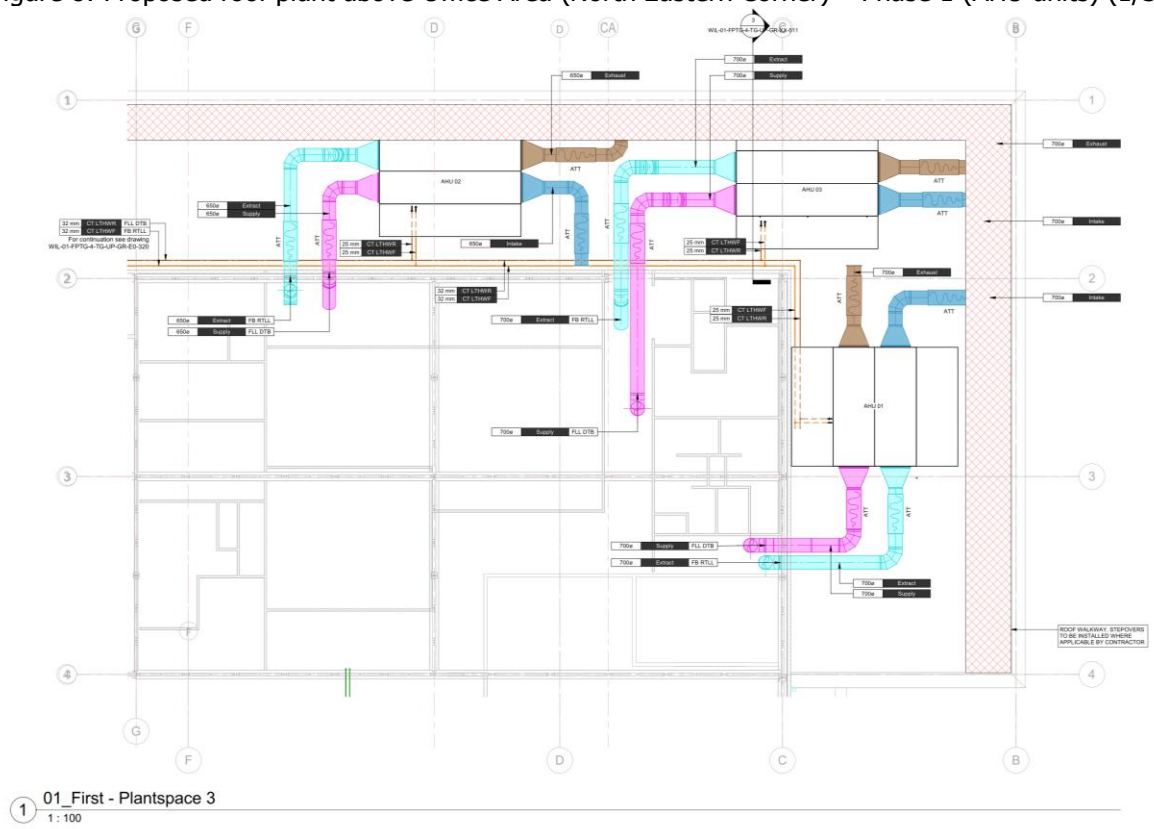


Figure 9: Proposed roof plant above Office Area (North Eastern Corner) – Phase 1 (AHU units) (2/3) – Roof Section

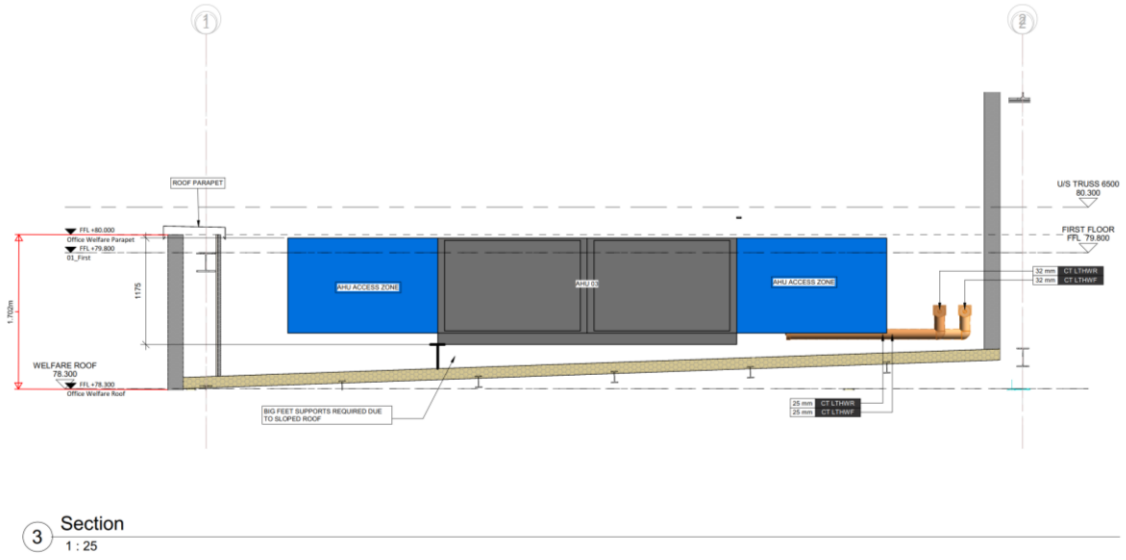


Figure 10: Proposed roof plant above Office Area (North Eastern Corner) – Phase 1 (AHU units) (3/3) – 3D View

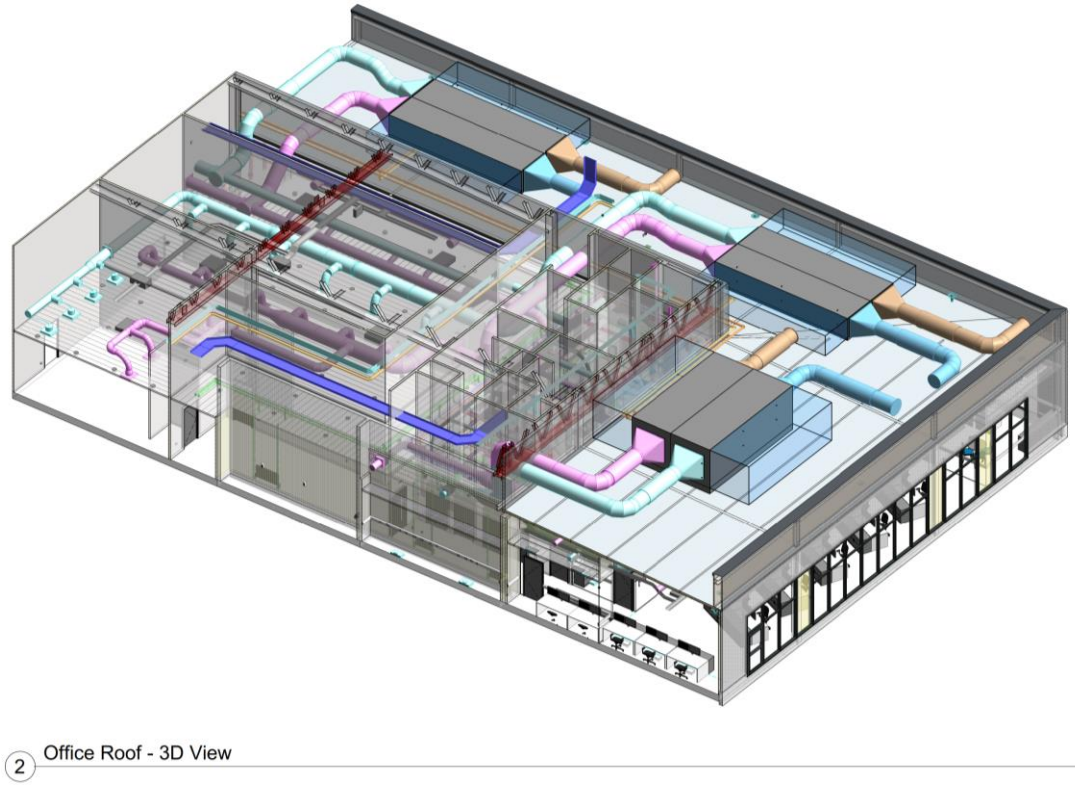


Figure 11: Proposed Condenser Units – Phase 1 – Layouts & 3D views

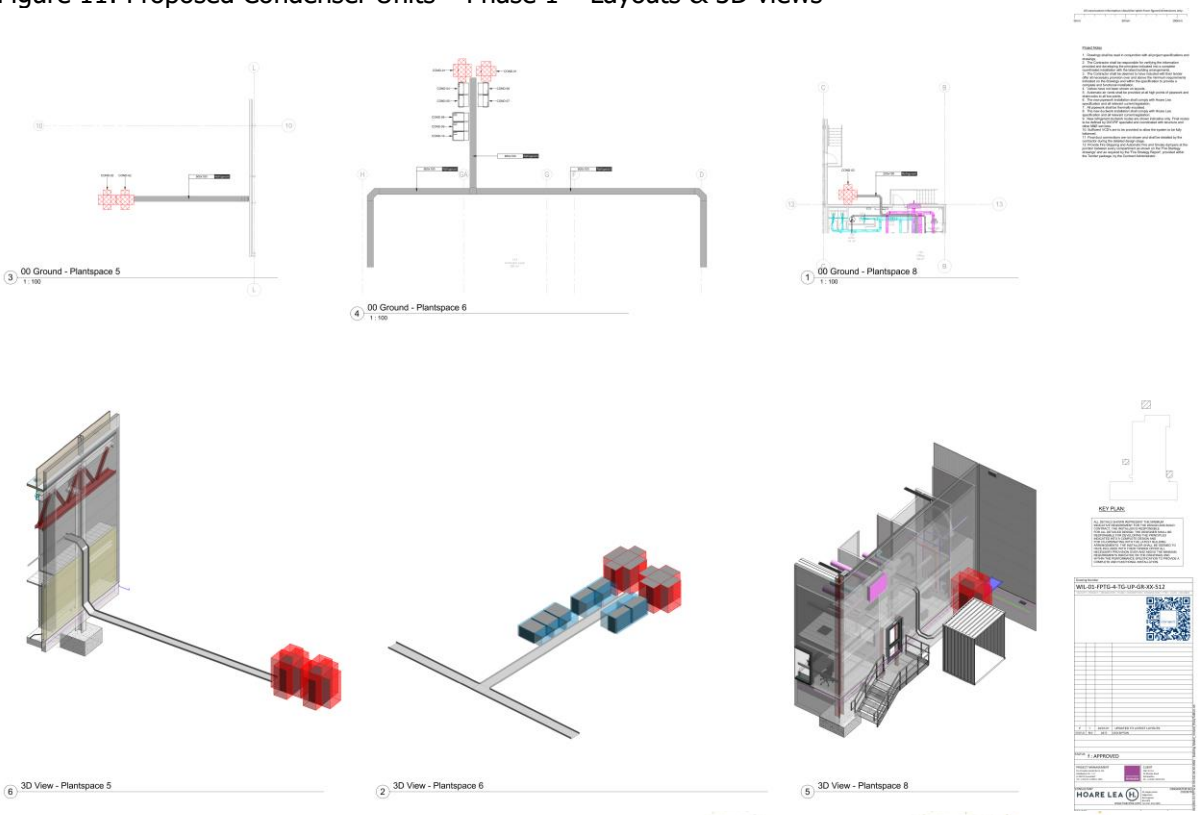
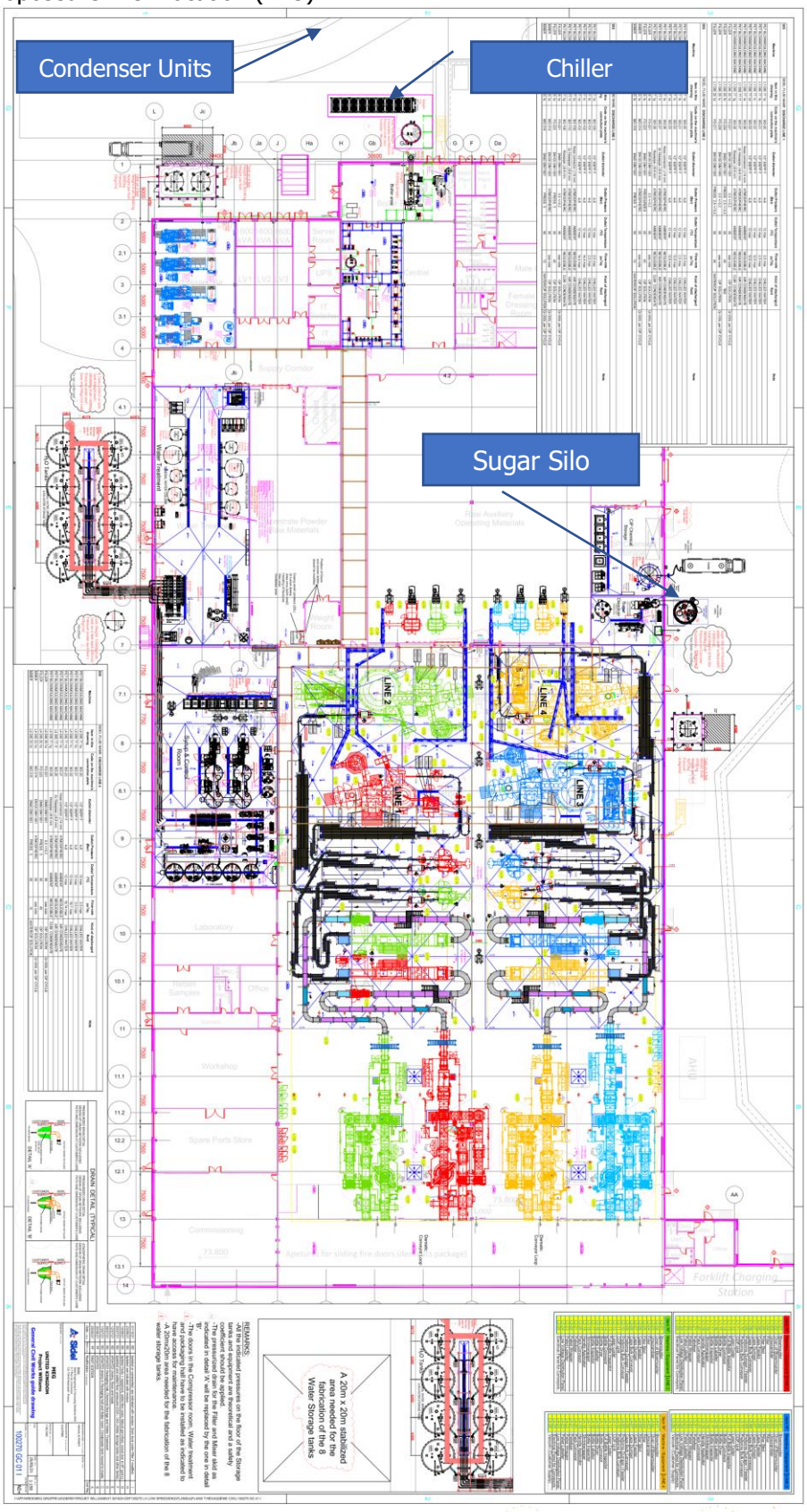


Figure 12: Proposed Chiller Location (N23)



AHU/ SF & EF Attenuators

It is understood that the proposed AHU/ SF & EF units will include attenuators. At this point in time, only a provisional space was provided so attenuators can be fitted by the contractor which might change current proposals to fit their own plant selection which should be similar to plant described above. For this reason, we have assumed generic attenuation, based on a standard NOICO rectangular attenuator, Model 40 with 600mm length. Higher attenuation is available, the selected attenuation can be used as a guide only to set the minimum insertion loss that should be provided by these attenuators.

