Noise Impact Assessment

Site Address: Kemira Chemicals UK Ltd, New Potter Grange Road, Goole, DN14 6BZ

Client Name: Matt Leitch – Kemira Chemicals UK Ltd

Project Reference No: NP-010770

Authorisation and Version Control		
Revision	Reported By	Checked By
01	T Watkin, MSc, MIOA	M Caley, MSc, MIOA

Amendment History		
Revision	Date	Summary of Amendments
01	05/03/2024	--

Disclaimer

Contact Details

NOVA Acoustics Ltd,
Suite 13, Crown House,
94 Armley Road,
Leeds,
LS12 2EJ

0113 322 7977

www.novaacoustics.co.uk

technical@novaacoustics.co.uk

Delivering sustainable development by promoting good health and well-being through effective management of noise.

Contents

List of Figures

List of Tables

1. Introduction

NOVA Acoustics Ltd has been commissioned to prepare a noise impact assessment for a proposed extension to industrial operations ('the Proposed Development') at Kemira Chemicals UK Ltd, New Potter Grange Road, Goole, DN14 6BZ ('the Site').

The applicant is preparing to submit a planning application to East Riding of Yorkshire Council. This report has been prepared to accompany the planning application.

A noise survey has been undertaken to establish the prevailing background sound levels at the closest Noise Sensitive Receptors ('NSR'). The report details the existing background sound climate and the predicted noise emissions associated with the proposed development. Measures required to mitigate noise impact from the proposed development have been recommended where necessary and assessed in accordance with the relevant performance standards, legislation, policy and guidance.

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

1.1 Standards, Legislation, Policy & Guidance

The following performance standards, legislation, policy and guidance have been considered to ensure good acoustic design in the assessment:

- National Planning Policy Framework (2023).
- Noise Policy Statement for England (2010).
- British Standard BS4142:2014+A1:2019 – 'Methods for rating and assessing industrial and commercial sound'.

Further information on the legislation can be found in Appendix B.

1.2 Background

Kemira Chemicals UK Ltd manufacture chemicals used in municipal water and wastewater treatment plants. An extension program was completed in 2021, and this proposal seeks to further increase the sites production capacity.

The site operations currently include:

- The delivery of raw material via HGVs, including magnetite,
- Storage of raw material,
- Production of chemicals within the main production building,
- Storage of manufactured chemicals,
- Loading and delivery of chemicals out of site via HGVs.

1.3 Proposal Brief

The proposal is for the extension and relocation of industrial operations. The applicant is proposing to the following:

- 1 No. additional dissolver vessel on the 2nd floor gantry of the main production area, which involves an upper-level extension to the production building.
- A redesign of the dissolver LEV ducting to terminate along the southern elevation of the production building at 3rd floor gantry height.
- The relocation of the magnetite storage and hopper loading to a currently vacant industrial unit owned by the applicant.
- The installation of an enclosed conveyor belt system between the new magnetite storage unit and main production building (at roof height).
- A lower-level extension to main production building for vehicle access.
- As a result of the increased production capacity, an increase of 14 No. HGV movements per day is anticipated as of 2030. This has been simplified to a 'worst-case' scenario to ensure a robust scenario.

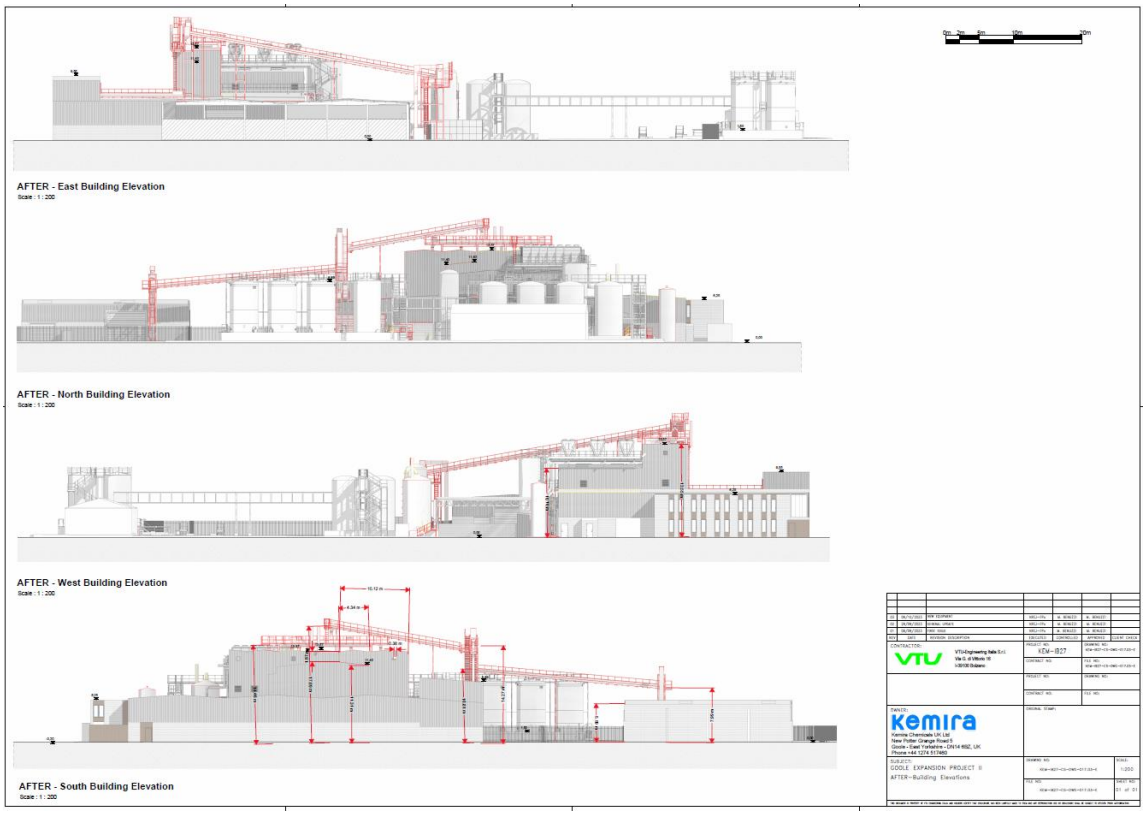
NOVA Acoustics has been informed that the site operates 24/7 and the proposed development will also conform to 24/7 operations.

NOVA Acoustics has been informed there is no additional external fixed plant included as part of the proposal.

The figure below shows the proposed development.

Drawing Ref No. KEM-IB27-CS-DWG-011.03-E from 'VTU-Engineering Italia S.r.l'

Figure 1 – Proposed Development – Plan View



Drawing Ref No. KEM-IB27-CS-DWG-017.03-E' from 'VTU-Engineering Italia S.r.l'

Figure 2 – Proposed Development – Elevations

1.4 Local Planning Authority Comments

The LPA has provided the following comments regarding the potential noise impact from the site:

"I acknowledge that the submitted Design and Access Statement confirms that "Noise is not anticipated outside of the buildings". However, the proposal includes the installation of a new distribution conveyor system, albeit this is described as fully enclosed. As such, a Noise Impact Assessment may be required in accordance with the Validation Checklist (details below)."

In light of the comments above, the applicant has commissioned NOVA Acoustics to compile an acoustic report.

