Customer:	**Royston Woodchip Limited**
Address	c/o Fluid Ice Limited 1 Beauchamp Court, Victors Way, Barnet, Hertfordshire, EN5 5TZ
Ref:	027/RoystonWoodchip/003

Noise Screening Assessment

Units 4 and 8 Five House Farm, Sandon Road, Therfield, Royston. Hertfordshire. SG8 9RE



27.06.16

027/RoystonWoodchip/003

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Enviroconsult Limited Registered Office: Brockton Farm Bungalow, Brockton, Sutton Maddock, Shifnal, Shropshire. TF11 9NA
Companies House registration number: 9597398

Executive Summary

The applicant is seeking to put in place four 500kW woodchip boilers, fuel store and associated infrastructure at 8 Five House Farm, Sandon Road, Therfield, Royston. Hertfordshire. SG8 9RE. Five House Farm Business Park comprises a range of agricultural buildings, as well as some B2 general industrial uses. It comprises a mix of agricultural and business uses including; grain stores, furniture manufacture & joinery workshop, catering and event management, a flooring company, design and manufacturing of gaming accessories, and an industrial cleaning company.

The business park is situated to the north of the farm house which is located on Sandon Road and has a separate vehicular access. There are 3 dwellings located on the opposite side of Sandon Road which are between 70 - 100 m south west of unit 4 and between 85 - 112m of unit 8. There is a further dwelling located between 250-300m to the east.

There are extensive agricultural uses surrounding the site in all directions.

The application building has been used as a potato cold store until recently however the farmer has now decided to cease growing potatoes hence Unit 8 is no longer required for agricultural purposes, and it is proposed to change it into a wood chip drying facility in order to produce high quality wood chip and wood fuel products for sale to biomass plant operators locally. The company already have similar facilities in Wales, Shropshire, Nottingham, Oxford, Gloucester, Worcester. Dorset and Hampshire.

The proposed development requires planning consent from North Hertfordshire District Council. In order to obtain that consent, additional reports on potential noise impact have been identified as being needed. An acoustic screening assessment based on predicted levels and calculations to show worst case is an appropriate basis for a screening assessment.

Sources of sound from the installation are identified as:

- Boiler and ancillary equipment
- Fans

Based on available data, the assessment identified the noise from fans as the dominant sound sources internally (with boiler and ancillary equipment providing minor contribution to the internal environment), this is consistent with observations at other existing plants. These sources are characterised by broadband hums of fans, pumps and associated plant. They are considered together as internal sound level which is then used for modelling.

Internal sound has been considered as a worst case scenario. Assumptions made for mitigation measures are considered conservative, and comparison levels for typical ambient and background sound levels have been assumed to be very low, in keeping with a rural setting. However, it should be noted that the business park has a number of existing industrial sources already present, and ambient sound levels are already higher than those assumed. In particular, a furniture manufacturer, and an extant grain drier are two current significant sources.

The results of the screening assessment indicate that the internal noise from the proposed development is acceptable, as both distance from the source to receptor and complete enclosure within the buildings reduces the sound to, at or below, ambient noise levels during both day and night operation. The assessment indicates that the impact at the nearest sensitive receptor complies with WHO and BS8233:2014 standards in respect of demonstrating there is no acoustic impact at any of the receptors. BS4142:2014 indicates a potential significant adverse impact which can be demonstrably mitigated at the sensitive receptors.

It is recommended that the doors on units should remain closed except for access whilst plant is operating in order ensure compliance, particularly during the night.

It is concluded that the noise levels generated by the proposed activities are therefore compliant with national and local planning policies.

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1 Introduction

The applicant is seeking to put in place four 500kW woodchip boilers, fuel store and associated infrastructure at a site at Units 4 and 8 Five House Farm, Sandon Road, Therfield. Royston Herts SG8 9RE. The proposed development requires planning consent from North Hertfordshire District Council. In order to obtain that consent, the council has suggested that a noise impact assessment would be helpful.