The spectral insertion loss provided by a NOICO, Model 40 (600mm length) is shown below and was applied to all the supply & extract terminals of the proposed/ assumed AHU/ EF and SF. Any other alternative attenuators can be used, as long as the minimum insertion losses shown below are achieved. The selection of the final attenuator should also consider other design ventilation parameters. We would advise that any final selection is confirmed by the M&E engineers to check whether the selected attenuator complies with their design requirements.

Table 8: Recommended Minimum Insertion Loss for Attenuators

Attenuator Model	**Insertion Loss, Octave Band Spectrum (dB) / Frequency (Hz)**							
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
NOICO Model 40 - 600mm length	4	6	10	17	23	16	12	10

Chillers/ Condenser Units -COND 01 Noise Control

Noise predictions suggest that both Chillers and Condenser Units (CON-01, Daykin REYQ24 (REYQ16U+REYQ8U)) require noise control measures in order to meet the noise limits imposed by current planning condition at the nearest noise sensitive receivers to the north.

We would recommend reducing the worst-case noise level emissions of both, the proposed Chiller and 2No. Condenser Units (CON-01, Daykin REYQ24 (REYQ16U+REYQ8U)) by at least 8dB(A). Noise predictions carried out with the absolute sound power noise levels (worst-case) suggest that without noise control measures, the predicted noise levels are expected to be slightly above the planning condition 18 (Ref. DMPA/2019/1205) site's noise emission limits of "*44dB $L_{Aeq(1\ hour)}$ between 07:00 to 23:00 hours and 41 dB $L_{Aeq(15mins)}$ between the hours of 23:00 to 07:00".*

The Chillers noise data shown above is based on a worst case at a full load of 32°C. Therefore, it is anticipated that at normal duty, the levels will be lower than those considered above. At lower operational temperatures, e.g. Full Load 30°C, the sound power level reduces by at least 8dB (82dBA(A)) according to the manufacturer. Nevertheless, we would recommend reducing the noise emissions to cover a worst-case scenario.

With regards to the condenser units, sound power noise data has been used. This is in our opinion a worst-case assumption. The manufacturer also provides plant noise emissions in terms of sound pressure noise levels at 1 metre from the units. Where these are used instead, then the noise level emissions will result in a much lower noise impact at the nearest receiver. This is a much more realistic approach in our opinion based on our experience when measuring condenser units noise emissions on site, particularly when located on a free field on a slab and away from reflective facades.

Nevertheless, the worst-case scenario using sound power noise levels will be used, we would still recommend the introduction of noise control measures to these 2No. Units – CON-01).

In summary, both the Chiller and 2No. Condenser Units COND-01 would need to be reduced by at least 8dB(A)) to meet planning condition 18 noise limits.

The required attenuation can be achieved by adding noise control barriers (not always effective), specialist fitted acoustic attenuators or fully specialist acoustic enclosures which are designed to reduce noise and provide the required air flow to the units if necessary. The selected attenuation would need to be able to reduce broadband noise emissions from these units by at least 8dB(A).

We have considered in the noise calculations below that these units will be fitted with specialist acoustic attenuators/ enclosures and the operational broadband noise levels will be reduced by at least 8dB(A). The plant noise levels, and attenuation considered are also shown in the noise data in Appendix 2.

6.2.3. **Proposed Industrial Delivery Noise**

It understood that the proposed site will include HGV movements and loading/ unloading of goods operations at the proposed loading docks shown on the proposed site plan above. The proposed HGV circuits are understood to follow the circuits shown in Figure 13 below.

Figure 13: Vehicle movement's strategy and proposed loading docks location

It is also understood that the proposed HGV movements are expected to be as follows based on the clients provided information:

- Outgoing Goods (21no. loading docks to south of the site) = 0600 – 2200
- Incoming Goods (2no. loading docks and 1no. silos to north of the site) = 0700 – 1900

The respectively HGV circuits are marked up in pink and red colour above (Goods In/ Out). There is also one HGV circuit used occasionally to access the recycling area and Gas/ H2O tanks located to the north of the site.

6.2.4. **Predicted Industrial Delivery Noise**

It is also understood that each 1no. HGV takes 35 minutes to arrive to a dock, load the trailer, and leave. On this basis, we have assumed the following:

- Max of 42no. HGV movements (Loading/ Unloading) at 21no. loading docks to south of the site – per 60-minute intervals – Daytime.
- Max of 10no. HGV movements (Loading/ Unloading) at 21no. loading docks to south of the site – per 15-minute intervals – Night Time (1/4 of the total daytime period).
- Max of 4no. HGV movements (Loading/ Unloading) at 2no. loading docks – per 60-minute intervals- Daytime.
- Max of 1no. HGV movements (Loading or Unloading) at 1no. loading docks to south of the site – per 15-minute intervals – Night Time (1/4 of the total daytime period).
- Max of 1no.HGV movements (Loading or Unloading) at 1no. silos area to north of the site) - per 60-minute intervals – Daytime.

- Max of 1no.HGV movements (Loading or Unloading) at 1no. silos area to north of the site per 15-minute intervals- Night Time (1/4 of the total daytime period).

Acoustic Consultants Limited have measured the HGV vehicle movements on many industrial sites. The typical noise level of an HGV manoeuvring back including reverse alarm beeping is shown in Table 9 below. Noise levels were then used and been modelled in the noise modelling software Cadna:A.

The measured levels are free-field levels and have been corrected to a distance of 10 metres where appropriate. The microphone was situated on a tripod at a height of 1.5 metres above the ground, in a free-field position.

Table 9: Typical Delivery Operation Noise Emission within Industrial/ Commercial Sites

Duration, T (min)	$L_{Aeq,\,T}$ (dB)	Activity at 10m
5	68	HGV Arrive
60	54	HGV unloading
2	69	HGV Depart

The measured and predicted sound power octave band levels for the activities above are also shown in Appendix 2 and were used in our noise modelling below.

It is also understood that the HGV will reverse and load/ unload their goods inside the store at the loading docks. The docks are surrounded by a 'rubber curtain' which will protect some noise from escaping through the any gaps. However, we have considered that the loading dock's door to be open and therefore no sound insulation has been considered; this is considered to be a worst-case scenario. The level radiating through the open door is considered to be similar to the above predicted indoor noise levels.

Loading / Unloading activity associated with the above vehicle delivery movements was also inserted at the 1no. silos area to north of the site. Noise levels used are based on above ones measured and shown in Table 9 above and are shown in more detail in Appendix 2.

6.3. Proposed Construction

6.3.1. Proposed Cladding/ Wall

It is understood that the building cladding/ wall will be built of a thermal insulated type of panel, more specifically 175mm thick PAROC panel system, with a laboratory sound insulation performance index of 31dB Rw; See Appendix 11.2.7.

6.3.2. Proposed Roof

The proposed Roof construction is also understood to be 130mm thick on a metal deck with a single ply membrane. According to the client, the system will be similar to 'Test 3' shown in the Kingspan's 'Technical Bulletin, Acoustics: Airborne Sound

Transmission, UK' manual' which have achieved a laboratory sound insulation index result of 31dB Rw; See Appendix 11.2.7.

We are not aware of any rooflight system being proposed for this scheme, however, should the roof include rooflight areas, then these would need to achieve at least 31 dB Rw. This can be achieved by using double polycarbonate panels of 6mm each (mass per unit area of 3.6kg/m^2) with a cavity of around 100mm.

6.3.3. Proposed Windows

The proposed windows are unknown; however, windows are only expected to be installed within office areas with no risk for noise breaking out, therefore, no specific sound insulation performance is required. However, please note that typical standard double window a configuration of '4mm-12mm-4mm' is expected to achieve Rw 31dB.

6.3.4. Proposed Loading Bay Doors/ Openings

These areas were assumed in our noise model to be 'open' and with a laboratory sound insulation performance of 0dB Rw. These areas are located to the south east of the building, with very low impact upon the nearest noise sensitive receivers, and therefore do not require any specific laboratory sound insulation index performance. However, please note that when closed, basic roller shutter doors achieve at least 18dB Rw, or 25dB Rw if insulated panel doors are used.

6.4. Proposed & Existing Topography

The proposed absolute heights within the site are based on the topographical drawings provided by the architect and Civil Engineer.

The existing site, outside the proposed site boundaries was modelled using the current available LIDAR topography and a grid of 2x2 m height points was used.

Both the contour and height points can be seen within the attached CadnaA noise model file.

6.5. Proposed Earth Bund & Parapets

6.5.1. Proposed Earth Bund

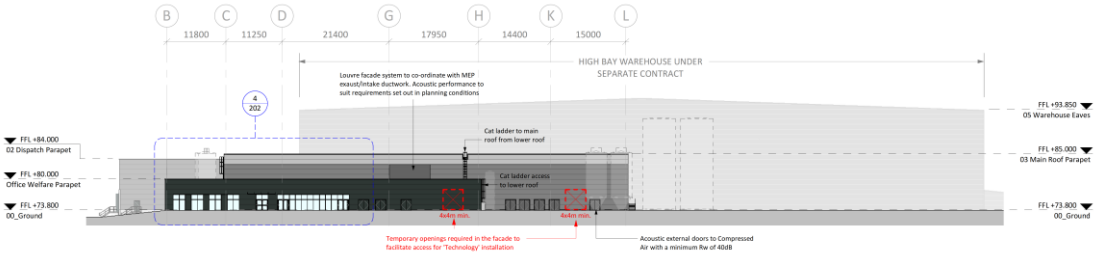
An earth bund has been proposed on the northern boundary of the site between the proposed development and the nearest noise sensitive receivers. The proposed absolute heights of the earth bund and site contour heights have been provided by the architect and are provided in appendix 2.

The northern building floor finish of the site is understood to have an absolute height of 73.8 metres above sea level. The site's heights decrease slightly towards the southern direction by some 0.45metres to an absolute floor finish height of 73.35 metres.

For this reason, the buildings ground heights in our noise model (CadnaA) below were considered to be flat, and the absolute ground height was considered to be 73.8 metres.

The proposed landscape earth bund is based on the supplied proposed topography of the site and is understood to be around 5 to 7 metres approximately above the absolute ground floor buildings height of 73.8 metres.

Figure 14: Proposed Northern Elevation showing proposed absolute floor finish heights



Layout North Elevation
1 : 500

Figure 15: Cross Section between site and receivers (assumed head top lane height) and indicative variation of absolute earth bund height

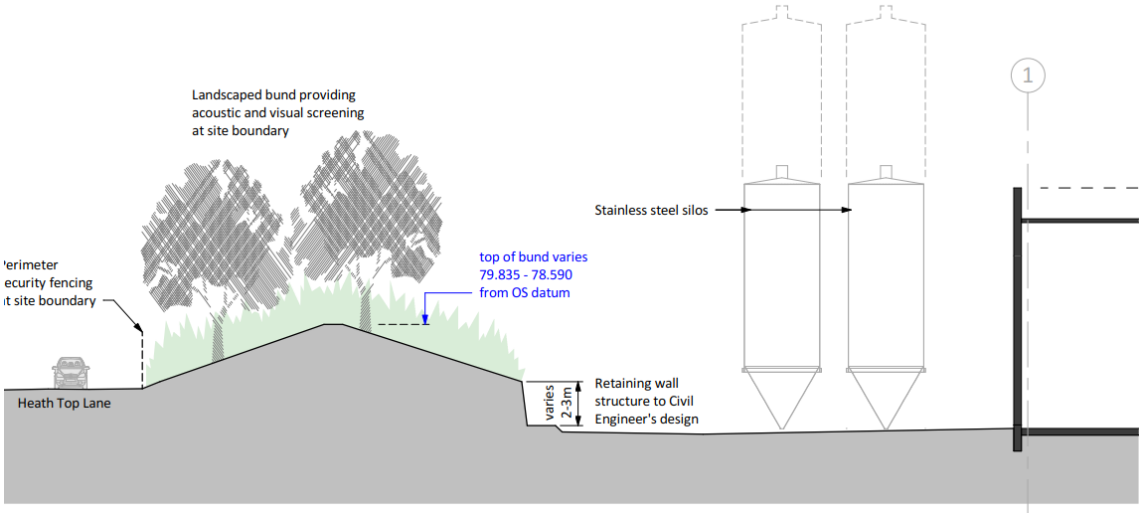
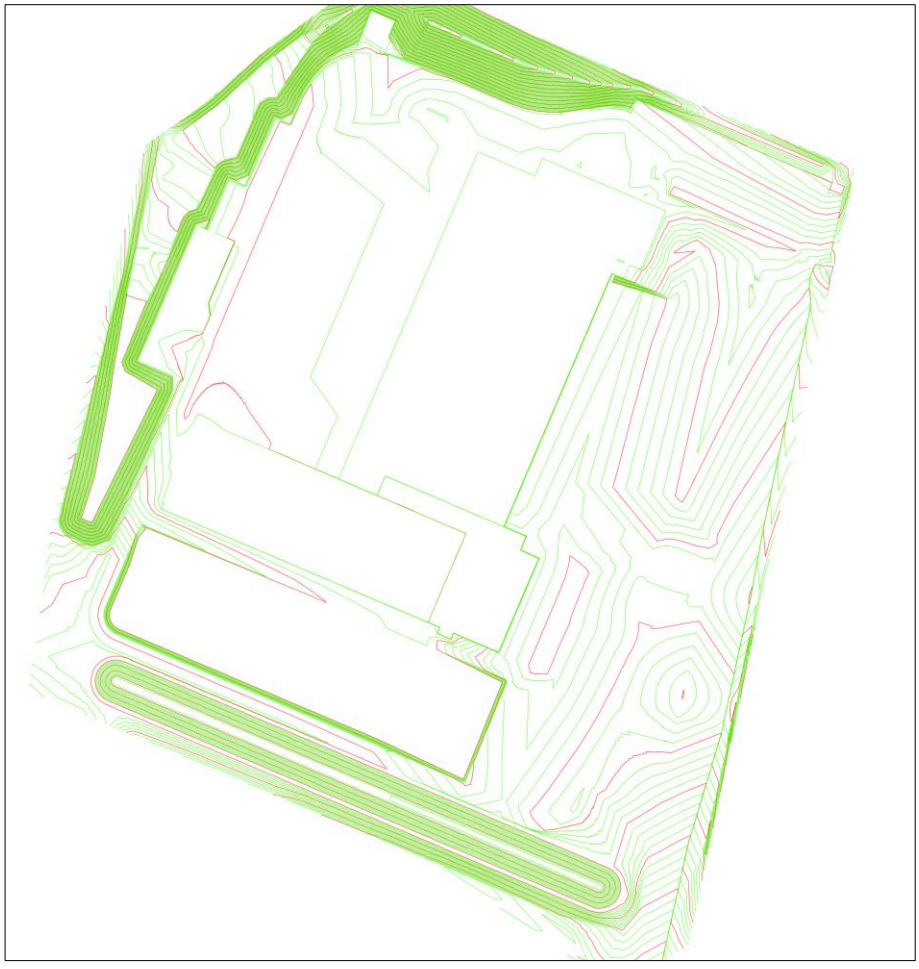


Figure 16: Proposed Site Height contours including of earth bund to be erected along the northern boundary of the site

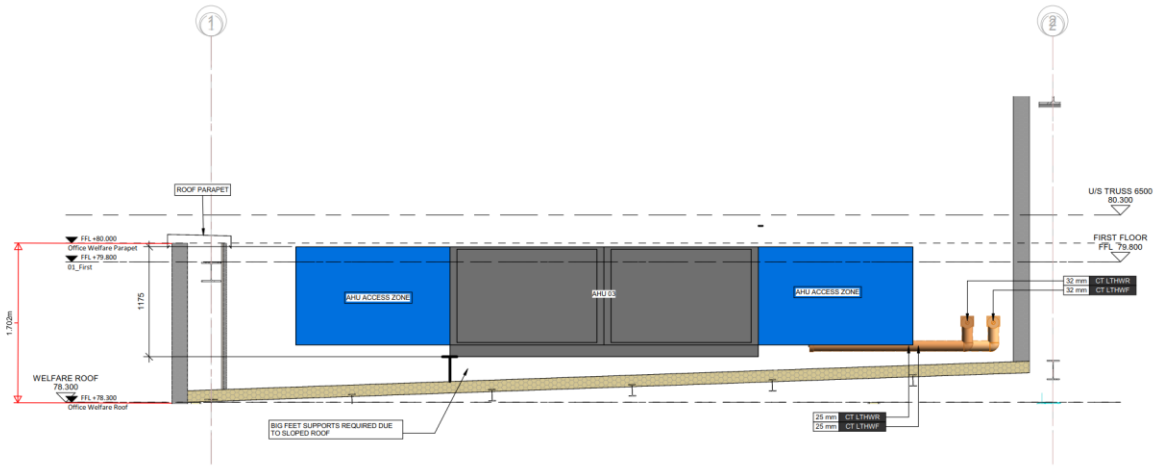


6.5.2. **Proposed Building Parapets**

It is understood that the building will include a parapet around the buildings with approximately 1.7 metres height, which was inserted as a relative height above the roof height of the buildings within CadnaA. This will provide some level of screening from proposed plant located at the roof of the proposed buildings. The only exception where this does not seem to be applied is at the warehouse building, however, no plat has been proposed on top of this roof.