2. Environmental Noise Survey

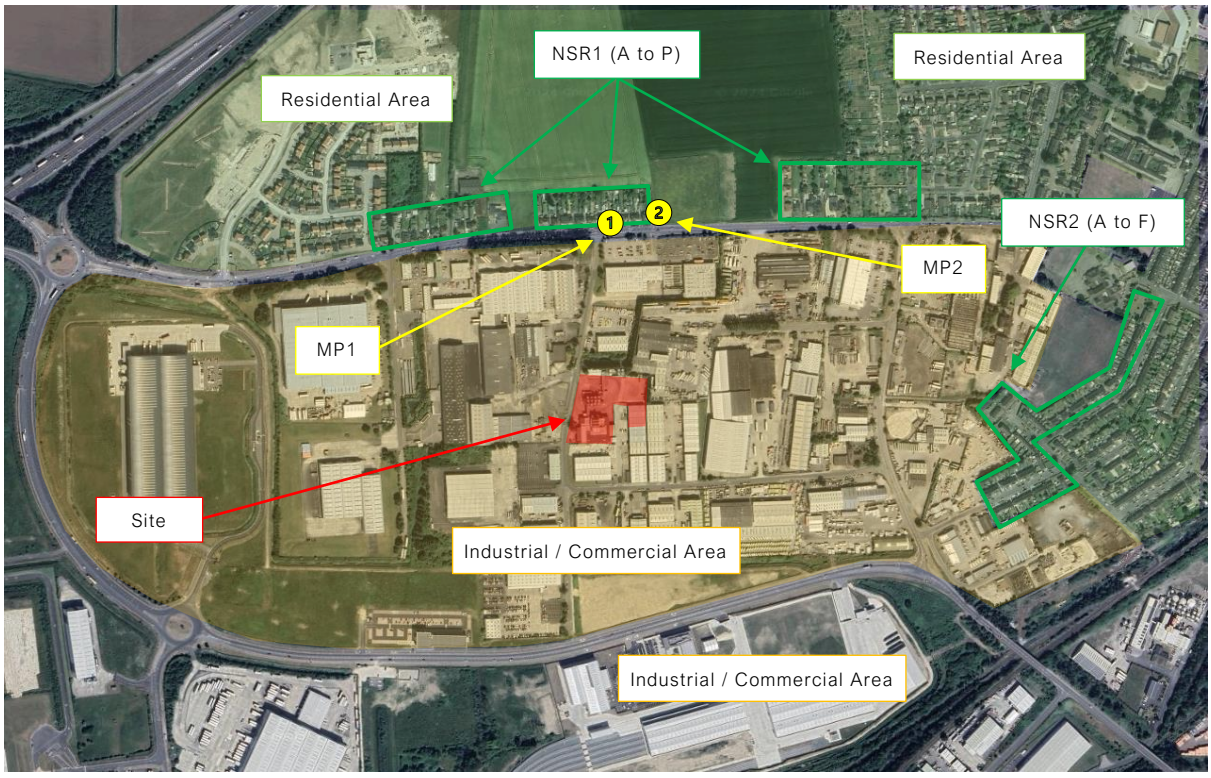
2.1 Measurement Methodology

The following table outlines the measurement dates and particulars. In all instances the equipment was field calibrated before and after each set of measurements; negligible drift was recorded. A 130mm diameter windshield was fitted to the microphones. Weather conditions during the environmental sound survey can be found in Appendix D.

Location	Survey Dates	Measurement Particulars
MP1	23-26/02/2024	Equipment mounted on a lamppost along Rawcliffe Rd (closest NSRs). The microphone was poisoned approximately 3.5m above the ground and at least 3.5m from any other large reflective surface (a secure location to avoid interference form the general public).
MP2	23/02/2024	Equipment mounted on a tripod at 1.5m above the ground in line with the NSRs closest façade to the site. This measurement was conducted as the secure monitoring location of MP1 was approximately 9m closer to Rawcliffe Rd than the closest façades of the closest NSRs.

Table 1 – Measurement Methodology

The figure below outlines the site surroundings and measurement locations:



Imagery ©2024 Airbus, Imagery © Airbus, CNES / Airbus, Getmapping plc, Infoterra Ltd & Bluesky, Maxar Technologies, map data ©2024

Figure 3 – Measurement Locations and Site Surroundings

2.1 Context & Subjective Impression

The proposed development site is located within a large industrial estate off Rawcliffe Road. The immediate surrounding areas consist of industrial usages, with the closest group of NSRs(1) situated approximately 220m northwards from the site perimeter. NSR1(A to P) is a group of semi-detached and detached dwellings that front Rawcliffe Road, with A being the closest to the site. A second group of NSRs labelled NSR2(A to F) are a minimum of 510m to the south-east of the site and are a several rows of terraced dwellings.

The industrial estate is relatively busy, and the noise profile at the site boundaries was found to be dominated by frequent HGV movements and broadband continuous plant noise emissions, both emanating from the site itself. However, the noise profile at all dwellings labelled NSR1 was dominated by road traffic noise emissions from Rawcliffe Road. Second in nature were the noise emissions generated by the businesses opposite each NSR1 dwelling. For example, HGV movements and loading noise emissions from 'BAF International GMBH' were just perceptible at the NSR1(J) which was approximately 90m to the west of MP1.

'BAF International GMBH' is assumed to be operational 24/7 given that it is a distribution and logistics company. The businesses to the east of MP1 (Toolstation, Howdens, Screwfix and B&Q) operate between 07:00 to 20:00 hours, Monday to Saturday, and 10:00 to 16:00 hours on Sundays. Due to the strictly commercial nature of the businesses opposite MP1, this monitoring location was deemed to present a 'worst-case' scenario in terms of a quieter acoustic climate where noise impact is expected to be greatest.

The acoustic environment at NSR2 was deemed lower in level than at NSR1 and the noise profile was dominated by distant road traffic noise emissions from the surrounding road networks and commercial/industrial noise emissions from the neighbouring businesses.

Any noise emissions generated by the site were inaudible at any dwelling under the label of NSR1 or NSR2.

2.2 Environmental Noise Survey Results

Background Sound Level Analysis

The following section outlines the measured background sound levels that have been used as the baseline for the subsequent BS4142 noise assessment. The figures overleaf show histogram graphs of the background sound levels measured throughout the entire measurement period. The time history results can be found in Appendix D.