The proposed site requires a change of use. The two process buildings are currently in agricultural use and B8 (Storage & Distribution). One is an insulated potato cold store, the other vacant since the marquee hire company vacated. The proposal is to convert the insulated store (Unit 8) into a wood drying facility with occasional chipping of virgin logs, and to convert the B8 Use (Unit 4) into wood chip storage. The drying boilers will themselves be fuelled by woodchip, which will be sourced locally as virgin timber and transported to the proposed fuel store.

1.1 Scope of Work - Noise

The purpose of this noise screening assessment is to assess the impact of the proposed activities and provide assurance that the activities on site will not adversely impact upon nearby sensitive receptors.

The methodology and approach are in line with the guidance issued:

- Provide an acoustic assessment of the likely impact of the proposal
- Note that the LPA should consider refusal of applications where the ultimate noise impact on sensitive receptors exceeds the SOAEL.
- The LPA may consider imposing conditions to mitigate noise impacts where noise levels exceed the LOAEL but are less than the SOAEL.
- LOAEL and SOAEL are defined in section 3

The overall impacts have been modelled to demonstrate compliance with BS4142:2014, BS8233:2014 and WHO limits as modified by Night Noise Guidelines for Europe (where applicable). No field measurements have been made of the existing noise climate. Assumed open countryside background and ambient sound levels have been used which are considered to be conservative.

1.2 Specification

The following work was identified:

- Review the policy and planning requirements for North Hertfordshire District Council in relation to noise
- Carry out a screening exercise based on determining acoustic character and quantify identified noise sources for the installation.
- Assess the acoustic impact of the installation on the nearest sensitive receptor using screening assessment techniques based on worst case.
- Produce a report to determine impact and identify any acoustic mitigation factors or controls (as appropriate)

1.3 Statement of Qualifications and experience - Tony Higgins

Tony Higgins has worked as a Public Protection Manager responsible for the environmental and occupational aspects of noise as part of local government regulation for over 20 years, both as a local government enforcement officer and as an independent environmental consultant for the last 8 years. Tony worked as a regulator, and is familiar with evidence gathering, enforcement, and legal processes across a number of regulatory regimes. His technical expertise covers a broad range of environmental disciplines including, environmental permitting, waste, noise and nuisance investigation, environmental planning, environmental impact assessment, health and safety, housing and licensing.

Tony is a fully qualified Chartered Environmental Health Practioner, and possesses a Post Graduate Diploma in Acoustics and Noise Control as well as a BSc (Hons) degree in Environmental Health and Master's degree in Environmental Pollution Control. Tony is a member of the Institute of Acoustics Measurement and Instrumentation Group, and has recently organised training on environmental acoustics and planning for the IOA in Birmingham and London, in particular addressing the recently reissued BS4142:2014 standard. Tony has provided expert witness advice for councils in both inquiry and court.

2 Site and surroundings

2.1 Description of site and surroundings

The site is located in the rural area of North Hertfordshire at Units 4 and 8 Five House Farm, Sandon Road, Therfield, Royston. Hertfordshire. SG8 9RE.

Five House Farm is a business park comprising numerous modern agricultural buildings with B2 and B8 uses including; furniture manufacture, carpet suppliers and hygiene services amongst others.

The main farm house is located 50m to the south. See Figure 1 below.

Figure 1 Google Image of site (with primary receptors marked)



The proposal is to convert units 4 and 8 into a wood chip drying facility. Appendix 2 shows images of the buildings.

The application building Unit 8 is constructed from a concrete blocks base, and steel frame with corrugated metal sheets with a duo pitched roof to each bay. The building has been significantly insulated due to its former use as a potato cold store (see fig.2 below), which has both thermal and acoustic benefits. It requires minor amendments to include the 4 chimneys. It is considered not to need additional work in order to ensure containment of internally generated sound likely to occur as a result of the proposed use.