Below we show a cross section of the proposed building showing the parapet.

Figure 17: Proposed parapet around the roof edge.



6.6. **Industrial Modelling Parameters**

The parameters within the Cadna:A model are as follows and are considered reasonable assumptions:

- The proposed building height is based on the supplied architectural elevations
- The existing building heights are based on site observations and vary between 7 to 15 metres high
- The 'max. Order of Reflection' was considered to be 1
- The ground across the site and surrounding area is considered hard and reflective (G=0) (worst-case)
- Buildings are considered to be reflective (alfa within CadnaA assumed to be 0.21)
- The predictions are based on the indoor, external plant and vehicle movement noise levels shown above in Section 6.2.1 to 6.2.3.
- The vehicle movements predictions are based on the measured pass by noise emission levels shown above (arrival/ departure). This level was then inserted in CadnaA using a moving point source to represent the pass by noise level of an HGV vehicle at 10km/h.
- The indoor noise levels were inserted in CadnaA as an indoor area noise source and vertical area noise source with the respective R_w performances

stated above. The height of the vertical area sources is assumed to be the full height of the proposed buildings which are shown in Appendix 2.

- The proposed absolute heights within the site are based on the topographical drawings provided by the architect and are provided in appendix 2.
- The existing site, outside the proposed site boundaries was modelled using the current available LIDAR topography and a grid of 2x2 m height points was used.
- The predicted noise map level is given at a height of 4.5 metres (worst case first floor window) above the ground height; absolute heights of receivers & building evaluation relative height above ground is provided in appendix.
- The generated noise map is given in a 5x5metres calculation grid

6.7. Industrial Modelling Results

Noise levels have been predicted based on the parameters set out above. The following noise models provide the daytime and night time predicted noise levels.

Figure 18: Predicted daytime $L_{Aeq,\ 1\ hour}$ noise levels

Figure 19: Predicted daytime $L_{Aeq,\ 1\ hour}$ noise levels at Northern Receivers

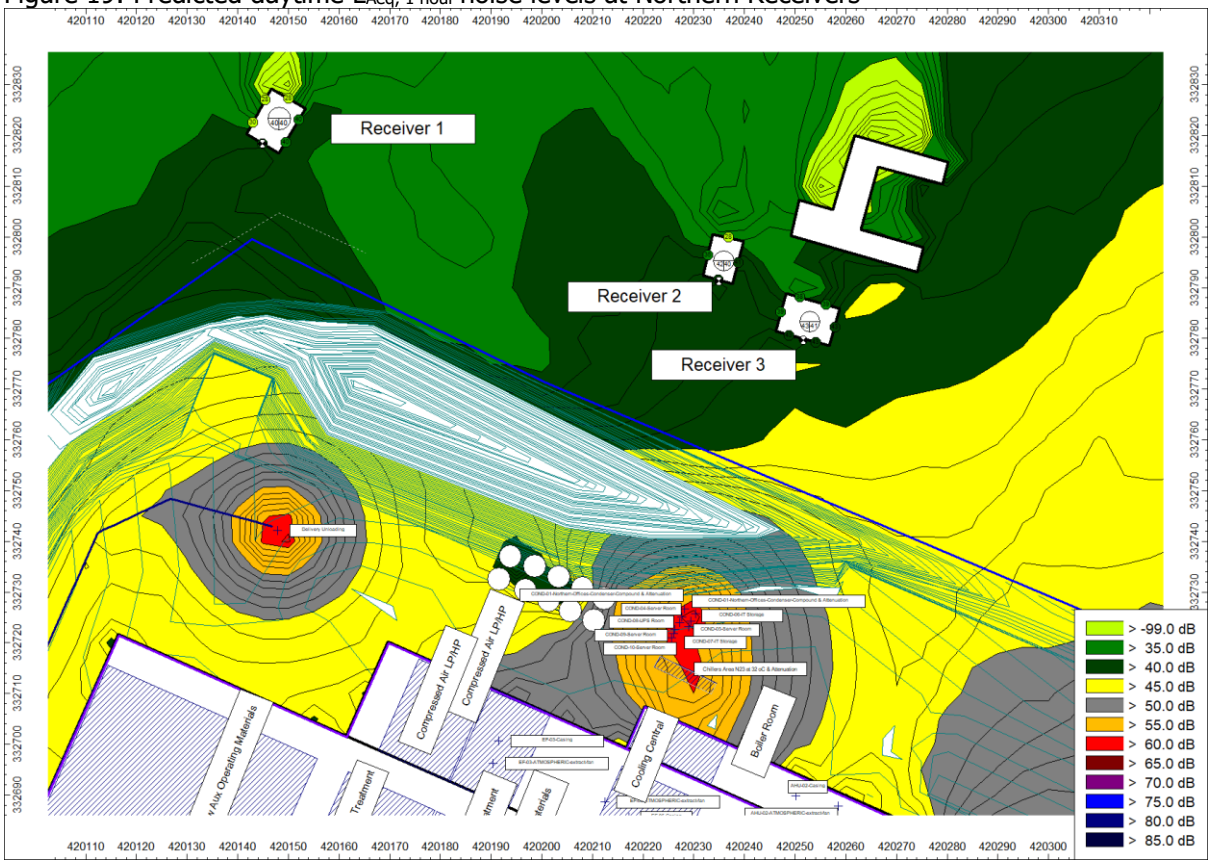


Figure 20: Predicted daytime $L_{Aeq,\ 1\ hour}$ noise levels at Western Receivers (Woodland Farm)

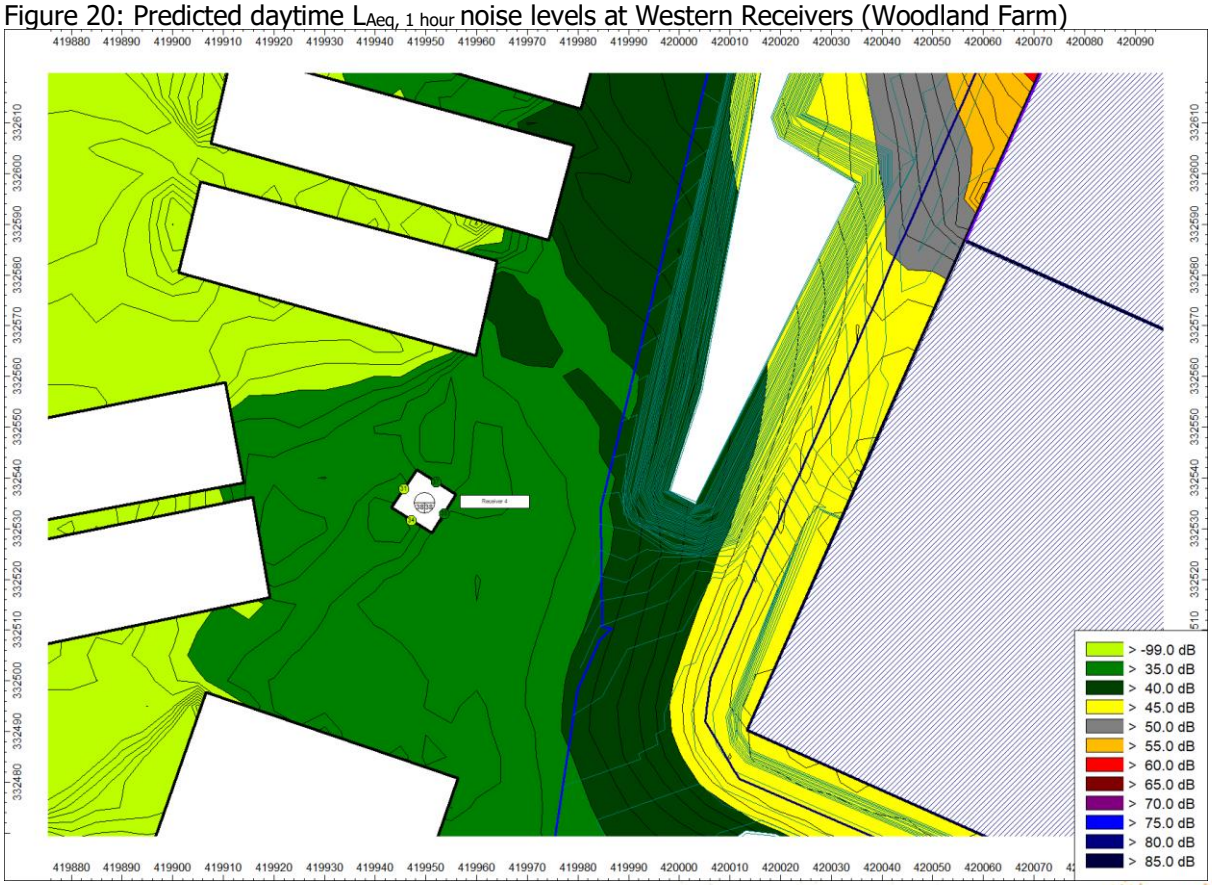


Figure 21: Predicted night time $L_{Aeq,\ 15\ min}$ noise levels

Figure 22: Predicted night time $L_{Aeq,\ 15\ min}$ noise levels at Northern Receivers

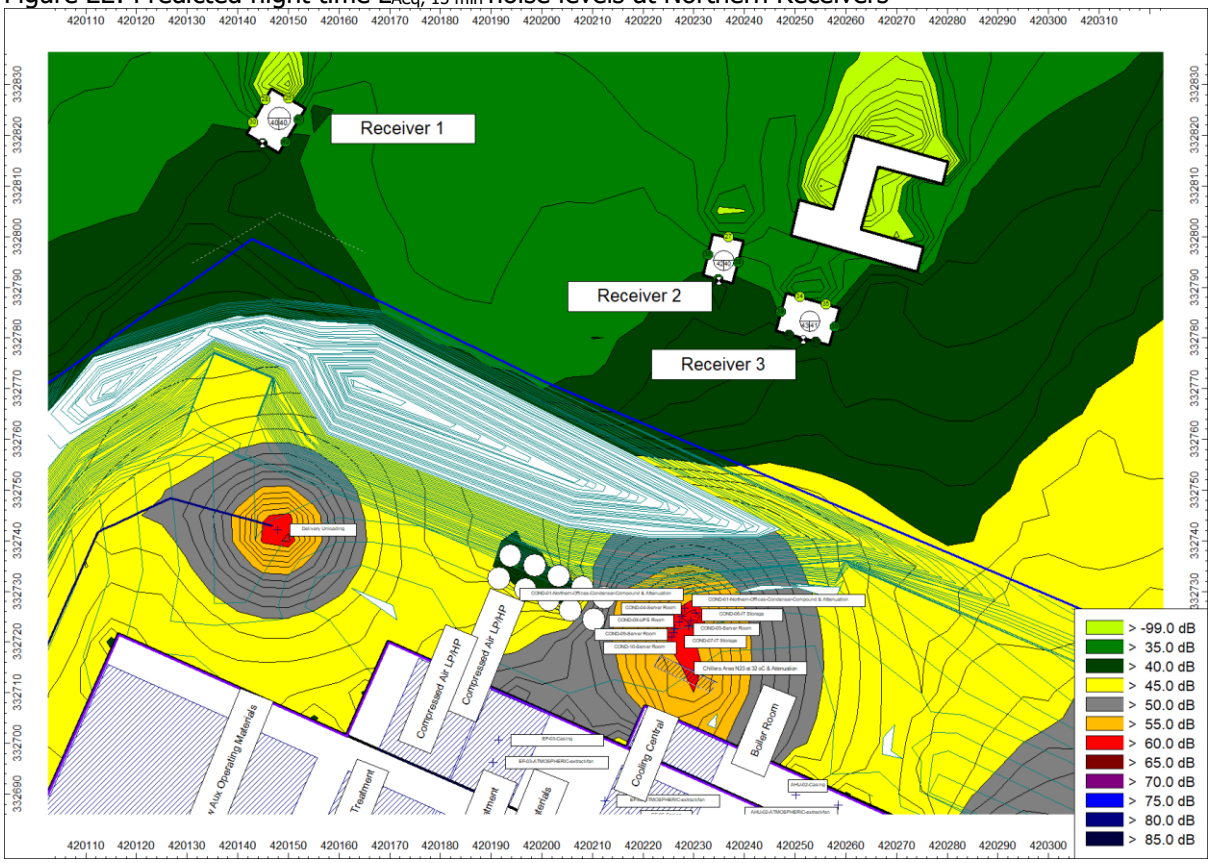
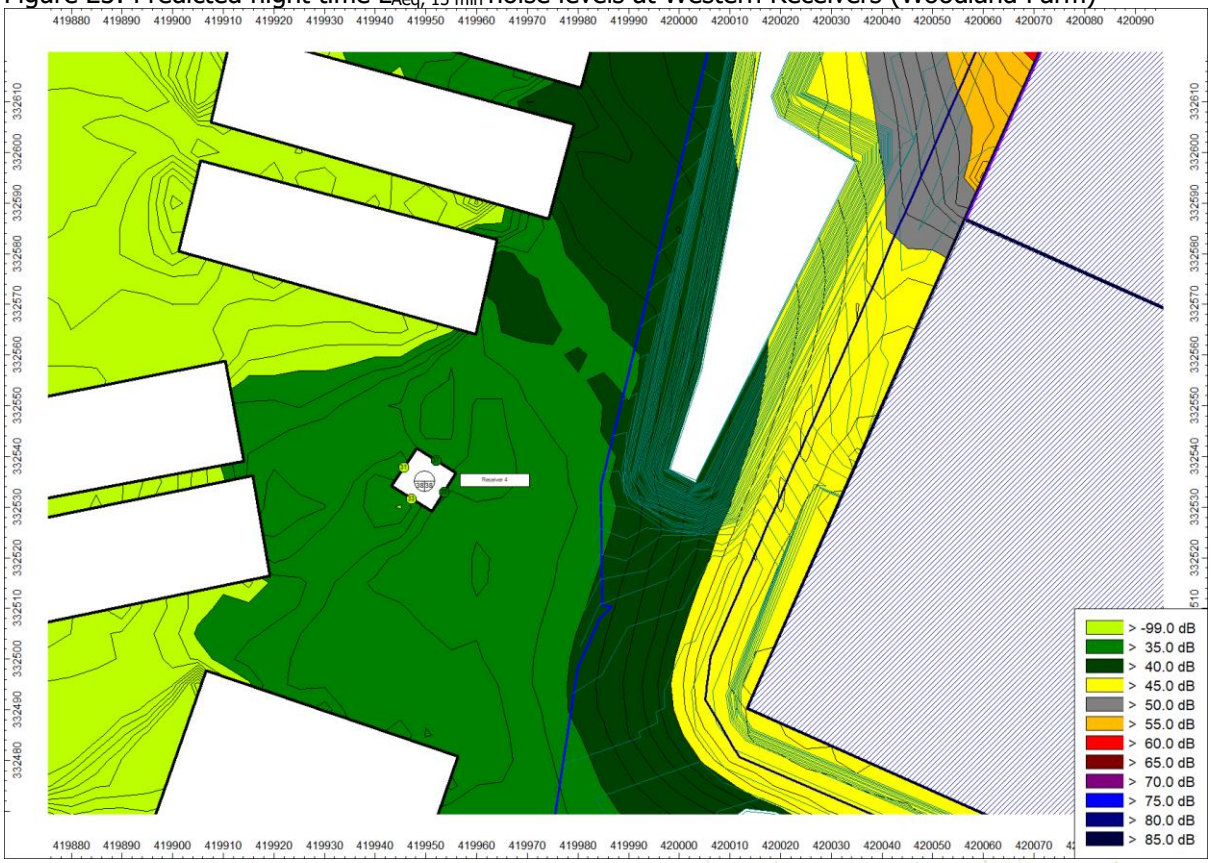