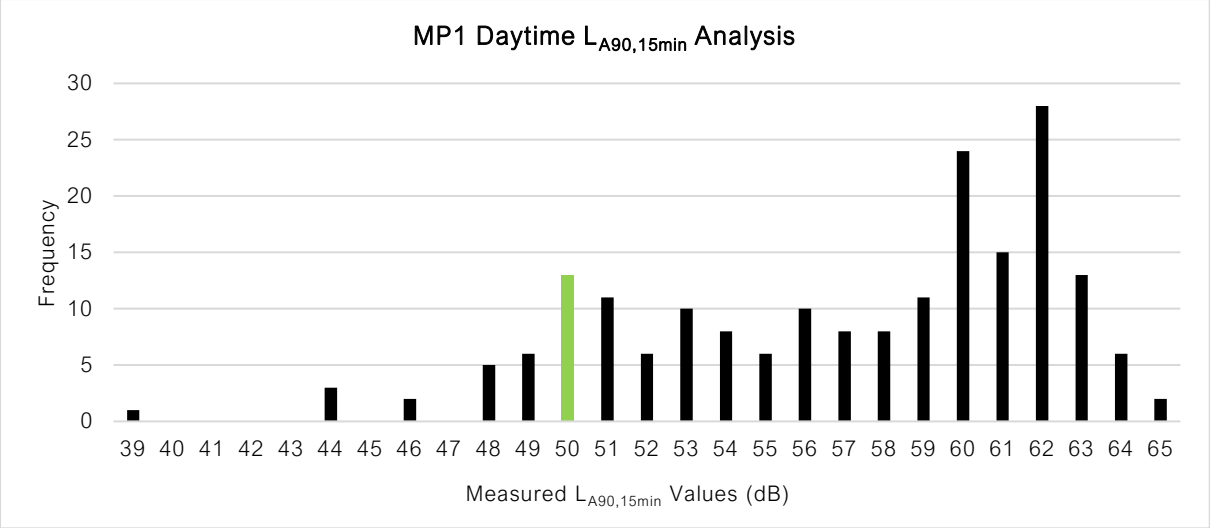


Figure 4 – MP1 Daytime Background Sound Level Analysis

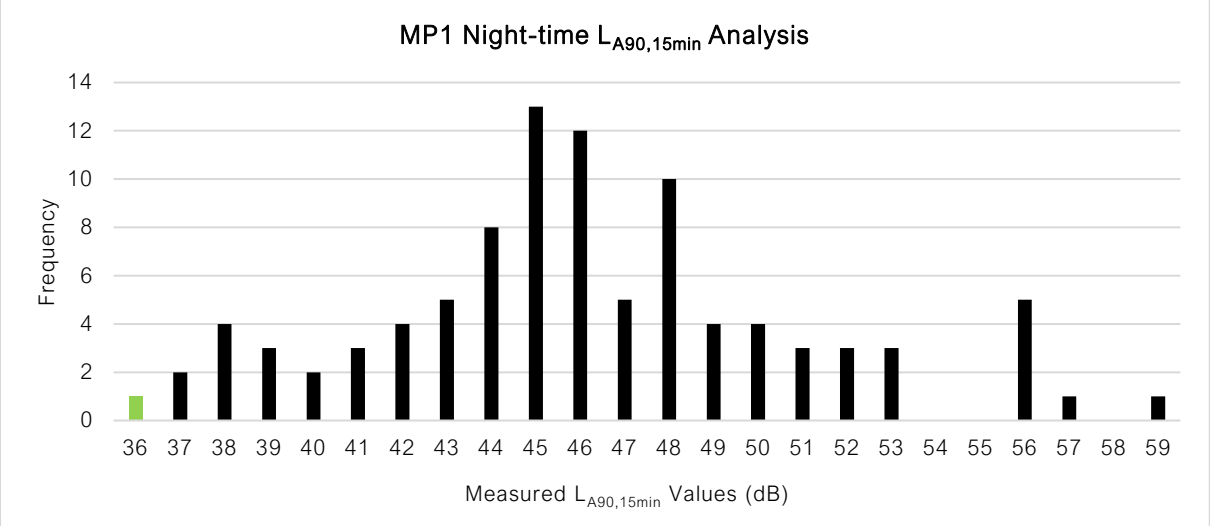


Figure 5 – MP1 Night-time Background Sound Level Analysis

As can be seen in Figure 4, the measured $L_{A90,15min}$ value of 50 dB has been used as the baseline for the daytime BS4142 assessments.

Indicated in Figure 5 is that the lowest measured $L_{A90,15min}$ value of 36 dB has been used as the baseline for the night-time BS4142 assessments.

An explanation for these chosen background sound levels is found in the proceeding section.

Short-term Measurements Results Summary

As the secure location of MP1 was situated approximately 9m closer to Rawcliffe Road than the closest façades of NSR1, attended monitoring was conducted at MP2 to allow for the comparison of $L_{A90,T}$ sound levels between the two. A summary of the results is shown in the table overleaf.

Location	Time Period ('T')	$L_{Aeq,T}$ (dB)	$L_{A90,T}$ (dB)
MP1	23/02/24: 12:45 – 13:15	68	63
MP2	23/02/24: 11:58 – 12:28	61	53

Table 2 – Comparison of Measured Sound Levels

As can be seen in the table above, there is approximately a 10 dB difference between the two measurement positions. It is recognised that this difference appears to be significant given the distance between the two positions. It is thought that whilst road traffic flows were comparable between the two measurements, the flow of traffic was less intense during the measurements at MP2.

Nonetheless, the background sound levels highlighted in Figures 3 and 4 are those 10 dB lower than the modal or 'lowest typical' $L_{A90,15min}$ measurements at MP1. This is thought to provide a 'robust' assessment capable of fully protecting the amenity of the surrounding NSRs.

3. BS4142 Noise Impact Assessment

In the following section of the report, the impact of the noise emissions generated by the proposed development is assessed.

3.1 Noise Breakout Emissions

Internal Ambient Sound Level Summary

Spot measurements of were conducted during a site visit on 23/02/2024. For all on-site measurements the following methodology was adhered to:

- Internal ambient noise measurements were taken at 1.5m above the ground in various locations.
- Where possible, measurements have been taken at a position where point source behaviour is expected and corrected for residual noise. Where not possible, measurements were taken where point source behaviour was expected but the noise source under measurement was dominant.
- All measurements were taken using a fast time-weighting and the sound level meter was set to log every 100ms.
- Measurements were taken in 1/3rd octave frequency bands; however, the report details the 1/1 octave band sound levels used in the specific sound level calculations.

The following table shows a summary of the sound levels measured on site.

Description	Octave Band (Hz, L_{eq} dB)								Overall (dBA)
	63	125	250	500	1k	2k	4k	8k	
Internal Ambient of Ground Floor Production Area (Ground Floor extension)	70	70	73	68	68	65	71	66	75
Internal Ambient on 2nd Floor by Dissolvers	74	74	73	73	71	69	71	59	77
Internal Ambient on 3rd Floor by Dissolvers LEV (Upper Floor Extension)	74	74	74	72	70	71	76	61	80
Specific Sound Level of JCB Loading Hopper (New Magnetite Storage Unit)	81	78	78	79	79	76	66	55	83

Table 3 – Specific Sound Levels of Site Operations

The internal ambient sound levels seen in the table above are deemed representative of the 2nd and 3rd floor extension to the production area where the 1 No. additional dissolver vessel is to be installed. They are thought to present a 'robust' scenario given there are currently 3 No. dissolver vessels installed.

Proposed Building Fabric Construction

NOVA Acoustics has been informed that the ground floor and upper-level extension to the main production building and new magnetite storage unit must be constructed from profiled 0.7mm sheet of steel for thermal reasons. Also for thermal reasons, all the proposed roller shutter doors ('RSDs') will most likely need to remain open.

Shown in the table below is the sound reduction performance each building fabric element, predicted in INSUL 9.0 sound insulation software.

Description	1/1 Octave Frequency Band (Hz, SRI dB)								Rw (dB)
	63	125	250	500	1k	2k	4k	8k	
0.7mm Profiled Sheet Steel	3	8	12	17	23	28	33	33	22
Gaps & Open RSD	0	0	0	0	0	0	0	0	0

Table 4 – Predicted Sound Reduction Performance of Building Fabric

3.2 External Source Sound Levels

HGV Movements

Due to loud landscaping works present on-site during the visit, measurements of HGV movements were not conducted. However, source noise levels of HGV pass-bys measured by NOVA Acoustics have been utilised (report No. NP-010637).

Outlined in the table below are the highest 1-second sound levels measured of an HGV pass-by and subsequent sound power levels calculated assuming point source behaviour over one reflective plane (Q2).

Description	Distance (m)	Octave Band (Hz, dB)								Overall (dBA)
		63	125	250	500	1k	2k	4k	8k	
HGV Pass-by ($L_{eq,1sec}$)	5	71	69	63	65	64	61	57	52	68
L_W of HGV Pass-by (Q2)	--	93	91	85	87	86	83	79	74	90

Table 5 – Calculated Sound Power Level of HGV Pass-by

The sound power levels seen in the table above have been time corrected using the histograms within the noise modelling software, accounting for:

- An additional 2 No. movements around the site per 1-hour daytime period (as per BS4142),
- An additional 1 No. movement around the site per 15-minute night-time period (as per BS4142).

Dissolver Vessel LEV Ductwork Terminus

The proposal includes a redesign of the dissolver vessels LEV ductwork so it terminates to a louvre situated along the southern elevation of the production building at 3rd floor height.

At this stage of the development, no technical drawings are available, however, the applicant has informed NOVA Acoustics that the ductwork is to include at least 3 No. 90 degree rounded elbows between each LEV fan outlet and flue terminus.

The anticipated LEV terminus sound power levels, calculated in accordance with guidance in the CIBSE Guide B4 (2016), are shown in the table below. The calculations cab be found in Appendix E, however, the following assumptions have been within the calculations (based on site visit):

- Each LEV fan is 15kW and operates at around 1470 RPM,

- Fan volume rate (Q) of 4 m^3/s,
- Fan static pressure (P) of 1100 N/m^2,
- Centrifugal style fan where the blade frequency increment ('BFI') lies at approximately 250 Hz for a fan operating at 1470 RPM,
- Between an 85-89% static efficiency (+3 dB correction),
- The ductwork is 253mm in diameter and terminates to a 250mm^2 outlet,
- 3 No. 90 degree rounded unlined elbows between each LEV fan outlet and flue terminus.

Description	1/1 Octave Frequency Band (Hz, L_W dB)								Overall (dBA)
	63	125	250	500	1k	2k	4k	8k	
Flue Outlet with 1 No. LEV fan in System	70	74	79	75	79	74	66	66	82
Flue Outlet with 3 No. LEV Fans in System	76	80	85	81	85	80	72	72	88

Table 6 – Sound Power Levels of Dissolver Flue Terminus

Conveyor Belt Motors

The proposal includes an enclosed conveyor belt driven by 9 No. motors that are to be installed between 10m to 17m above ground level. In the experience of NOVA Acoustics, the dominant noise sources as part of enclosed conveyor belt systems are the drive motors; these are considered exclusively.