Fig2. Photograph of site building

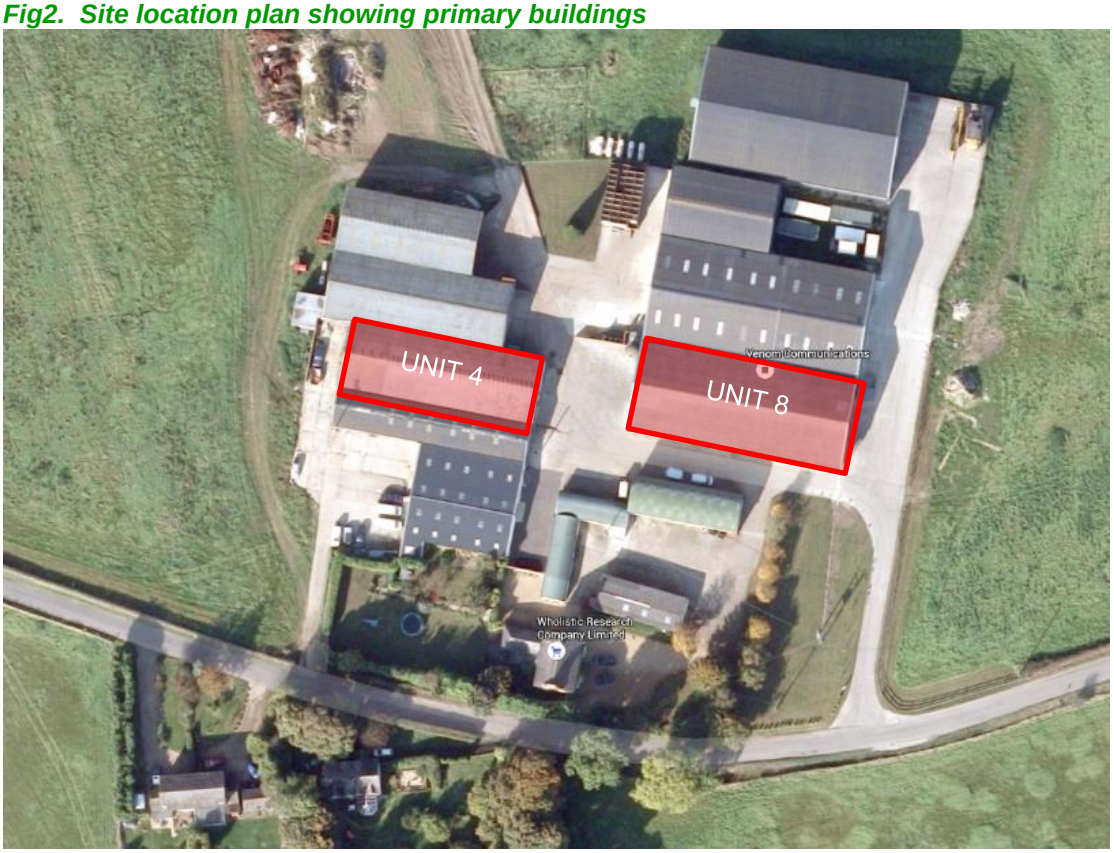


The other building (Unit 4) is considered to be a standard construction block and panel construction without the thermal cladding.

This assessment considers that primary building Unit 8 is enclosed and provides good acoustic attenuation. A figure of 20dB sound reduction has been used in calculations and is considered very conservative. In reality the structure should perform much better providing any gaps are sealed effectively and the doors remain closed.

There is also a substantial 'barrier' of buildings (see fig.3 below) located between the proposed site and the nearest sensitive receptor (the main farmhouse).

Fig2. Site location plan showing primary buildings



2.2 Nearest Sensitive Receptors and ambient noise environment

The nearest sensitive receptors are identified in the table below:

Receptor	Location	Comments
1	Five House Farm House	Located 50m south of the application site
2	Residential property	located 240m to the east of the application site
3	Residential property	located 350m to the north east of the application site

Receptor 1 is an agricultural dwelling with tenure tied to the operation of the farm.

The figure 1 (above) is marked for spatial location purposes only.

Receptor 1 is screened by the farm buildings within the site from Unit 4 and 8. The screening buildings are of a similar height to the proposed development site, providing full cover and a barrier effect.