Figure 23: Predicted night time $L_{Aeq,\ 15\ min}$ noise levels at Western Receivers (Woodland Farm)



7. Noise Assessment

Noise from industrial activity as it affects the noise sensitive residential properties is assessed in accordance with BS4142:2014 for the proposed hours of use. This is an EA's noise impact assessment requirement according to the guidance stated above in 3.2.1.

In addition, planning condition 18 also requires that "*The level of noise emitted from the site shall not exceed 44dB LAeq(1 hour) between 07:00 to 23:00 hours and 41 dB LAeq(15mins) between the hours of 23:00 to 07:00, as measured at the nearest noise sensitive receptor.*" This would however need to be confirmed on site with measurements. Nevertheless, the predicted noise levels above suggest that the noise limits are likely to be achieved.

Also, by complying with the planning noise limits above, it is anticipated that BS4142:2014 assessment will result in a low significant impact at the nearest receivers. This is demonstrated in BS4142:2014 the assessment below.

7.1. Initial Estimate

7.1.1. Background Sound Level

From the measured data obtained at the monitoring location, we have determined a typical design background sound level to 50 dB $L_{A90\ (1\ hour)}$ during the daytime and 46 dB $L_{A90\ (15\ min)}$.

7.1.2. Specific Sound Level

The specific sound level at the worst-case receiver is daytime 43 dB $L_{Aeq(1\ hour)}$ and night time 41 dB $L_{Aeq,\ (15\ min)}$ (northern receiver). The predicted levels at Woodland Farm to the west were determined to be daytime 38dB $L_{Aeq(1\ hour)}$ and night time 38 dB $L_{Aeq,\ (15\ min)}$. This is the level determined at the noise sensitive receivers without any character corrections applied.

7.1.3. Character Corrections

Character corrections should be added to the "specific sound level" if the "specific sound level" exhibits any tonality, impulsivity, other specific characteristics and/or intermittency at the assessment location. Based on our site visit the character corrections to be applied are as follows:

- **Tonality** – The supplier and installer should ensure any tonality is not distinguishable at the noise-sensitive receivers in the area. However, the level comparison against existing background of each individual unit is considered to be low and therefore we do not expect the tonality to be distinguishable against the residual noise and therefore no character correction is applied.

- **Impulsivity** – Delivery noise can be impulsive and we have applied +3 dB correction for impulsivity which is just perceptible at the noise receptor
- **Intermittency** – We do not expect that the intermittency of the plant will be distinguishable at the sensitive receiver over the residual noise climate and we have not applied correction for intermittency. We have also assumed all plant is running continuously within our noise model.
- **Other Sound Characteristics** – In our view no other corrections are necessary, impulsivity character has been applied and the site and receivers are already subject to industrial noise of similar character from the existing industrial units surrounding the site which are known to include external plant and vehicle movements.

7.1.4. Estimate of Impact

Therefore, the British Standard 4142:2014 initial estimate of the noise impact at the most sensitive locations is as follows:

Table 10: British Standard 4142:2014 Initial Estimate (Worst Case Receiver)

Parameter	Daytime	Night Time
Background Level, $L_{A90\ (T)}$	50 dB	46dB
Specific Sound Level, $L_{Aeq\ (T)}$	43 dB	41 dB
Acoustic Character Correction	+3 dB	+3 dB
Rating Level, $L_{Ar,\ T}$	46 dB	44 dB
Excess of rating over background level	-4 dB	-2 dB

This means that the rating noise level will result in a British Standard 4142:2014 assessment 'difference' of -4 dB during the daytime period and -2 dB during the night time period at the worst case, nearest noise-sensitive receivers.

BS 4142 states that "The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

Where the assessment difference is 0 dB or less during the daytime and night time periods, the impact is likely to be low and therefore acceptable.

7.1.5. Uncertainty

The assessment is based on the approved site plan and noise levels measured on site (existing similar Site in Germany) for the proposed plant and vehicle movements. Predictions have been undertaken using computer modelling following ISO standards such as ISO 9613-1.

The background noise measurements were carried out at a location representative of the noise climate at the nearest noise sensitive receivers and in accordance with the relevant standards such as BS4142 and BS 7445.

Al the monitoring equipment used by ACL on site and by ZECH Ingenieurgesellschaft on the German site in 2017 was considered to be calibrated before the survey work has been carried out and therefore the uncertainty of the measured noise levels included in this report is low.

The ambient noise levels measured on site and representative of the ambient noise levels near the noise sensitive receivers are free field levels and have not been affected by facades reflections and therefore the uncertainty of the measured levels is considered to be low. In addition, the weather conditions were not considered to have adversely affected the measured noise data.

In terms of directivity used, the model considers omnidirectional propagation, which is in our view considered to be a worst case, however, most of the proposed plant, e.g. roof's plant terminals (exhaust/ Supply) will be pointed away from the nearest noise sensitive receivers to the north, therefore the level of plant noise impact associated with the proposed plant on the roof is expected to be lower.

The author of this report is a Full Member of the Institute of Acoustics (MIOA) with a recognised acoustic qualification and eleven years' experience within the field of noise and acoustics and as such is suitably qualified and experienced to undertake a British Standard 4142:2014 assessment and environmental surveys which have also been carried out by the same person. This report has also been revised by a Member of the Institute of Acoustics (MIOA) with over 13 years of experience.

As such, we consider the predictions to be accurate of a worst-case situation and therefore the uncertainty of the assessment to be low and acceptable.

7.2. Context

7.2.1. Absolute Levels

BS4142 states:

1) *The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low. Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night. Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.*

With regard to 'absolute levels', the most relevant guidance is British Standard 8233:2014. Internally to a dwelling during the day and night the internal ambient noise levels should not exceed 35 dB $L_{Aeq(16hr)}$ and 30 dB $L_{Aeq(8hr)}$ respectively.

The internal level is approximately 15 dB quieter than the external free-field level (as stated by the BS8233:2014 and WHO 1999) allowing for the attenuation of a partially open window. Therefore, based on the predicted rating levels noted above, the internal absolute levels are as follows.

Table 11: Comparison with British Standard 8233:2014

Time	Predicted Level dB L_{Ar} with Character Correction	Open Window Correction dB(A)	Predicted Internal Level dB(A)	Within BS8233 Criteria?
Daytime	46	-15	31	YES
Night-time	41	-15	29	YES

As can be seen from the table above, the internal rating sound level is well below the British Standard 8233:2014 criteria during the daytime and night time period.

7.2.2. **Residual Levels**

British Standard 4142:2014 also states:

> *"2.) The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound.*
> *Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it."*

We have compared the residual noise climate, i.e. the ambient sound at the assessment location when the specific sound source (Proposed Industrial Site) is suppressed to such a degree that it does not contribute to the ambient sound, to the specific sound level (Proposed Industrial Site) and rating level (Proposed Industrial Site with character correction applied) over the worst-case time, the Sunday period. This summarised below:

Table 12: Comparison with the residual noise climate at worst case receiver

Calculation Notes	Daytime	Night Time
Residual Sound Level	48 to 55 dB $L_{Aeq(1\ hour)}$	46 to 52 dB $L_{Aeq(15\ min)}$
Specific Sound Level	43 dB $L_{Aeq(1\ hour)}$	41 $L_{Aeq(15\ min)}$
Rating Sound Level	46 dB $L_{Aeq(1\ hour)}$	44 $L_{Aeq(15\ min)}$

As can be seen, and as stated above the industrial rating sound levels (with character) are considered to be lower or equal to the residual sound at the noise sensitive receivers. We would consider the noise source could be perceivable but would be not be dominant over the residual noise climate.

7.3. Summary of British Standard 4142:2014

As can be seen above, once context is considered and the noise impact of the proposed site operation is compared to the existing noise climate, plus internal noise levels compared to the relevant adopted guidance of BS8233, then it is clear that the proposed site will be acceptable when assessed to British Standard 4142:2014.

We would therefore consider the proposed industrial site activities to be of a low impact at all noise-sensitive receivers.

7.4. Planning Condition 18 (Ref. DMPA/2019/1205)

As can be seen above, the predicted worst-case noise level emission $L_{Aeq,\ T}$ at the nearest noise sensitive receivers are also expected to meet the planning condition 18. We would consider the current proposals to be acceptable and to have a low impact at all the noise sensitive receivers around the site. This noise limits will need however to be confirmed with site measurements as part of the planning condition, however, noise modelling suggests that where the plant noise data and recommendations provided above are used then the noise emission limits at the nearest noise sensitive receivers will be achieved.

8. Noise Management Plan

We provide some bullet points that should be considered in the final Noise Management Plan document that can be applied to the site if a permit is granted to this site. The aim of this NMP is to demonstrate the operator has competence and commitment to control noise pollution. A detailed NMP will be provided separately using the EA's template provided and including more detailed information.

We would recommend that the following items are considered:

- Noise Monitoring Plan at the noise sensitive receivers every 6 months/ 12 months and around the site. Once installed, items of plant should be assessed to validate noise levels used in the model above or where they are found to be different than the above considered. This could be completed by an acoustic consultant with minimum AMIOA, using Class 2 (minimum) sound level meters. Following assessment can be carried out in house if required by a trained person. The noise monitoring should be completed under normal conditions, to check compliance with the limits below, which are based on the more stringent noise level emission limits stated in Planning Condition 18. By complying with the planning condition 18 specific noise level limits, we would also consider that the resultant noise rating levels $L_{Ar,T}$ at the nearest noise sensitive receivers will be acceptable and therefore a BS4142:2014 noise impact assessment will result in a low significant impact. This is typically the assessment method required by the Environmental Agency provided in the guidance shown in section 3.2.1.

Table 13: Noise Limits

Parameter	Planning Condition 18 Operational Noise Limit, $L_{Aeq,\ T,}$ (dB)	BS4142:2014 Noise Rating Limits, $L_{Ar,\ T}$ (dB)
Daytime (07:00 – 23:00 hours)	44 dB $L_{Aeq\ (1\ hour)}$	50 $L_{Ar\ (1\ hour)}$
Night Time (23:00 – 07:00 hours)	41 dB $L_{Aeq\ (15mins)}$	46 $L_{Ar\ (15\ min)}$

- Complaints phone number and email to be published for local residents.
- All complaints investigated by management, if there is a noise risk this to be supported by a noise assessment by a suitably qualified acoustician. The outcome of the investigation to be issued to the complainants.
- Periodic Plant Maintenance Plan.
- A Risk Assessment to be produced of noise problems from normal and abnormal situations, including worst case scenarios due to, for example, weather, temperature, breakdowns and accidents.
- Manage and monitor the external works near the northern yard area, particularly during the night time period.
- Include signs which state no use of horns / reverse alarms at night, assuming Health and Safety allows it.
- Reduce the amount of times delivery bay doors are open
- Any new plant/ operation likely to cause noise related issues in future should be assessed by a competent acoustic consultant, who is at least AMIOA.

- Ensure adequate CCTV is provided to the site.
- Ensure adequate lighting is provided and maintained to the site.
- Provide nearby residents with the direct telephone number to the store/security to ensure
- Maintain the boundary barriers to a reasonable degree on the site boundary.
- Staff to be fully trained and advised the good neighbour requirements.
- The noise management plan should be reviewed, typically once a year. The review should also consider land use around the facility and any future developments that may increase the impact.

9. Summary & Conclusions

PGF III Ltd appointed Acoustic Consultants Limited to carry out a noise impact assessment from the proposed industrial development operations at Dove Valley Park, Derby in support of a planning application.

The brief was to monitor existing background sound levels and provide a British Standard 4142:2014 noise impact assessment of activities associated with the proposed industrial operations and associated vehicle delivery movements on the nearby sensitive receivers around the site. Baseline plant noise data from similar facilities in Germany have also been provided to us by PGF III's European acoustic consultant.

In addition, Planning Condition 18 (Ref. DMPA/2019/1205), more stringent imposed noise emission limits at the nearest noise sensitive receivers were also considered in this report.

This report also follows the Environmental Agency (EA) published guidance on "Noise impact assessments involving calculations or modelling", published on the 23rd of October 2018 and provides a Noise Management Plan (NMP) based on the EA's "Noise and vibration management: environmental permits" guidance published on the 23rd of July 2021 as requested by the Environmental Agency following the EPR initial application on behalf of PGFI III, and submission of our ACL's noise Impact Assessment Report Ref. 8018 - Dove Valley Park, Derby V1.0, dated 17/10/19.

It also considers further comments received by the EA following the submission of ACL's 8726 Report, 20/08/21 which aimed to address the above previous received EA's comments and update plant noise data.

With the industrial site operating as outlined above, with noise mitigation measures installed as per our report, the rating sound level will result in a British Standard 4142:2014 difference of -4 dB during the daytime period and -2 dB during the night time period at the nearest noise-sensitive receivers.

BS 4142 states that "The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

Where the assessment difference is 0 dB or less during the daytime and night time periods, the impact is likely to be low and therefore acceptable.

Also, once context is considered and the noise impact of the proposed site operation is compared to the existing noise climate, plus internal noise levels compared to the relevant adopted guidance of BS8233:2014, then it is clear that the proposed site will be acceptable when assessed to British Standard 4142:2014.