At this stage of the development no makes or models have been defined. Consequently, specific sound levels have been predicted using formula No. 11.92 found in 'Engineering Noise Control' (Bies and Hansen, 1988). The calculation predicts sound pressure levels at 1m from an electric motor based on the following:

- Octave band level adjustments for TEFC motors (Table 11.24 of 'Engineering Noise Control'),
- Motor kW rating: it is anticipated that a motor of no greater than 39 kW would be appropriate,
- Motor RPM: the applicant has speculated that 100 RPM would be adequate.

Sound power levels are then calculated based on point source behaviour in free-field conditions. The predictions can be seen in the table below.

Description	Distance (m)	Octave Band (Hz, dB)								Overall (dBA)
		63	125	250	500	1k	2k	4k	8k	
L_P of TEFC Motor	1	47	50	52	55	55	54	49	41	60
L_W of TEFC Motor (Q1)	--	58	61	63	66	66	65	60	52	71

Table 7 – Predicted Sound Power Level of Conveyor Belt Motors

HGV Tipping of Magnetite

The tipping of magnetite was not observed during the site visits. As such, source noise levels for an HGV tipping sand measured by NOVA Acoustics have been used (6755AS). Due to the similar HGV and

material consistency, the activities are deemed to be comparable and therefore representative of the noise emissions generated on-site.

The table below outlines the source sound levels and calculated sound power levels assuming point source behaviour over one reflective plane (Q2).

Description	Distance (m)	Octave Band (Hz, dB)								Overall (dBA)
		63	125	250	500	1k	2k	4k	8k	
L_{eq} of HGV Tipping Sand	3	75	68	70	71	69	66	62	60	74
L_W of HGV Tipping Sand	--	93	86	88	89	87	84	80	78	91

Table 8 – Calculated Sound Power Level of HGV Tipping

NOVA Acoustics has been informed that HGV tipping typically lasts 5-minutes. To present a 'robust' scenario it has been assumed that HGV tipping occurs for 5-minutes during both the BS4142 reference time periods of 1-hour and 15-minutes during the daytime and night-time periods, respectively.

3.3 Noise Modelling & Cumulative Specific Sound Levels

The following assumptions have been made within the SoundPlan 9.0 noise modelling software:

- To accurately model the land surrounding the Site, the topographical data has been taken from the EA's 'National LIDAR Programme' on the DEFRA Data Services Platform.
- For the purpose of the assessment, the ground between the source and receivers is considered a mixture of acoustically 'hard' and 'soft' surfaces that have been modelled according to the ground type.
- Octave band noise data was used to facilitate noise modelling in accordance with ISO 9613-2. ISO 9613-2 assumes a 'downwind' model to the NSRs.
- The sound map grid height has been set to 3.5m, however, the noise levels used in the assessment has been taken from the most exposed point of each façade.
- The site and all other buildings and any intervening objects have been modelled according to measurements taken on-site, with Google Maps and those provided by the LIDAR data.
- The noise emissions breaking out of the buildings are calculated within the noise modelling software in accordance with BS12354-4:2000 assuming the following:
    - The internal ambient noise levels presented in Table 3,
    - The predicted sound reduction performance seen in Table 4,
    - A -6 dB Cd correction to account for the change in reverberant internal conditions to external non-reverberant conditions from breakout from acoustically reflective elements,
    - A -3 dB Cd correction where breakout is from open RSD or gaps.
- Any building fabric elements are assumed to behave as area noise sources. This is calculated within the SoundPlan software considering the formula: $L_W = L_{P1m} + 10*Log(S)$, where S is the surface area of the building element and L_{P1m} are the external noise levels calculated in accordance with BS12354.

- Point source emitters with the sound power levels seen in Table 6 have been used to represent the conveyor belt motors and are modelled at between 10m and 17m above the ground depending on the system location.
- A point source emitter with the sound power levels seen in Table 8 have been used to represent an HGV tipping magnetite at 1m above the ground. On-times are calculated within the noise model to account for 5-minutes of tipping during both the BS4142 reference time periods of 1-hour and 15-minutes during the daytime and night-time periods, respectively.
- An area source with the sound power levels seen in Table 6 has been used to represent the dissolver LEV ductwork terminus (L_{W/m^2}). The outlet is located along the southern elevate of the main production building and is set to 3rd floor gantry height.
- A line source modelled at 0.5m above the ground has been used represent the HGV movements in and out of site. The sound power levels seen in Table 5 are corrected within the noise model as a slow-moving point source accounting for the speed of the HGVs (4.4m/s), the travel distance around site and the number of movements per BS4142 reference time period:
    - 2 per 1-hour during the daytime,
    - 1 per 15-mintes during the night-time.

The sound maps showing the specific sound levels emission from the site can be seen in the following figures.

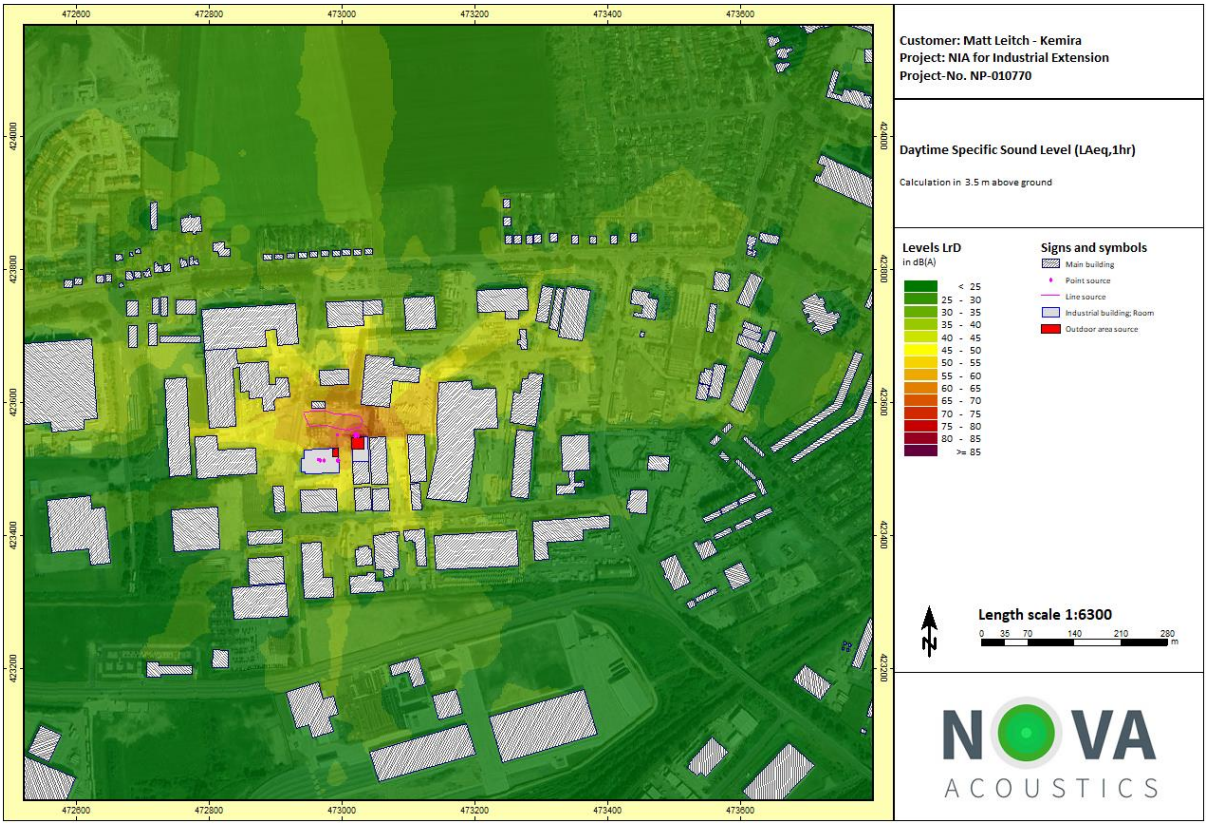


Figure 6 – Daytime Specific Sound Level Map

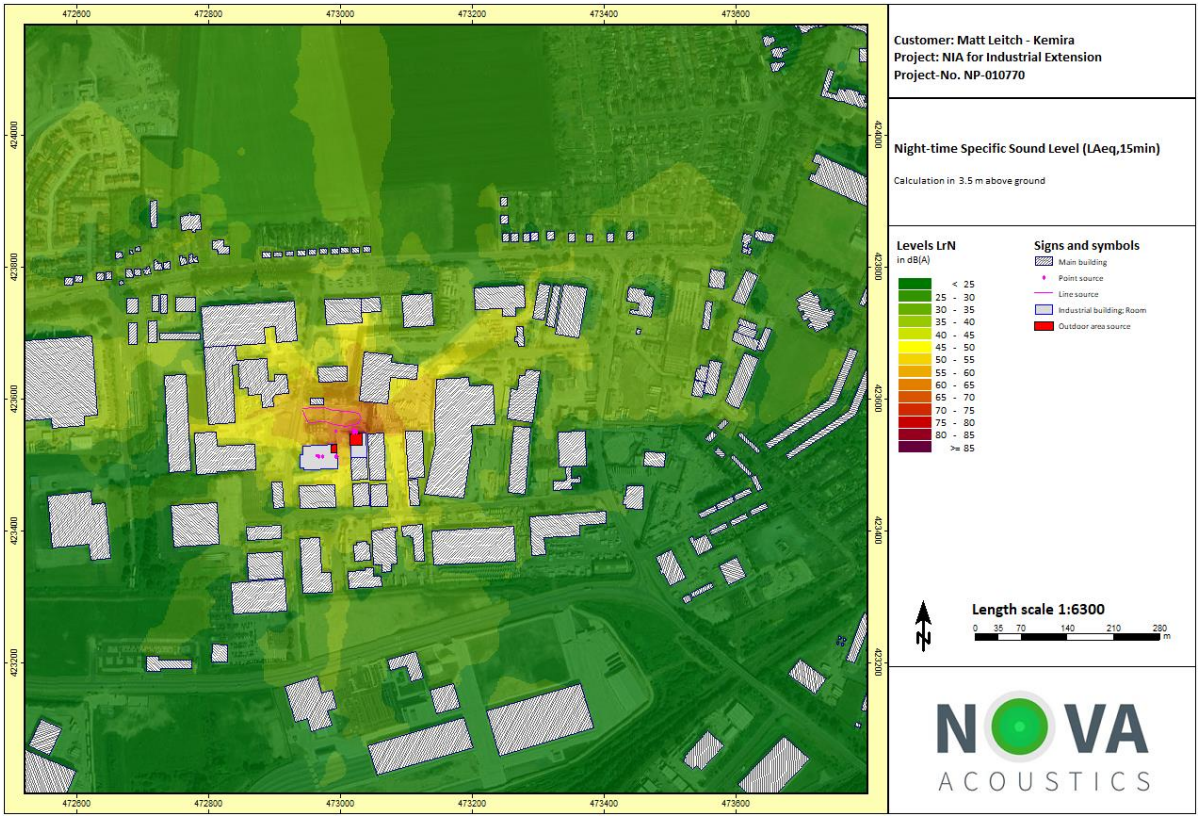


Figure 7 – Night-time Specific Sound Level Map

3.4 BS4142 Noise Impact Assessment

The BS4142 noise impact assessments are conducted at the most affected NSRs in the table below.

Daytime Noise Impact Assessment at Most Affected NSR(1)									
Description	1/1 Octave Frequency Band (Hz, dB)								Overall (dBA)
	63	125	250	500	1k	2k	4k	8k	
Daytime Specific Sound Level at NSR1(A) ($L_{eq,1hr}$)	42	35	33	33	31	27	9	-27	35
Acoustic Feature Correction	*No acoustic features are deemed to be perceptible given the absolute specific sound level.*								0
Rating Sound Level ($L_{Ar,Tr}$)	Specific Sound Level + Rating Penalties								35
Background Sound Level	MP1 Daytime $L_{A90,15min}$ – Figure 4.								50
Exceedance	$L_{Ar,Tr}$ – $L_{A90,15min}$								-15
BS4142 Assessment Outcome	The assessment indicates 'low impact, dependent on context'.								
NPPF & NPSE Outcome	The assessment indicates 'No Observed Effect Level' ('NOEL')								

Table 9 – Daytime BS4142 Noise Impact Assessment – Most Affected NSR(1)

Daytime Noise Impact Assessment at Most Affected NSR(2)									
Description	1/1 Octave Frequency Band (Hz, dB)								Overall (dBA)
	63	125	250	500	1k	2k	4k	8k	
Daytime Specific Sound Level at NSR1(A) ($L_{eq,1hr}$)	35	25	22	21	18	10	-11	-68	22
Acoustic Feature Correction	*No acoustic features are deemed to be perceptible given the absolute specific sound level.*								0
Rating Sound Level ($L_{Ar,Tr}$)	Specific Sound Level + Rating Penalties								22
Background Sound Level	MP1 Daytime $L_{A90,15min}$ – Figure 4.								50
Exceedance	$L_{Ar,Tr} - L_{A90,15min}$								-28
BS4142 Assessment Outcome	The assessment indicates 'low impact, dependent on context'.								
NPPF & NPSE Outcome	The assessment indicates 'No Observed Effect Level' ('NOEL')								

Table 10 – Daytime BS4142 Noise Impact Assessment – Most Affected NSR(2)

Night-time Noise Impact Assessment at Most Affected NSR(1)									
Description	1/1 Octave Frequency Band (Hz, dB)								Overall (dBA)
	63	125	250	500	1k	2k	4k	8k	
Daytime Specific Sound Level at NSR1(A) ($L_{eq,1hr}$)	42	35	33	33	31	27	10	-25	35
Acoustic Feature Correction	*No acoustic features are deemed to be perceptible given the absolute specific sound level. Furthermore, the specific noise emissions are akin to those already generated by the site and neighbouring businesses; it is thought that any acoustic features present in the specific noise emissions from the proposed development would not be distinguishable over the residual noise climate.*								0
Rating Sound Level ($L_{Ar,Tr}$)	Specific Sound Level + Rating Penalties								35
Background Sound Level	MP1 Daytime $L_{A90,15min}$ – Figure 5.								36
Exceedance	$L_{Ar,Tr} - L_{A90,15min}$								-1
BS4142 Assessment Outcome	The assessment indicates 'low impact, dependent on context'.								
NPPF & NPSE Outcome	The assessment indicates 'No Observed Effect Level' ('NOEL')								

Table 11 – Night-time BS4142 Noise Impact Assessment – Most Affected NSR(1)

Daytime Noise Impact Assessment at Most Affected NSR(2)									
Description	1/1 Octave Frequency Band (Hz, dB)								Overall (dBA)
	63	125	250	500	1k	2k	4k	8k	
Daytime Specific Sound Level at NSR1(A) ($L_{eq,1hr}$)	35	25	22	22	18	10	-10	-68	22
Acoustic Feature Correction	*No acoustic features are deemed to be perceptible given the absolute specific sound level.*								0
Rating Sound Level ($L_{Ar,Tr}$)	Specific Sound Level + Rating Penalties								22
Background Sound Level	MP1 Daytime $L_{A90,15min}$ – Figure 5.								36
Exceedance	$L_{Ar,Tr} - L_{A90,15min}$								-28
BS4142 Assessment Outcome	The assessment indicates 'low impact, dependent on context'.								
NPPF & NPSE Outcome	The assessment indicates 'No Observed Effect Level' ('NOEL')								

Table 12 – Daytime BS4142 Noise Impact Assessment – Most Affected NSR(2)

Recommendations & BAT

Although the BS4142 assessments have indicated 'low impact', it is advised to follow the best available techniques ('BAT') typically implemented in these types of industrial developments.

It should be highlighted that the dominant noise source contributing the most to the cumulative specific sound levels is that of the noise breakout from the open RSD of the new magnetite storage and hopper loading unit. Noise modelling has indicated that cumulative specific sound levels are reduced by 7 dBA at the most affected NSR1 if the RSD is assumed closed. It is advised to keep the RSD of the new magnetite storage and loading unit closed other than when HGVs are delivering raw material, at which point it is advised to cease loading until the delivery is complete.