We would therefore consider the proposed industrial site activities to be of a low impact at all noise-sensitive receivers and to fall below the Lowest Observed Adverse Effect Level (LOAEL) of the NPPG and NPSE.

10. Appendix 1 – Glossary of Acoustic Terminology

A-weighted sound pressure pA – value of overall sound pressure, measured in pascals (Pa), after the electrical signal derived from a microphone has been passed through an A-weighting network

A-weighted sound pressure level, L_{pA} - quantity of A-weighted sound pressure given by the following formula in decibels (dBA)

$$L_{pA} = 10 \log_{10} (p_A/p_0)^2$$

where:

p_A is the A-weighted sound pressure in pascals (Pa);
p_0 is the reference sound pressure (20 μPa)

Background sound level, $L_{A90,\,T}$ – A-weighted sound pressure level that is exceeded by the residual sound assessment location for 90% of a given time interval, T, measured using weighting F and quoted to the nearest whole number of decibels

Break-in - noise transmission into a structure from outside.

Decibel (dB) – The decibel is the unit used to quantify sound pressure levels. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). Therefore, a logarithmic scale is used to describe sound pressure levels and also sound intensity and power levels. The logarithms are taken to base 10. Hence an increase of 10 dB in sound pressure level is equivalent to an increase by a factor of 10 in the sound pressure level (measured in Pascals). Subjectively, this increase would correspond to a doubling of the perceived loudness of sound.

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 = t2 – t1, has the same mean-squared sound pressure as a sound that varies with time, and is given by the following equation:

$$L_{AeqT} = 10\lg_{10}\left\{(1/T)\int_{t_1}^{t_2}[p_A(t)^2/p_0^2]\mathrm{d}t\right\} \qquad (1)$$

where:

p_0 is the reference sound pressure (20 μPa); and

$p_A(t)$ is the instantaneous A-weighted sound pressure (Pa) at time t

NOTE The equivalent continuous A-weighted sound pressure level is quoted to the nearest whole number of decibels.

Facade level – sound pressure level 1 m in front of the façade. Facade level measurements of L_{pA} are typically 1 dB to 3 dB higher than corresponding free-field measurements because of the reflection from the facade.

Free-field level – sound pressure level away from reflecting surfaces. Measurements made 1.2 m to 1.5 m above the ground and at least 3.5 m away from other reflecting surfaces are usually regarded as free-field. To minimize the effect of reflections the measuring position has to be at least 3.5 m to the side of the reflecting surface (i.e. not 3.5 m from the reflecting surface in the direction of the source).

Octave and Third Octave Bands – The human ear is sensitive to sound over a range of frequencies between approximately 20 Hz to 20 kHz and is generally more sensitive to medium and high frequencies than to low frequencies within the range. There are many methods of describing the frequency content of a noise. The most common methods split the frequency range into defined bands, in which the mid-frequency is used as the band descriptor and in the case of octave bands is double that of the band lower. For example, two adjacent octave bands are 250 Hz and 500 Hz. Third octave bands provide a fine resolution by dividing each octave band into three bands. For example, third octave bands would be 160 Hz, 250 Hz, 315 Hz for the same 250 Hz octave band.

Sound pressure level – Sound pressure level is stated on many of the charts. It is the amplitude of the acoustic pressure fluctuations in a sound wave, fundamentally measured in Pascals (Pa), typically from 20 micro-Pascals to 100 Pascals, but commonly simplified onto the decibel scale.

Sound reduction index, R – laboratory measure of the sound insulating properties of a material or building element in a stated frequency band.

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.
Structure-borne noise – audible noise caused by the vibration of elements of a structure, the source of which is within a building or structure with common elements

Rating level, $L_{Ar,\ Tr}$ – Specific sound level plus any adjustment for the characteristic features of the sound.

Reverberation Time, T – The reverberation time is defined as the time taken for a noise level in an enclosed space to decay by 60 dB from a steady level, once the noise source has stopped. It is measured in seconds. Often a 60-dB decay cannot be measured so the reverberation time is measured over a lesser range and corrected back to the time for a 60-dB drop assuming a constant decay rate. Common parameters are T20 (time taken for a 20-dB decay multiplied by three) and T30 (time taken for a 30-dB decay multiplied by two).

Vibration Dose Value, VDV – measure of the total vibration experienced over a specified period of time.

Estimated Vibration Dose Value, eVDV – estimation of the total vibration experienced over a specified period of time. This is usually based on the number of events and *shortened measurement data.*

Weighted sound reduction index, R_w – Single-number quantity which characterizes the airborne sound insulating properties of a material or building element over a range of frequencies. The weighted sound reduction index is used to characterize the insulation of a material or product that has been measured in a laboratory (see BS EN ISO 717-1).

Weighted standardized impact sound pressure level, $L'_{nT,\ w}$ - single-number quantity used to characterize the impact sound insulation of floors over a range of frequencies. NOTE weighted standardized impact sound pressure level is used to characterize the insulation of floors in buildings (see Annex C and BS EN ISO 717-2).

Weighted standardized level difference, $D_{nT,\ w}$ – single-number quantity that characterizes the airborne sound insulation between rooms. NOTE Weighted standardized level difference is used to characterize the insulation between rooms in a building (see Annex C and BS EN ISO 717-1).

11. Appendix 2 – Noise Modelling Parameters & Data

11.1. Predicted Indoor Noise Levels

Room's Name	Lw		Cumulative Sound Pressure Level	Resultant Sound Power Level	Total Floor Area	Total Assumed Ceiling Area	Assumed Ceiling Height	Total Room's Wall Area	Total Room's Surface Area (S)	Assumed Room's Absorption Coeficient Alfa (reflective)	Total sound absorbtion ($A=S * \alpha_{avg}$)	Room's Volume	Assumed Distance to Receiver (Worst Case)	Q Factor (Directivity)	Sound Power within Room	Equivalent Absoprtion Area (A)	Room Constant ($A/(1-\alpha_{avg})$	Direct sound pressure level	Reverberant sound pressure level	Indoor Sound Pressure Level
	Type	Noise Source(s) Code	dB(A)		(m^2)	(m^2)	(m)	(m^2)	(m^2)	α	(m^2)	(m^3)	(m)		dB(A)	(m^2)		(dBA)	(dBA)	(dBA)
Warehouse & Logistics	Lw	NS14++NS02	89	97	30336	30336	20.50	14282	74955	0.1	7495	621896	10.25	2	97	7495	8328	69	64	70
Conveyor Loop + Outgoing Goods	Lw	NS14	63	71	17780	17780	10.20	5440	40999	0.1	4100	181352	5.10	2	71	4100	4555	49	40	49
NS26-Workshop	Lw	NS26	80	88	239	239	10.20	631	1109	0.1	111	2437	5.10	2	88	111	123	66	73	74
NS06 - CIP	Lw	NS06	69	77	192	192	10.20	565	948	0.1	95	1955	5.10	2	77	95	105	55	63	63
Syrup & Control Room	Lw	NS12++NS05	80	88	548	548	10.20	955	2052	0.1	205	5592	5.10	2	88	205	228	66	71	72
Raw Auxiliary Operating	Lw	NS25++NS10	80	88	1486	1486	10.20	1573	4544	0.1	454	15155	5.10	2	88	454	505	65	67	69
Water Treatment	Lw	NS31++NS09	84	92	612	612	10.20	1009	2233	0.1	223	6239	5.10	2	92	223	248	70	74	76
Water Treatment	Lw	NS31++NS09	84	92	314	314	10.20	723	1352	0.1	135	3206	5.10	2	92	135	150	70	76	77
Concrete Powder / Raw Materials	Lw	NS08++NS05	66	74	487	487	10.20	900	1874	0.1	187	4965	5.10	2	74	187	208	52	57	58
lls & Labels + Raw Aux Operating Materia	Lw	NS10++NS25	80	88	1486	1486	10.20	1573	4544	0.1	454	15155	5.10	2	88	454	505	65	67	69
Incoming Goods	Lw	NS10	70	78	300	300	10.20	706	1306	0.1	131	3057	5.10	2	78	131	145	56	62	63
Sugar Dissolver	Lw	NS12	80	88	85	85	10.20	375	544	0.1	54	862	5.10	2	88	54	60	66	76	77
Compressed Air LP/HP	Lw	NS20++NS04	89	97	301	301	6.80	472	1075	0.1	107	2049	3.40	2	97	107	119	78	82	83
Compressed Air LP/HP	Lw	NS20++NS04	89	97	256	256	6.80	435	946	0.1	95	1738	3.40	2	97	95	105	78	82	84
Boiler Room	Lw	NS03	69	77	209	209	6.80	393	812	0.1	81	1423	3.40	2	77	81	90	58	63	65
Cooling Central	Lw	NS23	90	98	300	300	6.80	471	1072	0.1	107	2041	3.40	2	98	107	119	79	83	85
Server Room (wall only)	Lw	NS13	80	88	132	132	6.80	313	577	0.1	58	899	3.40	2	88	58	64	69	76	77
AVT 1+AVT 2	Lw	NS11 (x4)++NS15 (X4)++NS27 (x4)++NS29 (X4)	100	108	5680	5680	10.20	3075	14436	0.1	1444	57941	5.10	2	108	1444	1604	86	82	87
AVT 3 +AVT 4	Lw	NS11 (x4)++NS15 (X4)++NS27 (x4)++NS29 (X4)	100	108	6391	6391	10.20	3262	16044	0.1	1604	65191	5.10	2	108	1604	1783	86	81	87

11.2. CadnaA Noise Sources Used

Name	ID	Type	1/3 Octave Spectrum (dB)												Source
			Weight.	63	125	250	500	1000	2000	4000	8000	A		lin	
NS17 - Ventilating System (AHU)	AHU	Lw	A	0	0	0	60	0	0	0	0	60		63.2	
NS16- Sugar Delivery	Sugar	Lw	A	0	0	0	89	0	0	0	0	89		92.2	
NS23 - Chiller	CHILLER	Lw	A	0	0	0	85	0	0	0	0	85		88.2	
NS14-Warehouse, General	Warehouse	Lw	A	0	0	0	63	0	0	0	0	63		66.2	
NS02 - Warehouse, telpher	Telpher	Lw	A	0	0	0	89	0	0	0	0	89		92.2	
NS26 - Workshop	Workshop	Lw	A	0	0	0	80	0	0	0	0	80		83.2	
NS06 - Process Technology, CIP	CIP	Lw	A	0	0	0	69	0	0	0	0	69		72.2	
NS05 - Process Technology, General	NS05	Lw	A	0	0	0	63	0	0	0	0	63		66.2	
NS12 - Sugar Dissolver	NS12	Lw	A	0	0	0	80	0	0	0	0	80		83.2	
NS10 - Incoming Warehouse, Raw materials	NS10	Lw	A	0	0	0	70	0	0	0	0	70		73.2	
NS25 - Filling and packing line, perform supply	NS25	Lw	A	0	0	0	79	0	0	0	0	79		82.2	
NS09 - Water House	NS09	Lw	A	0	0	0	68	0	0	0	0	68		71.2	
NS31 - Water Treatment	NS31	Lw	A	0	0	0	84	0	0	0	0	84		87.2	
NS08 - Pulver Solution	NS08	Lw	A	0	0	0	63	0	0	0	0	63		66.2	
NS04 - Compressed Air	NS04	Lw	A	0	0	0	86	0	0	0	0	86		89.2	
NS20 - Compressed Air, Hp	NS20	Lw	A	0	0	0	85	0	0	0	0	85		88.2	
NS07 - Process technolgy, valve island	NS07	Lw	A	0	0	0	85	0	0	0	0	85		88.2	
Ns03 - Boiler Room	NS03	Lw	A	0	0	0	69	0	0	0	0	69		72.2	
NS23 - Chiller	NS23	Lw	A	0	0	0	85	0	0	0	0	85		88.2	
NS13 - Low Voltage distribution	NS13	Lw	A	0	0	0	80	0	0	0	0	80		83.2	
AHU-01-Casing	AHU_01_Casing	Lw (c)		67	74	62	63	54	48	40	49	63.4		75.3	Dalair Ltd
AHU-01-ATMOSPHERIC-supply-fan	AHU_01_ATMOSPHERIC_supply_fan	Lw		74	77	76	73	68	66	64	62	75.1		81.7	Dalair Ltd
AHU-01-ATMOSPHERIC-extract-fan	AHU_01_ATMOSPHERIC_extract_fan	Lw		75	85	82	81	80	79	76	71	85.5		89.4	Dalair Ltd
AHU-02-Casing	AHU_02_Casing	Lw (c)		68	73	65	64	58	54	48	54	65.3		75.2	Dalair Ltd
AHU-02-ATMOSPHERIC-supply-fan	AHU_02_ATMOSPHERIC_supply_fan	Lw		70	81	77	73	70	67	63	61	76		83.5	Dalair Ltd
AHU-02-ATMOSPHERIC-extract-fan	AHU_02_ATMOSPHERIC_extract_fan	Lw		77	85	82	81	81	79	77	72	86		89.6	Dalair Ltd
AHU-03-Casing	AHU_03_Casing	Lw (c)		66	75	63	64	56	49	40	48	64.5		76.1	Dalair Ltd
AHU-03-ATMOSPHERIC-supply-fan	AHU_03_ATMOSPHERIC_supply_fan	Lw		69	83	77	73	70	67	63	60	76.2		84.7	Dalair Ltd
AHU-03-ATMOSPHERIC-extract-fan	AHU_03_ATMOSPHERIC_extract_fan	Lw		76	86	79	80	77	73	69	66	82		88.4	Dalair Ltd
AHU-04-Casing	AHU_04_Casing	Lw (c)		81	84	77	81	74	70	60	66	80.6		87.7	Dalair Ltd
AHU-04-ATMOSPHERIC-supply-fan	AHU_04_ATMOSPHERIC_supply_fan	Lw		78	90	85	84	88	87	83	79	92.5		94.8	Dalair Ltd
AHU-04-ATMOSPHERIC-extract-fan	AHU_04_ATMOSPHERIC_extract_fan	Lw		83	91	89	93	92	90	84	79	96.4		98.6	Dalair Ltd

AHU-05-Casing	AHU_05_Casing	Lw (c)		82	82	80	81	73	69	60	65	80.5	87.6	Dalair Ltd
AHU-05-ATMOSPHERIC-supply-fan	AHU_05_ATMOSPHERIC_supply_fan	Lw		79	88	89	85	87	86	82	79	91.9	94.7	Dalair Ltd
AHU-05-ATMOSPHERIC-extract-fan	AHU_05_ATMOSPHERIC_extract_fan	Lw		84	91	91	94	91	89	84	79	96.1	98.8	Dalair Ltd
AHU-06-Casing	AHU_06_Casing	Lw (c)		76	75	75	78	72	68	60	65	78	82.8	Dalair Ltd
AHU-06-ATMOSPHERIC-supply-fan	AHU_06_ATMOSPHERIC_supply_fan	Lw		73	80	87	82	85	85	81	78	90.4	92	Dalair Ltd
AHU-06-ATMOSPHERIC-extract-fan	AHU_06_ATMOSPHERIC_extract_fan	Lw		80	88	91	91	88	86	80	74	93.2	96.4	Dalair Ltd
AHU-07-Casing	AHU_07_Casing	Lw (c)		78	81	77	80	71	67	57	64	79	85.5	Dalair Ltd
AHU-07-ATMOSPHERIC-supply-fan	AHU_07_ATMOSPHERIC_supply_fan	Lw		76	88	86	84	85	83	79	77	89.6	92.9	Dalair Ltd
AHU-07-ATMOSPHERIC-extract-fan	AHU_07_ATMOSPHERIC_extract_fan	Lw		80	88	91	91	88	87	81	76	93.6	96.6	Dalair Ltd
AHU-08-Casing	AHU_08_Casing	Lw (c)		75	80	75	80	72	69	57	64	79.2	84.6	Dalair Ltd
AHU-08-ATMOSPHERIC-supply-fan	AHU_08_ATMOSPHERIC_supply_fan	Lw		73	84	82	84	86	85	79	77	90.4	91.8	Dalair Ltd
AHU-08-ATMOSPHERIC-extract-fan	AHU_08_ATMOSPHERIC_extract_fan	Lw		79	89	92	92	87	86	79	76	93.3	97	Dalair Ltd
AHU-09-Casing	AHU_09_Casing	Lw (c)		74	76	72	76	69	65	56	62	75.6	81.2	Dalair Ltd
AHU-09-ATMOSPHERIC-supply-fan	AHU_09_ATMOSPHERIC_supply_fan	Lw		72	83	84	80	83	82	78	75	87.8	90.1	Dalair Ltd
AHU-09-ATMOSPHERIC-extract-fan	AHU_09_ATMOSPHERIC_extract_fan	Lw		76	85	85	88	88	86	80	76	92.2	93.9	Dalair Ltd
SF-01-Casing	SF_01_Casing	Lw (c)		70	70	71	72	65	57	49	57	71.4	77.2	Dalair Ltd
SF-01-ATMOSPHERIC-supply-fan	SF_01_ATMOSPHERIC_supply_fan	Lw		74	80	87	82	82	80	76	75	87.1	90.5	Dalair Ltd
EF-01-Casing	EF_01_Casing	Lw (c)		67	73	69	70	64	56	48	56	69.9	76.6	Dalair Ltd
EF-01-ATMOSPHERIC-extract-fan	EF_01_ATMOSPHERIC_extract_fan	Lw		79	88	89	90	90	84	80	77	93.2	95.9	Dalair Ltd
SF-02-Casing	SF_02_Casing	Lw (c)		70	74	71	73	64	59	50	56	72	78.5	Dalair Ltd
SF-02-ATMOSPHERIC-supply-fan	SF_02_ATMOSPHERIC_supply_fan	Lw		75	86	86	82	84	82	78	75	88.5	91.7	Dalair Ltd
EF-02-Casing	EF_02_Casing	Lw (c)		68	73	72	70	61	57	47	53	69.8	77.3	Dalair Ltd
EF-02-ATMOSPHERIC-extract-fan	EF_02_ATMOSPHERIC_extract_fan	Lw		80	88	92	90	87	85	79	74	92.4	96.3	Dalair Ltd
EF-03-Casing	EF_03_Casing	Lw (c)		68	73	72	70	61	57	47	53	69.8	77.3	Dalair Ltd
EF-03-ATMOSPHERIC-extract-fan	EF_03_ATMOSPHERIC_extract_fan	Lw		80	88	92	90	87	85	79	74	92.4	96.3	Dalair Ltd
EF-04-Casing	EF_04_Casing	Lw (c)		68	73	72	70	61	57	47	53	69.8	77.3	Dalair Ltd
EF-04-ATMOSPHERIC-extract-fan	EF_04_ATMOSPHERIC_extract_fan	Lw		80	88	92	90	87	85	79	74	92.4	96.3	Dalair Ltd
EF-05-Casing	EF_05_Casing	Lw (c)		68	73	72	70	61	57	47	53	69.8	77.3	Dalair Ltd
EF-05-ATMOSPHERIC-extract-fan	EF_05_ATMOSPHERIC_extract_fan	Lw		80	88	92	90	87	85	79	74	92.4	96.3	Dalair Ltd
COND-01-Northern-Offices-Condenser-Compound	COND_01	Lw	A	0	0	0	86.3	0	0	0	0	86.3	89.5	Daikin-REYQ24U (REYQ16U)+(REYQ8U)
COND-02-Western-Condenser-Compound	COND_02	Lw	A	0	0	0	83.8	0	0	0	0	83.8	87	Daikin-REYQ18U
COND-03-Office	COND_03	Lw	A	0	0	0	62	0	0	0	0	62	65.2	Daikin-RXM
COND-04-Server Room	COND_04	Lw	A	0	0	0	70	0	0	0	0	70	73.2	Daikin-RZAG
COND-05-Server Room	COND_05	Lw	A	0	0	0	70	0	0	0	0	70	73.2	Daikin-RZAG
COND-06-IT Storage	COND_06	Lw	A	0	0	0	70	0	0	0	0	70	73.2	Daikin-RZAG
COND-07-IT Storage	COND_07	Lw	A	0	0	0	70	0	0	0	0	70	73.2	Daikin-RZAG
COND-08-UPS Room	COND_08	Lw	A	0	0	0	62	0	0	0	0	62	65.2	DMOUCD021E
COND-09-Server Room	COND_09	Lw	A	0	0	0	70	0	0	0	0	70	73.2	DMOUCD021
COND-10-Server Room	COND_10	Lw	A	0	0	0	70	0	0	0	0	70	73.2	DMOUCD021
REF-01-Chilled-Concentrate-Storage	REF-01	Lw (c)	A	28	28	28	72	28	28	28	28	72	75.9	Mastair
Lidl Depart	Depart	Lw (c)		104	94	92	93	93	90	83	74	96.9	105.4	
Lidl Arrive	Arrive	Lw (c)		111	97	91	92	92	89	83	73	96.3	111.3	
Lidl Unloading	Unloading	Lw (c)		91	85	79	79	77	75	71	53	82.2	92.6	

11.2.1. CadnaA: proposed/ Existing Building Heights

Name	M.	ID	RB	Residents	Absorption	Height			
						Begin			
						(m)			
		Existing Industrial Building	x	0	0.21	15	r	420033	332288
		Existing Industrial Building	x	0	0.21	15	r	419916	332446
		Existing Industrial Building	x	0	0.21	7	r	419832	332475
		Existing Industrial Building	x	0	0.21	7	r	419880	332519
		Existing Industrial Building	x	0	0.21	7	r	419884	332543
		Existing Industrial Building	x	0	0.21	7	r	419802	332383
		Existing Industrial Building	x	0	0.21	7	r	420376	332204
		Existing Industrial Building	x	0	0.37	7	r	420264	332806
Receiver 2		Nearest Residential	x	0	0.37	7	r	420236	332796
Receiver 1		Existing Industrial Building	x	0	0.37	8	r	420148	332823
		Existing Industrial Building	x	0	0.21	7	r	420586	332270
		Existing Industrial Building	x	0	0.21	7	r	420601	332249
		Existing Industrial Building	x	0	0.21	7	r	420660	332324
		ACL_Proposed Industry Silos	x	0	0.21	12.5	r	420061	332659
		ACL_Proposed Industry Silos	x	0	0.21	12.5	r	420056	332647
		ACL_Existing Buildings	x	0	0.21	15	r	420401	332377
		ACL_Existing Buildings	x	0	0.21	15	r	420390	332341
		ACL_Existing Buildings	x	0	0.21	15	r	420360	332310
		ACL_Existing Buildings	x	0	0.21	7	r	419933	332581
		ACL_Existing Buildings	x	0	0.21	7	r	419944	332606
		ACL_Existing Buildings	x	0	0.21	7	r	419950	332631
		ACL_Existing Buildings	x	0	0.21	7	r	419972	332701
		ACL_Existing Buildings	x	0	0.21	7	r	419980	332737
		ACL_Existing Buildings	x	0	0.21	7	r	419966	332671
Receiver 3		Nearest Residential	x	0	0.21	7	r	420252	332784
		ACL_Proposed Industry	x	0	0.21			420097	332511
		ACL_Proposed Industry	x	0	0.21			420159	332601
		ACL_Proposed Industry	x	0	0.21			420212	332690
		ACL_Proposed Industry	x	0	0.21			420253	332683
Receiver 4		Woodland Farm	x	0	0.21	7	r	419950	332535

11.2.2. CadnaA: Line Sources – Vehicle Movements

Name	M.	ID	Result. PWL			Result. PWL'			Lw / Li			Correction			Sound Reduction		Attenuation	Operating Time			K0	Freq.	Direct.	Moving Pt. Src			
			Day	Evening	Night	Day	Evening	Night	Type	Value	norm.	Day	Evening	Night	R	Area		Day	Special	Night				Number			Speed
			(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)			dB(A)	dB(A)	dB(A)	dB(A)		(m^2)		(min)	(min)	(min)	(dB)	(Hz)		Day	Evening	Night	(km/h)
In going Goods			93.3	-15.7	87.3	65.3	-43.7	59.3	PWL-Pt	Arrive		41.0	0.0	10.0							0.0		(none)	8.0	0.0	2.0	10.0
Incoming Goods			88.6	-17.5	82.5	62.3	-43.7	56.3	PWL-Pt	Arrive		41.0	0.0	10.0							0.0		(none)	4.0	0.0	1.0	10.0
CO2/N2 H2O Vehicle Supply			85.9	-14.1	85.9	56.3	-43.7	56.3	PWL-Pt	Arrive		41.0	0.0	10.0							0.0		(none)	1.0	0.0	1.0	10.0
Out going Goods			96.7	-17.1	93.7	70.7	-43.1	67.7	PWL-Pt	Depart		41.0	0.0	10.0							0.0		(none)	24.0	0.0	12.0	10.0
In going Goods			93.6	-15.5	87.5	65.3	-43.7	59.3	PWL-Pt	Arrive		41.0	0.0	10.0							0.0		(none)	8.0	0.0	2.0	10.0
In going Goods			93.3	-15.7	87.3	65.3	-43.7	59.3	PWL-Pt	Arrive		41.0	0.0	10.0							0.0		(none)	8.0	0.0	2.0	10.0

11.2.3. CadnaA: Area Noise Sources – Roof/ Horizontal Areas

Name	M.	ID	Result. PWL		Result. PWL"				Lw / Li			Correction		Sound Reduction			Attenuation	Operating Time			K0	Freq.	Direct.	Moving Pt. Src			
			Day	Evening	Night	Day	Evening	Night	Type	Value	norm.	Day	Evening	Night	R	Area		Day	Special	Night				Number			
			(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)			dB(A)	dB(A)	dB(A)	dB(A)		(m²)		(min)	(min)	(min)	(dB)	(Hz)		Day	Evening	Night	
Warehouse & Logistics			76.6	76.6	76.6	35	35	35	Li	70		0	0	0	31	14327.18					0	500	(none)				
NS26-Workshop			62.5	62.5	62.5	39	39	39	Li	74		0	0	0	31	222.85					0	500	(none)				
Syrup & Control Room			64.3	64.3	64.3	37	37	37	Li	72		0	0	0	31	536.32					0	500	(none)				
Folls & LAbels _Raw Aux Operating Materials			66.6	66.6	66.6	34	34	34	Li	69		0	0	0	31	1809.69					0	500	(none)				
Water Treatment			66.8	66.8	66.8	42	42	42	Li	77		0	0	0	31	304.55					0	500	(none)				
Water Treatment			68.8	68.8	68.8	41	41	41	Li	76		0	0	0	31	602.34					0	500	(none)				
Concrete Powder / Raw Materials			49.8	49.8	49.8	23	23	23	Li	58		0	0	0	31	477.55					0	500	(none)				
Raw Auxiliary Operating			65.6	65.6	65.6	34	34	34	Li	69		0	0	0	31	1460.03					0	500	(none)				
Incoming Goods			52.8	52.8	52.8	28	28	28	Li	63		0	0	0	31	299.45					0	500	(none)				
Sugar Dissolver			61.2	61.2	61.2	42	42	42	Li	77		0	0	0	31	83.76					0	500	(none)				
Compressed Air LP/HP			73	73	73	49	49	49	Li	84		0	0	0	31	251.11					0	500	(none)				
Compressed Air LP/HP			72.7	72.7	72.7	48	48	48	Li	83		0	0	0	31	295.46					0	500	(none)				
Boiler Room			51.6	51.6	51.6	30	30	30	Li	65		0	0	0	31	145.8					0	500	(none)				
Cooling Central			74.7	74.7	74.7	50	50	50	Li	85		0	0	0	31	292.09					0	500	(none)				
AVT 1+AVT 2			89.8	89.8	89.8	52	52	52	Li	87		0	0	0	31	6017.45					0	500	(none)				
AVT 3 +AVT 4			90.5	90.5	90.5	52	52	52	Li	87		0	0	0	31	7040.21					0	500	(none)				
NS06 - CIP			50.6	50.6	50.6	28	28	28	Li	63		0	0	0	31	183.4					0	500	(none)				
Conveyor Loop + Outgoing Goods			49.8	49.8	49.8	14	14	14	Li	49		0	0	0	31	3823.49					0	500	(none)				
Chillers Area N23 at 32 oC & Attenuation			82.2	90.2	82.2	67.4	75.4	67.4	Lw	90.2		-8	0	-8							0	500	(none)				