4. Conclusion and Action Plan

The proposed development has been assessed against the requirements of BS4142. The noise impact assessment has indicated 'low impact' in accordance with BS4142, which when considering the wider context of the site, the proposed development is deemed to cause impact at a 'No Observed Effect Level' ('NOEL') in accordance with the NPSE and NPPF.

The following 'Action Plan' is outlined to ensure the design considerations and specifications from this report are duly implemented:

1. If the assumptions made within this report greatly differ from operating conditions that may arise further in the development process, further calculations and reassessment will be required. These include:
    a. Conveyor motor kW rating and RPM,
    b. LEV ductwork design,
    c. LEV fan operating conditions.
2. It is advised to keep the RSD of the new magnetite storage and loading unit closed other than when HGVs are delivering raw material, at which point it is advised to cease loading until the delivery is complete.

The findings of this report will require written approval from the Local Authority prior to work commencing.

Appendix A – Acoustic Terminology

A-weighted sound pressure level, L_{pA}	Quantity of A-weighted sound pressure given by the following formula in decibels (dBA). $L_{pA} = 10 \log_{10} (pA/p_0)^2$. Where: pA is the A-weighted sound pressure in pascals (Pa) and $p0$ is the reference sound pressure (20 µPa)
Background Sound	Underlying level of sound over a period, T, which might in part be an indication of relative quietness at a given location
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$	Value of the A-weighted sound pressure level in decibels (dB) of a continuous, steady sound that, within a specified time interval, T, has the same mean-squared sound pressure as the sound under consideration that varies with time
Facade level	Sound pressure level 1 m in front of the facade
Free-field level	Sound pressure level away from reflecting surfaces
Indoor ambient noise	Noise in a given situation at a given time, usually composed of noise from many sources, inside and outside the building, but excluding noise from activities of the occupants
Noise Criteria	Numerical indices used to define design goals in a given space
Noise Rating (NR)	Graphical method for rating a noise by comparing the noise spectrum with a family of noise rating curves
Octave Band	Band of frequencies in which the upper limit of the band is twice the frequency of the lower limit
Percentile Level, $L_{AN,T}$	A-weighted sound pressure level obtained using time-weighting “F”, which is exceeded for N% of a specified time interval
Rating Level, $L_{Ar,Tr}$	Equivalent continuous A-weighted sound pressure level of the noise, plus any adjustment for the characteristic features of the noise
Reverberation time, T	Time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped
Sound Pressure, p	root-mean-square value of the variation in air pressure, measured in pascals (Pa) above and below atmospheric pressure, caused by the sound
Sound Pressure Level, L_p	Quantity of sound pressure, in decibels (dB), given by the formula: $L_p = 10\log_{10}(p/p_0)^{2.}$ Where: p is the root-mean-square sound pressure in pascals (Pa) and $p0$ is the reference sound pressure (20 µPa)
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

Appendix B – Standards, Legislation, Policy, and Guidance

This report is to be primarily based on the following standards, legislation, policy and guidance.

B.1 – National Planning Policy Framework (2023)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), published in 2023. This replaced all earlier guidance on noise and places an emphasis on sustainability. In section 15, Conserving and enhancing the natural and local environment, paragraph 180, it states:

Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;

Paragraph 191 states:

Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) *Mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
b) *Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
c) *Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.*

B.2 – Noise Policy Statement for England (2010)

Paragraph 191 of the NPPF also refers to advice on adverse effects of noise given in the Noise Policy Statement for England (NPSE). This document sets out a policy vision to:

Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.

To achieve this vision the Statement identifies the following three aims:

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life;
- Where possible, contribute to the improvement of health and quality of life.

In achieving these aims the document introduces significance criteria as follows:

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur. It is stated that "significant adverse effects on health and quality of life should be avoided while also considering the guiding principles of sustainable development".

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected. It is stated that the second aim above lies somewhere between LOAEL and SOAEL and requires that: "all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur."

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise. This can be related to the third aim above, which seeks: "where possible, positively to improve health and quality of life through the pro-active management of noise while also considering the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim."

This is further expanded using the updated "Noise Exposure Hierarchy Table" which includes an additional level of impact referred to as the 'No Observed Adverse Effect Level' ('NOAEL'). It is stated that at this level: *"noise can be heard, but does not cause any change in behaviour, attitude or other physiological response"*. In addition, noise at this level *"can slightly affect the acoustic character of the area but not such that there is a change in the quality of life".*

The NPSE recognises that it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations and provides no guidance as to how these criteria should be interpreted. It is clear, however, that there is no requirement to achieve noise levels where there are no observable adverse impacts but that reasonable and practicable steps to reduce adverse noise impacts should be taken in the context of sustainable development and ensure a balance between noise sensitive and the need for noise generating developments.

Any scheme of noise mitigation outlined in this report will, therefore, aim to abide by the above principles of the NPPF and NPSE whilst recognizing the constraints of the site.

B.3 – BS4142:2014+A1:2019 – 'Methods for rating and assessing industrial and commercial sound'

Overview

BS4142:2014 sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS4142:2014 for assessing the effect of sound on residential receptors is to compare the measured or predicted sound level from the source in question, the $L_{Aeq,T}$ 'specific sound level', immediately outside the dwelling with the $L_{A90,T}$ background sound level.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the $L_{Ar,Tr}$ 'rating sound level'. A correction to include the consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

Rating Penalty

Section 9 of BS4142:2014 describes how the rating sound level should be derived from the specific sound level, by deriving a rating penalty.

BS4142:2014 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. This can be approached in three ways:

a) subjective method;
b) objective method for tonality;
c) reference method."

Due to the nature of the development the subjective method has been adopted to derive the rating sound level from the specific sound level. This is discussed in Section 9.2 of BS4142:2014, which states:

"Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed. Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources."

BS4142:2014 defines four characteristics that should be considered when deriving a rating penalty, namely; tonality; impulsivity; intermittency; and other sound characteristics, which are defined as:

a) Tonality

A rating penalty of +2 dB is applicable for a tone which is "just perceptible", +4 dB where a tone is "clearly perceptible", and +6 dB where a tone is "highly perceptible".

b) Impulsivity

A rating penalty of +3 dB is applicable for impulsivity which is "just perceptible", +6 dB where it is "clearly perceptible", and +9 dB where it is "highly perceptible".

c) Other Sound Characteristics

BS4142:2014 states that where "the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distance against the residual acoustic environment, a penalty of +3 dB can be applied."

d) Intermittency

BS4142:2014 states that when the "specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time … if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied."

Background Sound Level

The background sound level is the underlying level of sound over a period, T, and is indicative of the relative quietness at a given location. It does not reflect the occurrence of transient and/or higher sound level events and is generally governed by continuous or semi-continuous sounds.

To ensure the background sound level values used within the assessment are reliable and suitably represent both the particular circumstance and periods of interest, efforts have been made to quantify a 'typical' background sound level for a given period. The purpose has not been to simply select the lowest measured value. Diurnal patterns have also been considered as they can have a major influence on background sound levels, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night time period for sleep purposes.

Since the intention is to determine a background sound level in the absence of the specific sound that is under consideration, it is necessary to understand that the background sound level can in some circumstances legitimately include industrial and/or commercial sounds that are present as separate to the specific sound.

Assessment of Impact

BS4142:2014 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 estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

- "Typically, the greater this difference, the greater the magnitude of the impact."
- "A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context."
- "A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context."
- "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 negligible impact, depending on the context."

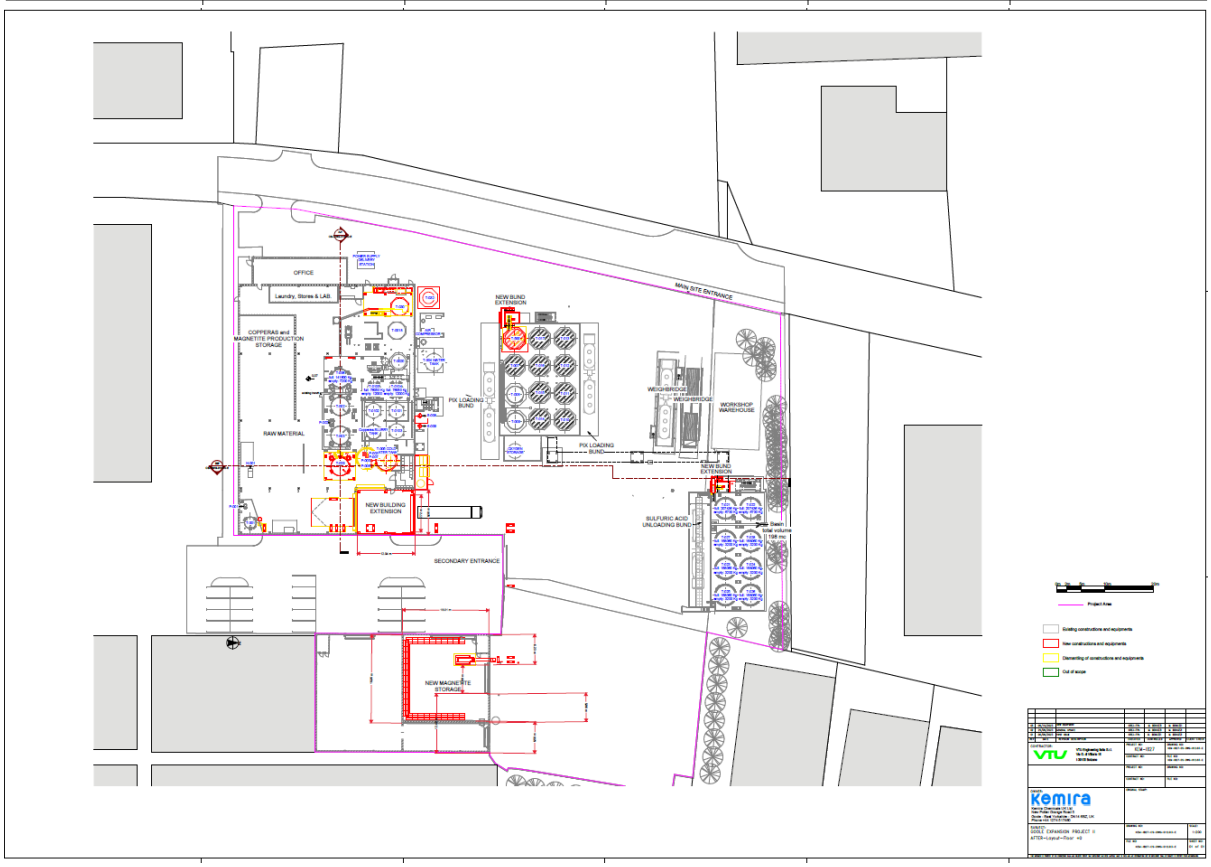
Interpreting the guidance given in BS4142:2014, with consideration of the guidance given in the NPSE and NPPG Noise, an estimation of the impact of the rating sound is summarised in the following text:

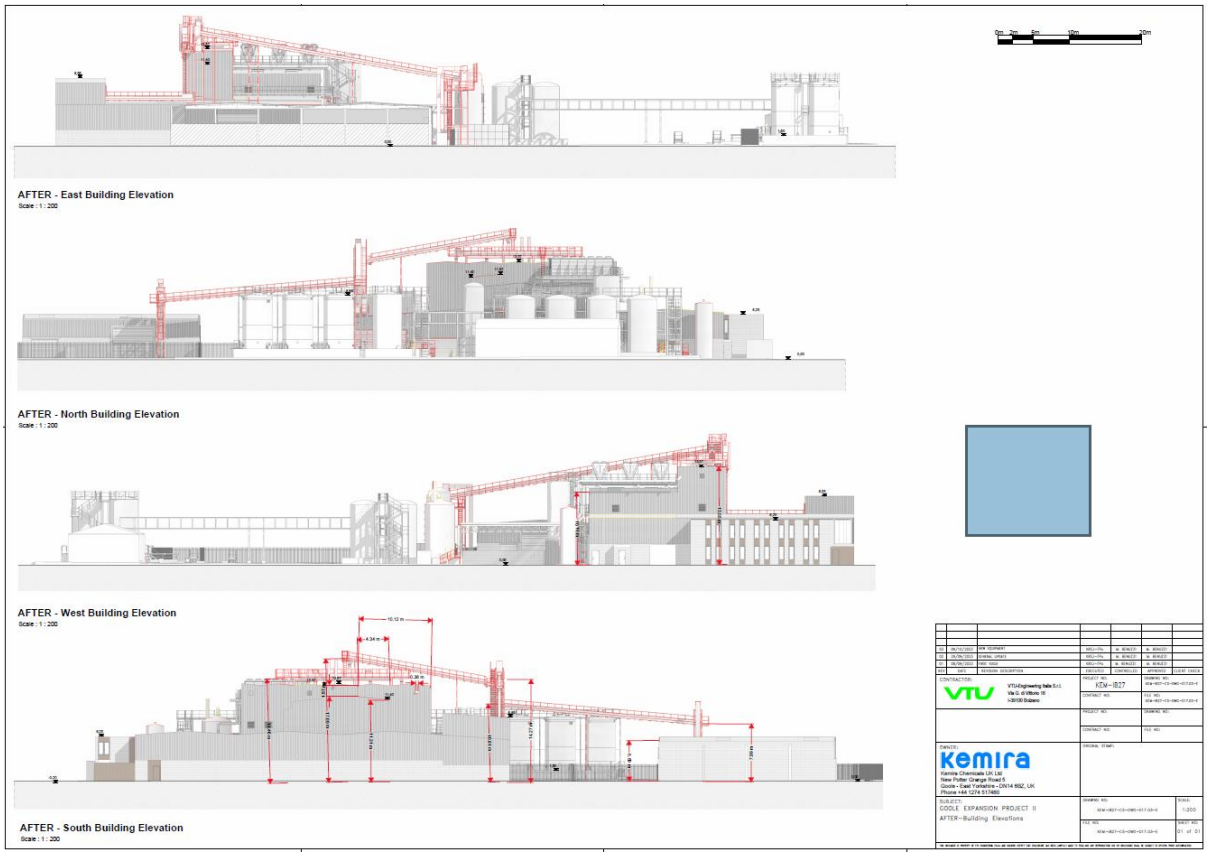
- A rating sound level that is +10 dB above the background sound level is likely to be an indication of a Significant Observed Adverse Effect Level;

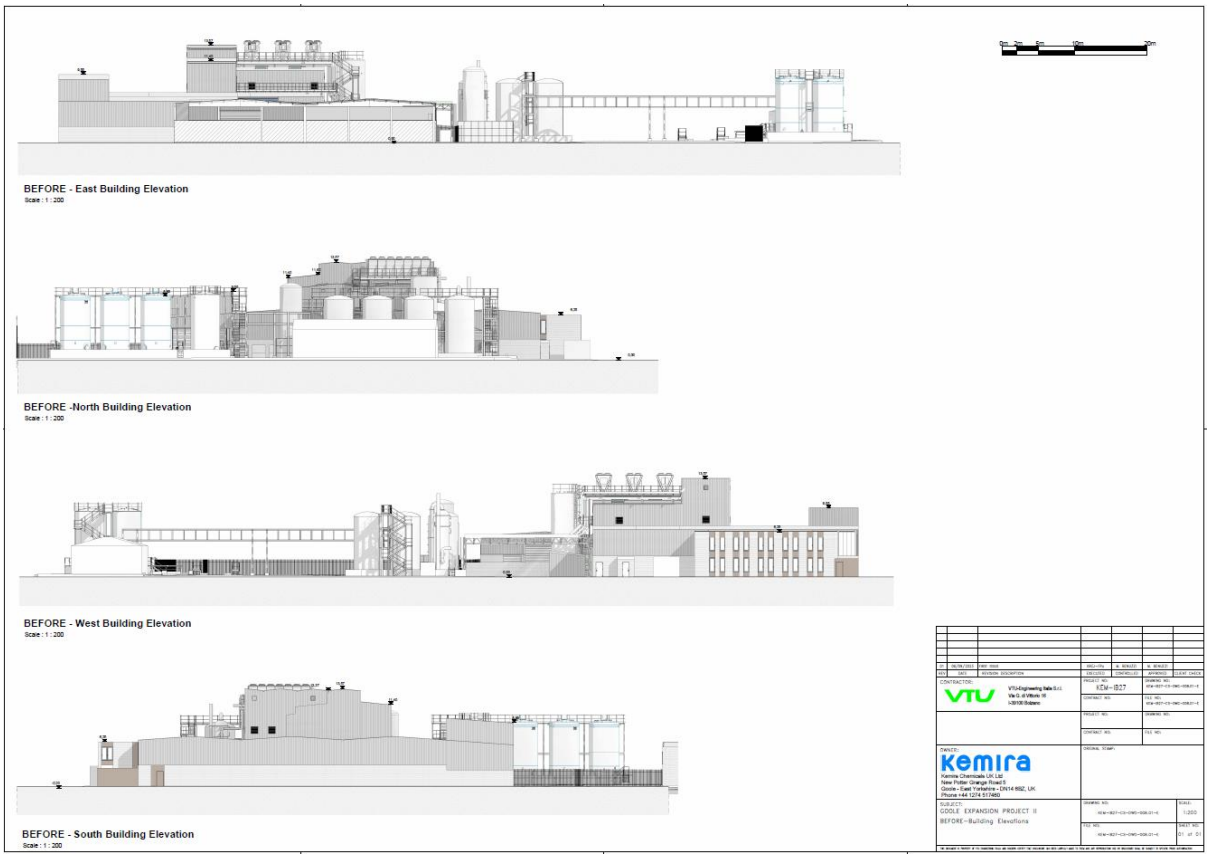
- A rating sound level that is +5 dB above the background sound level is likely to be an indication of a Lowest Observed Adverse Effect Level;
- The lower the rating sound level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating sound level does not exceed the background sound level, this is an indication of the specific sound source having a negligible impact and would therefore classified as No Observed Adverse Effect Level.