11.2.4. CadnaA: Point Sources

Name	M.	ID	Result. PWL			Lw / Li			Correction			Sound Reduction		Attenuation	Operating Time			K0	Freq.	Direct.	Height		Coordinates		
			Day	Evening	Night	Type	Value	norm.	Day	Evening	Night	R	Area		Day	Special	Night						X	Y	Z
			(dBA)	(dBA)	(dBA)			dB(A)	dB(A)	dB(A)	dB(A)		(m²)		(min)	(min)	(min)	(dB)	(Hz)		(m)		(m)	(m)	(m)
AHU-01-ATMOSPHERIC-extract-fan			61.9	61.9	61.9	Lw	AHU_01_ATMOSPHER		0	0	0			NC40				0		(none)	1.1	g	420266.6	332677.2	79.4
AHU-01-ATMOSPHERIC-supply-fan			61.9	61.9	61.9	Lw	AHU_01_ATMOSPHER		0	0	0			NC40				0		(none)	1.1	g	420271.2	332673.5	79.4
AHU-01-Casing			63.4	63.4	63.4	Lw	AHU_01_Casing		0	0	0							0		(none)	1.7	g	420264.6	332670.1	80
AHU-02-ATMOSPHERIC-extract-fan			71.4	71.4	71.4	Lw	AHU_02_ATMOSPHER		0	0	0			NC40				0		(none)	1.1	g	420258.5	332687.8	79.4
AHU-02-ATMOSPHERIC-supply-fan			63.3	63.3	63.3	Lw	AHU_02_ATMOSPHER		0	0	0			NC40				0		(none)	1.1	g	420254.1	332682.9	79.4
AHU-02-Casing			65.3	65.3	65.3	Lw	AHU_02_Casing		0	0	0							0		(none)	1.7	g	420250.2	332689.8	80
AHU-03-ATMOSPHERIC-extract-fan			68.1	68.1	68.1	Lw	AHU_03_ATMOSPHER		0	0	0			NC40				0		(none)	1.1	g	420273.8	332679.5	79.4
AHU-03-ATMOSPHERIC-supply-fan			64.1	64.1	64.1	Lw	AHU_03_ATMOSPHER		0	0	0			NC40				0		(none)	1.1	g	420273.1	332678	79.4
AHU-03-Casing			64.5	64.5	64.5	Lw	AHU_03_Casing		0	0	0							0		(none)	1.7	g	420266.1	332682	80
AHU-07-ATMOSPHERIC-extract-fan			78.2	78.2	78.2	Lw	AHU_07_ATMOSPHER		0	0	0			NC40				0		(none)	0.8	g	420162.1	332615.6	84
AHU-07-ATMOSPHERIC-extract-fan - Assumed Phase 2			78.2	78.2	78.2	Lw	AHU_07_ATMOSPHER		0	0	0			NC40				0		(none)	0.8	g	420138.3	332623.7	84
AHU-07-ATMOSPHERIC-supply-fan			74.8	74.8	74.8	Lw	AHU_07_ATMOSPHER		0	0	0			NC40				0		(none)	0.8	g	420158.1	332624.1	84
AHU-07-ATMOSPHERIC-supply-fan - Assumed Phase 2			74.8	74.8	74.8	Lw	AHU_07_ATMOSPHER		0	0	0			NC40				0		(none)	0.8	g	420134.3	332632.2	84
AHU-07-Casing			79	79	79	Lw	AHU_07_Casing		0	0	0							0		(none)	1.7	g	420163.8	332622.6	84.9
AHU-07-Casing - Assumed Phase 2			79	79	79	Lw	AHU_07_Casing		0	0	0							0		(none)	1.7	g	420140.1	332630.7	84.9
AHU-08-ATMOSPHERIC-extract-fan			78.3	78.3	78.3	Lw	AHU_08_ATMOSPHER		0	0	0			NC40				0		(none)	0.8	g	420169.7	332637.6	84
AHU-08-ATMOSPHERIC-extract-fan - Assumed Phase 2			78.3	78.3	78.3	Lw	AHU_08_ATMOSPHER		0	0	0			NC40				0		(none)	0.8	g	420145.9	332645.8	84
AHU-08-ATMOSPHERIC-supply-fan			74.6	74.6	74.6	Lw	AHU_08_ATMOSPHER		0	0	0			NC40				0		(none)	0.8	g	420168.1	332646.7	84
AHU-08-ATMOSPHERIC-supply-fan - Assumed Phase 2			74.6	74.6	74.6	Lw	AHU_08_ATMOSPHER		0	0	0			NC40				0		(none)	0.8	g	420144.3	332654.9	84
AHU-08-Casing			79.2	79.2	79.2	Lw	AHU_08_Casing		0	0	0							0		(none)	1.7	g	420173.7	332641	84.9
AHU-08-Casing - Assumed Phase 2			79.2	79.2	79.2	Lw	AHU_08_Casing		0	0	0							0		(none)	1.7	g	420150	332649.1	84.9
AHU-09-ATMOSPHERIC-extract-fan			76	76	76	Lw	AHU_09_ATMOSPHER		0	0	0			NC40				0		(none)	0.8	g	420164.8	332626.6	84
AHU-09-ATMOSPHERIC-extract-fan - Assumed Phase 2			76	76	76	Lw	AHU_09_ATMOSPHER		0	0	0			NC40				0		(none)	0.8	g	420141.1	332634.8	84
AHU-09-ATMOSPHERIC-supply-fan			72.9	72.9	72.9	Lw	AHU_09_ATMOSPHER		0	0	0			NC40				0		(none)	0.8	g	420163	332634.6	84
AHU-09-ATMOSPHERIC-supply-fan - Assumed Phase 2			72.9	72.9	72.9	Lw	AHU_09_ATMOSPHER		0	0	0			NC40				0		(none)	0.8	g	420139.2	332642.7	84
AHU-09-Casing			75.6	75.6	75.6	Lw	AHU_09_Casing		0	0	0							0		(none)	1.7	g	420168.2	332631.1	84.9
AHU-09-Casing - Assumed Phase 2			75.6	75.6	75.6	Lw	AHU_09_Casing		0	0	0							0		(none)	1.7	g	420144.4	332639.3	84.9
COND-01-Northern-Offices-Condenser-Compound & Atte			78.3	86.3	78.3	Lw	COND_01		-8	0	-8							0	500	(none)	0.5	r	420228.2	332726.8	74.33
COND-01-Northern-Offices-Condenser-Compound & Atte			78.3	86.3	78.3	Lw	COND_01		-8	0	-8							0	500	(none)	0.5	r	420230.4	332725.7	74.3
COND-02-Western-Condenser-Compound			83.8	83.8	83.8	Lw	COND_02		0	0	0							0	500	(none)	0.5	r	420072.5	332631.5	74.02
COND-02-Western-Condenser-Compound			83.8	83.8	83.8	Lw	COND_02		0	0	0							0	500	(none)	0.5	r	420070.2	332632.6	74.02
COND-03-Office			62	62	62	Lw	COND_03		0	0	0							0	500	(none)	0.5	r	420201	332534.9	72.8
COND-04-Server Room			70	70	70	Lw	COND_04		0	0	0							0	500	(none)	0.5	r	420227.6	332725.1	74.3
COND-05-Server Room			70	70	70	Lw	COND_05		0	0	0							0	500	(none)	0.5	r	420227.2	332724	74.3
COND-06-IT Storage			70	70	70	Lw	COND_06		0	0	0							0	500	(none)	0.5	r	420229.4	332724.3	74.3
COND-07-IT Storage			70	70	70	Lw	COND_07		0	0	0							0	500	(none)	0.5	r	420229	332723.2	74.3
COND-08-UPS Room			62	62	62	Lw	COND_08		0	0	0							0	500	(none)	0.5	r	420226.3	332722.6	74.3
COND-09-Server Room			70	70	70	Lw	COND_09		0	0	0							0	500	(none)	0.5	r	420225.9	332721.8	74.29
COND-10-Server Room			70	70	70	Lw	COND_10		0	0	0							0	500	(none)	0.5	r	420225.6	332721	74.28
Delivery Unloading		Unloading	82.2	82.2	82.2	Lw	Unloading		0	0	0							0		(none)	1.1	g	420147.9	332742.2	75.05
EF-01-ATMOSPHERIC-extract-fan			77	77	77	Lw	EF_01_ATMOSPHERIC		0	0	0			NC40				0		(none)	0.8	g	420185.4	332667.7	84
EF-01-ATMOSPHERIC-extract-fan - Assumed Phase 2			77	77	77	Lw	EF_01_ATMOSPHERIC		0	0	0			NC40				0		(none)	0.8	g	420161.6	332675.8	84
EF-01-Casing			69.9	69.9	69.9	Lw	EF_01_Casing		0	0	0							0		(none)	1.7	g	420190.3	332664.7	84.9
EF-01-Casing - Assumed Phase 2			69.9	69.9	69.9	Lw	EF_01_Casing		0	0	0							0		(none)	1.7	g	420166.5	332672.9	84.9
EF-02-ATMOSPHERIC-extract-fan			77.5	77.5	77.5	Lw	EF_02_ATMOSPHERIC		0	0	0			NC40				0		(none)	0.8	g	420237.2	332628.9	84
EF-02-Casing			69.8	69.8	69.8	Lw	EF_02_Casing		0	0	0							0		(none)	1.7	g	420238.6	332633.8	84.9
EF-03-ATMOSPHERIC-extract-fan			77.5	77.5	77.5	Lw	EF_03_ATMOSPHERIC		0	0	0			NC40				0		(none)	0.8	g	420190.4	332696.2	84
EF-03-Casing			69.8	69.8	69.8	Lw	EF_03_Casing		0	0	0							0		(none)	1.7	g	420191.5	332700.6	84.9
EF-04-ATMOSPHERIC-extract-fan			77.5	77.5	77.5	Lw	EF_04_ATMOSPHERIC		0	0	0			NC40				0		(none)	0.8	g	420209.6	332683.6	84
EF-04-Casing			69.8	69.8	69.8	Lw	EF_04_Casing		0	0	0							0		(none)	1.7	g	420215.6	332681.8	84.9
EF-05-ATMOSPHERIC-extract-fan			77.5	77.5	77.5	Lw	EF_05_ATMOSPHERIC		0	0	0			NC40				0		(none)	0.8	g	420212.4	332688.6	84
EF-05-Casing			69.8	69.8	69.8	Lw	EF_05_Casing		0	0	0							0		(none)	1.7	g	420217.1	332685.6	84.9
SF-01-ATMOSPHERIC-supply-fan			72.7	72.7	72.7	Lw	SF_01_ATMOSPHERIC		0	0	0			NC40				0		(none)	0.8	g	420178	332661.3	84
SF-01-ATMOSPHERIC-supply-fan - Assumed Phase 2			72.7	72.7	72.7	Lw	SF_01_ATMOSPHERIC		0	0	0			NC40				0		(none)	0.8	g	420154.3	332669.5	84
SF-01-Casing			71.4	71.4	71.4	Lw	SF_01_Casing		0	0	0							0		(none)	1.7	g	420183.9	332657.8	84.9
SF-01-Casing - Assumed Phase 2			71.4	71.4	71.4	Lw	SF_01_Casing		0	0	0							0		(none)	1.7	g	420160.1	332665.9	84.9
SF-02-ATMOSPHERIC-supply-fan			73.7	73.7	73.7	Lw	SF_02_ATMOSPHERIC		0	0	0			NC40				0		(none)	0.8	g	420234.6	332639.9	84
SF-02-Casing			72	72	72	Lw	SF_02_Casing		0	0	0							0		(none)	1.7	g	420232.7	332633.7	84.9
AHU-04-Casing			80.6	80.6	80.6	Lw	AHU_04_Casing		0	0	0							0		(none)	1.7	g	420152.3	332596.8	84.9

AHU-05-Casing			80.5	80.5	80.5	Lw	AHU_05_Casing	0	0	0							0		(none)	1.7	g	420147.1	332586.6	84.9
AHU-06-Casing			78	78	78	Lw	AHU_06_Casing	0	0	0							0		(none)	1.7	g	420139.2	332565.5	84.9
AHU-04-ATMOSPHERIC-supply-fan			77.4	77.4	77.4	Lw	AHU_04_ATMOSPHEI	0	0	0			NC40				0		(none)	0.8	g	420147.1	332600.3	84
AHU-04-ATMOSPHERIC-extract-fan			80.2	80.2	80.2	Lw	AHU_04_ATMOSPHEI	0	0	0			NC40				0		(none)	0.8	g	420149.9	332591.9	84
AHU-05-ATMOSPHERIC-extract-fan			80.3	80.3	80.3	Lw	AHU_05_ATMOSPHEI	0	0	0			NC40				0		(none)	0.8	g	420145.7	332581.2	84
AHU-05-ATMOSPHERIC-supply-fan			77.2	77.2	77.2	Lw	AHU_05_ATMOSPHEI	0	0	0			NC40				0		(none)	0.8	g	420142.3	332589.9	84
AHU-06-ATMOSPHERIC-supply-fan			75.6	75.6	75.6	Lw	AHU_06_ATMOSPHEI	0	0	0			NC40				0		(none)	0.8	g	420134	332571.2	84
AHU-06-ATMOSPHERIC-extract-fan			77.8	77.8	77.8	Lw	AHU_06_ATMOSPHEI	0	0	0			NC40				0		(none)	0.8	g	420136.5	332561.8	84
AHU-04-Casing - Assumed Phase 2			80.6	80.6	80.6	Lw	AHU_04_Casing	0	0	0							0		(none)	1.7	g	420129.6	332611.8	84.9
AHU-05-Casing - Assumed Phase 2			80.5	80.5	80.5	Lw	AHU_05_Casing	0	0	0							0		(none)	1.7	g	420124.3	332597.7	84.9
AHU-06-Casing - Assumed Phase 2			78	78	78	Lw	AHU_06_Casing	0	0	0							0		(none)	1.7	g	420115.9	332578	84.9
AHU-04-ATMOSPHERIC-supply-fan - Assumed Phase 2			77.4	77.4	77.4	Lw	AHU_04_ATMOSPHEI	0	0	0			NC40				0		(none)	0.8	g	420124.4	332615.4	84
AHU-04-ATMOSPHERIC-extract-fan - Assumed Phase 2			80.2	80.2	80.2	Lw	AHU_04_ATMOSPHEI	0	0	0			NC40				0		(none)	0.8	g	420126.7	332606	84
AHU-05-ATMOSPHERIC-extract-fan - Assumed Phase 2			80.3	80.3	80.3	Lw	AHU_05_ATMOSPHEI	0	0	0			NC40				0		(none)	0.8	g	420121.5	332591.1	84
AHU-05-ATMOSPHERIC-supply-fan - Assumed Phase 2			77.2	77.2	77.2	Lw	AHU_05_ATMOSPHEI	0	0	0			NC40				0		(none)	0.8	g	420117.9	332601.1	84
AHU-06-ATMOSPHERIC-supply-fan - Assumed Phase 2			75.6	75.6	75.6	Lw	AHU_06_ATMOSPHEI	0	0	0			NC40				0		(none)	0.8	g	420110	332583.9	84
AHU-06-ATMOSPHERIC-extract-fan - Assumed Phase 2			77.8	77.8	77.8	Lw	AHU_06_ATMOSPHEI	0	0	0			NC40				0		(none)	0.8	g	420112.3	332573.1	84
Silo Dry Air Generator & Injector			97.5	89.5	97.5	Lw	89++80	8	0	8							0	500	(none)	2	r	420240.3	332619	74.44
Silo Filter		Silo_Filter@1	94	86	94	Lw	86	8	0	8							0	500	(none)	9.3	r	420240.3	332619	81.74

11.2.5. CadnaA: Vertical Noise Sources – Wall Cladding/ Loading Bay Opening Areas (Roller Shutter Doors)

Name	M.	ID	Result. PWL		Result. PWL"				Lw / Li			Correction		Sound Reduction			Attenuation	Operating Time					Direct.
			Day	Evening	Night	Day	Evening	Night	Type	Value	norm.	Day	Evening	Night	R	Area		Day	Special	Night	K0	Freq.	
			(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)			dB(A)	dB(A)	dB(A)	dB(A)		(m²)		(min)	(min)	(min)	(dB)	(Hz)	
AVT 1+AVT 2			81.3	81.3	81.3	52	52	52	Li	87		0	0	0	31	848.7		60	0	60	3	500	(none)
AVT 3 +AVT 4			81.7	81.7	81.7	52	52	52	Li	87		0	0	0	31	943.27		60	0	60	3	500	(none)
Warehouse & Logistics			69.5	69.5	69.5	35	35	35	Li	70		0	0	0	31	2803.09		60	0	60	3	500	(none)
Warehouse & Logistics			68.3	68.3	68.3	35	35	35	Li	70		0	0	0	31	2160.64		60	0	60	3	500	(none)
Warehouse & Logistics			60.3	60.3	60.3	35	35	35	Li	70		0	0	0	31	338.64		60	0	60	3	500	(none)
Warehouse & Logistics			54.5	54.5	54.5	35	35	35	Li	70		0	0	0	31	88.84		60	0	60	3	500	(none)
Sugar Dissolver			60.5	60.5	60.5	42	42	42	Li	77		0	0	0	31	71.52		60	0	60	3	500	(none)
Incoming Goods			51.5	51.5	51.5	28	28	28	Li	63		0	0	0	31	223.88		60	0	60	3	500	(none)
Boiler Room			49.2	49.2	49.2	30	30	30	Li	65		0	0	0	31	82.42		60	0	60	3	500	(none)
Boiler Room			46	46	46	30	30	30	Li	65		0	0	0	31	40.15		60	0	60	3	500	(none)
Compressed Air LP/HP			68.4	68.4	68.4	49	49	49	Li	84		0	0	0	31	87.62		60	0	60	3	500	(none)
Compressed Air LP/HP			66.4	66.4	66.4	48	48	48	Li	83		0	0	0	31	68.44		60	0	60	3	500	(none)
Folls & LAbels _Raw Aux Operating Materials			59.8	59.8	59.8	34	34	34	Li	69		0	0	0	31	383.54		60	0	60	3	500	(none)
Warehouse & Logistics			65.7	65.7	65.7	35	35	35	Li	70		0	0	0	31	1170.81		60	0	60	3	500	(none)
Warehouse & Logistics			65.1	65.1	65.1	35	35	35	Li	70		0	0	0	31	1020.05		60	0	60	3	500	(none)
Loading Dock 1			74.9	74.9	74.9	66	66	66	Li	70		0	0	0	0	7.7		60	0	60	3	500	(none)
Loading Dock 2			74.7	74.7	74.7	66	66	66	Li	70		0	0	0	0	7.46		60	0	60	3	500	(none)
Loading Dock 3			74.8	74.8	74.8	66	66	66	Li	70		0	0	0	0	7.57		60	0	60	3	500	(none)
Loading Dock 4			75	75	75	66	66	66	Li	70		0	0	0	0	7.86		60	0	60	3	500	(none)
Loading Dock 5			74.8	74.8	74.8	66	66	66	Li	70		0	0	0	0	7.61		60	0	60	3	500	(none)
Loading Dock 6			74.7	74.7	74.7	66	66	66	Li	70		0	0	0	0	7.43		60	0	60	3	500	(none)
Loading Dock 7			74.8	74.8	74.8	66	66	66	Li	70		0	0	0	0	7.58		60	0	60	3	500	(none)
Loading Dock 8			74.7	74.7	74.7	66	66	66	Li	70		0	0	0	0	7.45		60	0	60	3	500	(none)
Loading Dock 9			74.8	74.8	74.8	66	66	66	Li	70		0	0	0	0	7.53		60	0	60	3	500	(none)
Loading Dock 10			74.8	74.8	74.8	66	66	66	Li	70		0	0	0	0	7.58		60	0	60	3	500	(none)
Loading Dock 11			74.8	74.8	74.8	66	66	66	Li	70		0	0	0	0	7.58		60	0	60	3	500	(none)
Loading Dock 12			74.8	74.8	74.8	66	66	66	Li	70		0	0	0	0	7.56		60	0	60	3	500	(none)
Loading Dock 13			74.8	74.8	74.8	66	66	66	Li	70		0	0	0	0	7.58		60	0	60	3	500	(none)
Loading Dock 14			74.8	74.8	74.8	66	66	66	Li	70		0	0	0	0	7.62		60	0	60	3	500	(none)
Loading Dock 15			74.8	74.8	74.8	66	66	66	Li	70		0	0	0	0	7.56		60	0	60	3	500	(none)
Loading Dock 16			74.7	74.7	74.7	66	66	66	Li	70		0	0	0	0	7.37		60	0	60	3	500	(none)
Loading Dock 17			74.7	74.7	74.7	66	66	66	Li	70		0	0	0	0	7.41		60	0	60	3	500	(none)
Loading Dock 18			74.8	74.8	74.8	66	66	66	Li	70		0	0	0	0	7.64		60	0	60	3	500	(none)
Loading Dock 19			74.8	74.8	74.8	66	66	66	Li	70		0	0	0	0	7.54		60	0	60	3	500	(none)
Loading Dock 20			74.8	74.8	74.8	66	66	66	Li	70		0	0	0	0	7.62		60	0	60	3	500	(none)
Loading Dock 21			74.8	74.8	74.8	66	66	66	Li	70		0	0	0	0	7.54		60	0	60	3	500	(none)
Loading Dock 22			77.2	77.2	77.2	66	66	66	Li	70		0	0	0	0	13.21		60	0	60	3	500	(none)
Loading Dock 23			77.1	77.1	77.1	66	66	66	Li	70		0	0	0	0	13.01		60	0	60	3	500	(none)
Warehouse & Logistics			66.8	66.8	66.8	35	35	35	Li	70		0	0	0	31	1516.81		60	0	60	3	500	(none)

11.2.6. Noise Levels at Receivers/ Building Evaluation

Individual Receivers

Name	M.	ID	Level Lr	Limit. Value				Land Use			Height		Coordinates		
			Day	Night	Day	Night		Type	Auto	Noise Type			X	Y	Z
			(dBA)	(dBA)	(dBA)	(dBA)					(m)		(m)	(m)	(m)
Receiver 2			41.7	39.9	0	0			x	Total	4.5	r	420234.9	332791.2	81.22
Receiver 1			40.3	40.2	0	0			x	Total	4.5	r	420144.9	332818.4	81.27
Receiver 3			43.1	41.2	0	0			x	Total	4.5	r	420251.7	332779.7	81.04
Receiver 4			37.6	37.5	0	0			x	Total	4.5	r	419954.1	332533.8	76.42

Building Evaluation Receivers

Name	M.	ID	Level	Excess Levels			Land Use			Coordinates		Floor Height			Round up	ute Height Code	
			Day	Night	From	To	Type	Auto	Noise Type	X	Y	Ø	EG	OG-OG			
			(dBA)	(dBA)	Floor	Floor				(m)	(m)	(m)	(m)	(m)			
Receiver 3			43.2	41.3				x	Roads	420252.9	332783.3	4	4.5	1000	0.5	r	
Receiver 1			40.4	40.2				x	Roads	420148.2	332823.4	4.5	4.5	1000	0.5	r	
Receiver 2			41.7	40				x	Roads	420235.9	332795.3	4	4.5	1000	0.5	r	
Receiver 4			37.6	37.5				x	Roads	419949.7	332535.1	4	4.5	1000	0.5	r	

11.2.7. Laboratorial Sound Insulation Index Performance Rw of Proposed Construction

Wall/ Cladding

Updated: 15.1.2016

PAROC

Declaration of Performance

No. 60004-CPR/combined

1. Unique identification code of the product-type:
   PAROC® (line, smooth, micro, dot) AST E

2. Type, batch or serial number or any other element allowing identification of the construction product as required pursuant to Article 11(4):
   See product label

Thickness, Weight		
Nominal Thickness	**Actual Thickness**	**Weight**
50 mm	53 mm	16 kg/m^2
80 mm	79 mm	19 kg/m^2
100 mm	99 mm	22 kg/m^2
120 mm	120 mm	24 kg/m^2
150 mm	151 mm	28 kg/m^2
175 mm	173 mm	31 kg/m^2
200 mm	202 mm	34 kg/m^2
240 mm	243 mm	39 kg/m^2
300 mm	305 mm	47 kg/m^2
Material		
Core Material, Density	**External Sheet (EN 10326-S320GD+Z275) 0,6 - 0,7 (EN 10326-S320GD+Z100) 0,5**	**Internal Sheet (EN 10326-S320GD+Z275) 0,6 – 0,7 (EN 10326-S320GD+Z100) 0,5**
Stone wool, 120 kg/m^3	PVDF/SP/FoodSafe 0.5/0.6/0.7	PVDF/SP/FoodSafe 0.5/0.6/0.7

3. Intended use or uses of the construction product, in accordance with the applicable harmonised technical specification, as foreseen by the manufacturer:
   Self-supporting double skin metal faced insulating sandwich panels.
   External walls and wall cladding, walls (including partitions) within the building envelope.
   Roofs and ceilings
4. Name, registered trade name or registered trade mark and contact address of the manufacturer as required pursuant to Article 11(5):
   Paroc Panel System Oy Ab
   FI-21600 Parainen

5. System or systems of assessment and verification of constancy of performance of the construction product as set out in Annex V:
   System 1 for reaction to fire.
   System 2+ for other properties.

6. In case of the declaration of performance concerning a construction product covered by a harmonized standard:
   Notified certification body No. 0809 – VTT Expert Services Ltd performed the initial inspection of the manufacturing plant and of factory production control and the continuous surveillance, assessment and evaluation of the factory production control under system 1 and system 2+ and issued the certificate of constancy of performance (VTT-0809-CPR-1156).

Paroc Panel System Oy Ab / Declaration of Performance, No. 60004-CPR 1 (3)

Updated: 15.1.2016

PAROC

7. Declared performance

Reaction to Fire, Fire Resistance			
Essential characteristics	**Performance**		**Harmonized technical specification**
Reaction to Fire, Euroclass (for all applications)	A2-s1,d0		EN 14509:2013
Fire Resistance, wall Horizontal / Vertical installation *For more information regarding details and spans contact Paroc Panel System / Technical Support	**Thickness** 50 mm 80 mm 100 mm 120 mm 150 mm 175 mm 200 mm 240 mm 300 mm	**Fire Class*** EI 45/45 EI 45/90 EI 45/120 EI 45/120 EI 240/240 EI 240/240 EI 240/240 EI 240/240 EI 240/240	EN 14509:2013
Fire Resistance, ceiling	100 – 300mm	EI 60	EN 14509:2013

Thermal Transmittance			
Essential characteristics	**Performance**		**Harmonized technical specification**
Thermal Conductivity (declared) in 10 °C, λ_{10} Core material: stone wool, 120 kg/m^3	0.045 W/mK		EN 14509:2013
Thermal Transmittance	**Thickness** 50 mm 80 mm 100 mm 120 mm 150 mm 175 mm 200 mm 240 mm 300 mm	**W/m^{2}K** 0.77 0.53 0.43 0.36 0.29 0.25 0.22 0.18 0.14	

Water Permeability, Water Vapour Permeability, Air Permeability		
Essential characteristics	**Performance**	**Harmonized technical specification**
Water Permeability	Class A	EN 14509:2013
Water Vapour Permeability	Impermeable	
Air Permeability	1,0 m^3 /m^2/h at 50 Pa	

Airborne Sound Insulation, Sound Absorption			
Essential characteristics	**Performance**		**Harmonized technical specification**
Airborne Sound Insulation R_w (C; C_{tr})	**Thickness** 50 mm 80 mm 100 mm 120 mm 150 mm 175 mm 200 mm 240 mm 300 mm	**dB** 31 (-3; -3) 31 (-3; -3) 31 (-3; -3) 31 (-3; -3) 31 (-3; -3) 31 (-3; -3) 30 (-3; -3) 30 (-3; -3) 30 (-3; -3)	EN 14509:2013
Sound Absorption α_w	NPD		EN 14509:2013

Durability		
Essential characteristics	**Performance**	**Harmonized technical specification**
Durability	Pass	EN 14509:2013

Updated: 15.1.2016

PAROC

Mechanical Resistance

Strength, Resistance to Point Load and Access Loads			
Essential characteristics	**Performance**		**Harmonized technical specification**
Tensile Strength (panel)	0.230 MPa		EN 14509:2013
Compression Strength (core)	0.110 MPa		
Shear Strength	0.090 MPa		
Shear Modulus (core) Mean Value	9 MPa		
Reduced Long Term Shear Strength	0.045 MPa		
Resistance to Point Load and Access Loads	pass		
Creep Coefficient			
Essential characteristics	**Performance**		**Harmonized technical specification**
Creep Coefficient t = 2000 h	0.6		EN 14509:2013
Creep Coefficient t = 100 000 h	1.0		
Wrinkling Stress			
Essential characteristics	**Performance**		**Harmonized technical specification**
Wrinkling Stress, In Span	165 MPa		EN 14509:2013
Wrinkling Stress, In Span (elevated temp.)	165 MPa		
Wrinkling Stress 300 mm, In Span	150 MPa		
Wrinkling Stress 300 mm, In Span (elevated temp.)	145 MPa		
Wrinkling Stress at Central Support, internal surface	**Thickness**	**MPa**	
	50 mm	132	
	80 mm	128	
	100 mm	125	
	120 mm	122	
	150 mm	118	
	175 mm	114	
	200 mm	110	
	240 mm	105	
	300 mm	92	
Wrinkling Stress at Central Support (elevated temp.), external surface	**Thickness**	**MPa**	
	50 mm	93	
	80 mm	95	
	100 mm	96	
	120 mm	97	
	150 mm	98	
	175 mm	94	
	200 mm	89	
	240 mm	82	
	300 mm	68	

8. The performance of the product identified in points 1 and 2 is in conformity with the declared performance in point 7.
   This declaration of performance is issued under the sole responsibility of the manufacturer identified in point 4.

Signed for and on behalf of the manufacturer by:
Paroc Panel System Oy Ab
Kimmo Tamminen, Production Director

Parainen 15.1.2016

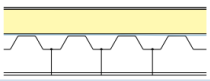
(signature)

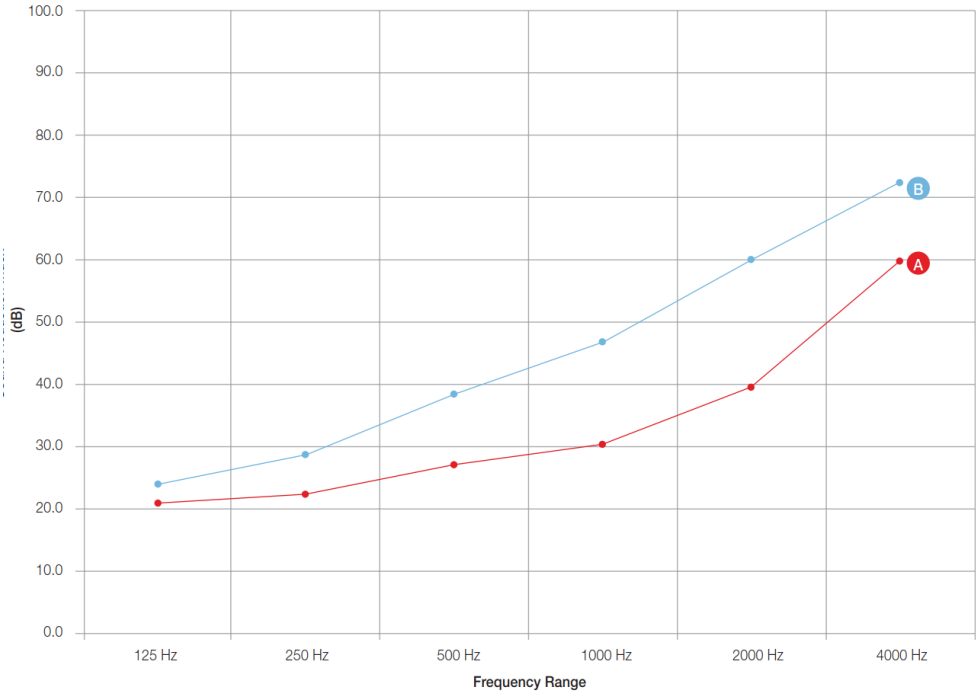
Roof Construction (Test 3A)

TECHNICAL BULLETIN

Test 3

Construction Tested and Assessed

A	Single ply membrane, 80 mm *Kingspan* **Therma**roof® TR26 LPC/FM, 5 Kg/m² acoustic sheet and a galvanized metal deck	
B	Same as above with correction for 24 mm mineral fibre ceiling tile (8.23 Kg/m²) with a 300 mm ceiling void	



Sound Reduction Index in dB over a Range of Frequencies

	Frequency (Hz)						
Test	125	250	500	1000	2000	4000	Provenance
A	21.4	22.4	26.9	30.6	39.9	50.9	(SRL Test 39 Report No. C/00/5L/7950/1)
B	24	29	38	47	60	72	(Predicted – SRL Report No. C/40269)

**Assessment carried out by Sound Research Laboratories.*

A – weighted Sound Reduction Index (R_W)

Test	R_W (dB)
A	31
B	41

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