During the daytime, the assessment is carried out over a reference time period of 1-hour. The periods associated with day or night, for the purposes of the Standard, are 07.00 to 23.00 and 23.00 to 07.00, respectively.

Appendix C – Location and Site Plans




AFTER - East Building Elevation
Scale : 1 : 200
AFTER - North Building Elevation
Scale : 1 : 200
AFTER - West Building Elevation
Scale : 1 : 200
AFTER - South Building Elevation
Scale : 1 : 200
kemira
GODLE EXPANSION PROJECT II
AFTER-Building Elevations


BEFORE - East Building Elevation
Scale : 1 : 200
BEFORE -North Building Elevation
Scale : 1 : 200
BEFORE - West Building Elevation
Scale : 1 : 200
BEFORE - South Building Elevation
Scale : 1 : 200
kemira
GODLE EXPANSION PROJECT II
BEFORE-Building Elevations

Appendix D – Environmental Survey

D.1 – Time History Noise Data

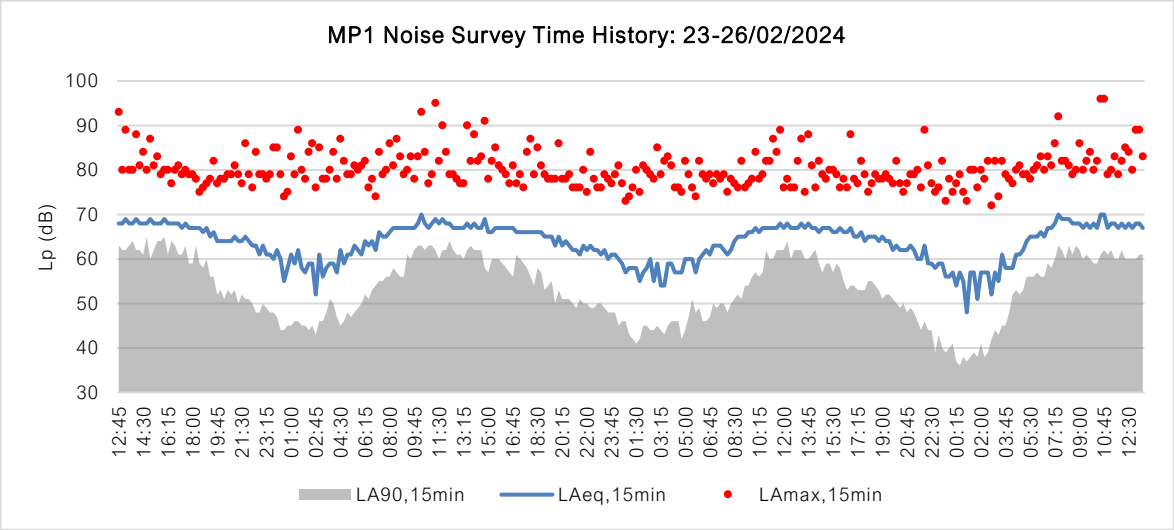


Figure 8 – MP1 Noise Survey Time History

D.2 – Surveying Equipment

Piece of Equipment	Serial No.	Calibration Deviation
CESVA SC250 Class 1 Sound Level Meter	T252860	≤0.1
CESVA CB011 Class 1 Calibrator	T253524	

Table 13 – Surveying Equipment

All equipment used during the survey was field calibrated at the start and end of the measurement period with a negligible deviation of ≤0.1 dB. All sound level meters are calibrated every 24 months, and all calibrators are calibrated every 12 months by a third-party calibration laboratory. All microphones were fitted with a protective windshield for the entire measurements period. Calibration certificates can be provided upon request.

D.3 – Meteorological Conditions

As the environmental noise survey was carried out over a long un-manned period no localised records of weather conditions were taken. However, all measurements have been compared with met office weather data of the area, specifically the closest weather station, and the data from the weather station is outlined in the table below. When reviewing the time history of the noise measurements, any scenarios that were considered potentially to be affected by the local weather conditions have been omitted. The analysis of the noise data includes statistical and percentile analysis and review of minimum and maximum values, which aids in the preclusion of any periods of undesirable weather conditions. The weather conditions were deemed suitable for the measurement of environmental noise in accordance with BS7445 Description and Measurement of Environmental Noise. The table below presents the average temperature, wind speed and rainfall range for each 24-hour period during the entire measurement.

Weather Conditions – Pear Tree Park, Howden (Approx. 4.8km NE of Site)				
Time Period	Air Temp (^{0}C)	Rainfall (mm/h)	Prevailing Wind Direction	Wind Speed (m/s)
23/02/23: 00:00 – 23:59	1.9 – 8.3	0.0	WSW	0.0 – 8.3
24/02/23: 00:00 – 23:59	-0.2 – 10.1	0.0	ENE	0.0 – 2.2
25/02/23: 00:00 – 23:59	-1.2 – 10.1	0.0	NE	0.0 – 4.4
26/02/23: 00:00 – 23:59	1.0 – 9.8	0.0	SSE	0.0 – 6.5

Table 14 – Weather Conditions

Appendix E – Calculations

In-duct Sound Power Calculations

Mech In-Duct to Atmosphere Calcs

Item / Description		Source / Notes			Ducting Type	dB(A)	1/1 Octave Frequency Band (Hz, dB)							
							63	125	250	500	1000	2000	4000	8000
Centrifugal Blower Outlet					Cylindrical	87	87	87	89	84	83	78	70	70
Uncertainty	Yes						3	3	3	3	3	3	3	3
Description	**Item**	**Duct Type (Mean Dim/Dia (mm))**	**Width (mm)**	**Height (mm)**	**Quantity (No.) / Length (m)**	**dB(A)**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Bend Element Attenuation	No. 1	Round Unlined (200-400mm)			3		-4.8	-5.8	-6.8	-7.8	-7.8	-7.8	-7.8	-7.8
Total In-Duct Loss		Outlet Type	Hight (mm)	Width (mm)	Outlet Dia (mm)		-1.0	-2.0	-3.0	-4.0	-4.0	-4.0	-4.0	-4.0
End Reflection	No Grill	Rectangular	250	250	0		-16	-11	-7	-4	Assumed Neglible			
Outlet Sound Power Level						**82**	**70**	**74**	**79**	**75**	**79**	**74**	**66**	**66**
Cummulative Outlet Sound Power Level (4 No. LEV Fans)						**88**	**76**	**80**	**85**	**81**	**85**	**80**	**72**	**72**


NOVA
ACOUSTICS