Receptors 2 and 3 have no intervening barriers but do benefit from ground and air absorption due to the significant distances sound has to travel across open fields. Ground and air absorption have been ignored for assessment purposes.

A number of site photographs are included in Appendix 2 to help provide context.

2.3 Ambient Noise

The application site is a working farm. Machinery and vehicle movements are frequent during the day and occasional at night. The ambient noise in the wider area is considered to be low but the existing operations around the business park will be louder during the day.

The B2 general industrial use (furniture manufacture) and the B8 uses add to the ambient noise in the environment during the day but are not operational at night. It is anticipated that existing agricultural activities are potential sources at night.

During the day the acoustic environment is dictated by vehicle movements, the use of power, occasional crashes and bangs, and occasional rumbles hums and whines from motors

The grain drier works in a transient manner, operating 24hours a day and 7 days a week, during the harvest periods (typically 6-8weeks a year). Grain driers when operational are the dominant noise source in an area (as they are located externally), and consist of a broadband fan noise.

Distant Road traffic noise is barely audible at the site.

Individual events (crashes, bangs, scraping of metal on concrete, engine sounds etc.) will all occur periodically and will be dominant in the area when they occur.

3 Description of the installation

3.1 Description of Installation

The proposed development requires the installation of 4 x 500 kW woodchip boilers running on dry wood. Each boiler will be vented by its own 350 mm flue. The wood fuel boilers are located inside the site building, the major sound source is the fan unit associated with discharging effluent gas to atmosphere. The fan units are located inside the site buildings. The sound profile of the wood fuel burners is as noted in Fig.4. and Fig.5.below:

Figure 4. Fan Units

Woodcock & Wilson
Phone : 01484 462777
Fax : 01484 462888

WOODCOCK & WILSON LTD

Customer : Celtic Community Wood Fuel
Project : Fan Selection by Martyn Crouch
Item 1 - Ref : Temp 1

Quote Ref : Q32269 rev A
23/05/2014

Gas Properties :

Barom Pressure :	101325	pa
Operating Temp :	20	Deg.C.
Humidity :	50	%
Specific Gravity :	1	
Inlet Density :	1.2001	Kg/m3

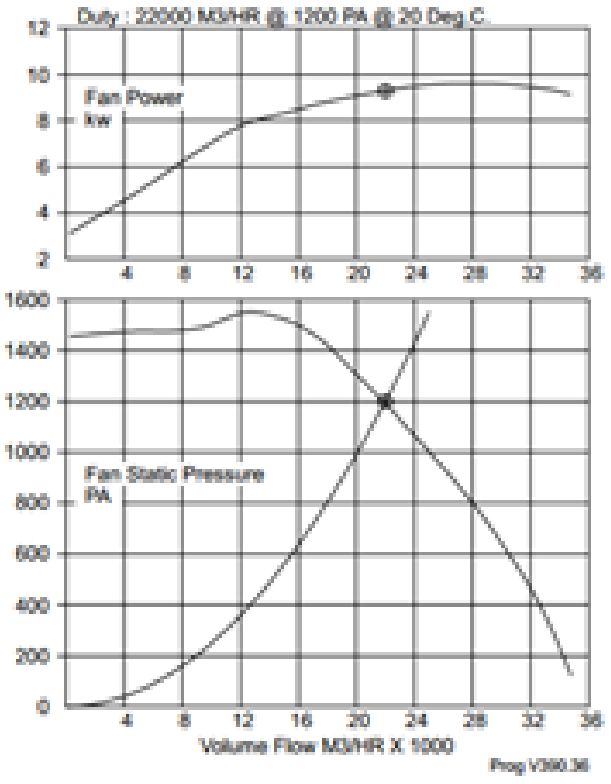
Duty Required :

Inlet Volume Flow :	22000	m3/hr
Fan Static Pressure :		
Inlet Pressure :	-0	pa
Outlet Pressure :	1200	pa

Fan Selected :
SWSI-BFN-1000/100-77

Speed :	960	Rpm
Impeller Ø :	1000	mm
Fan Class :	1	

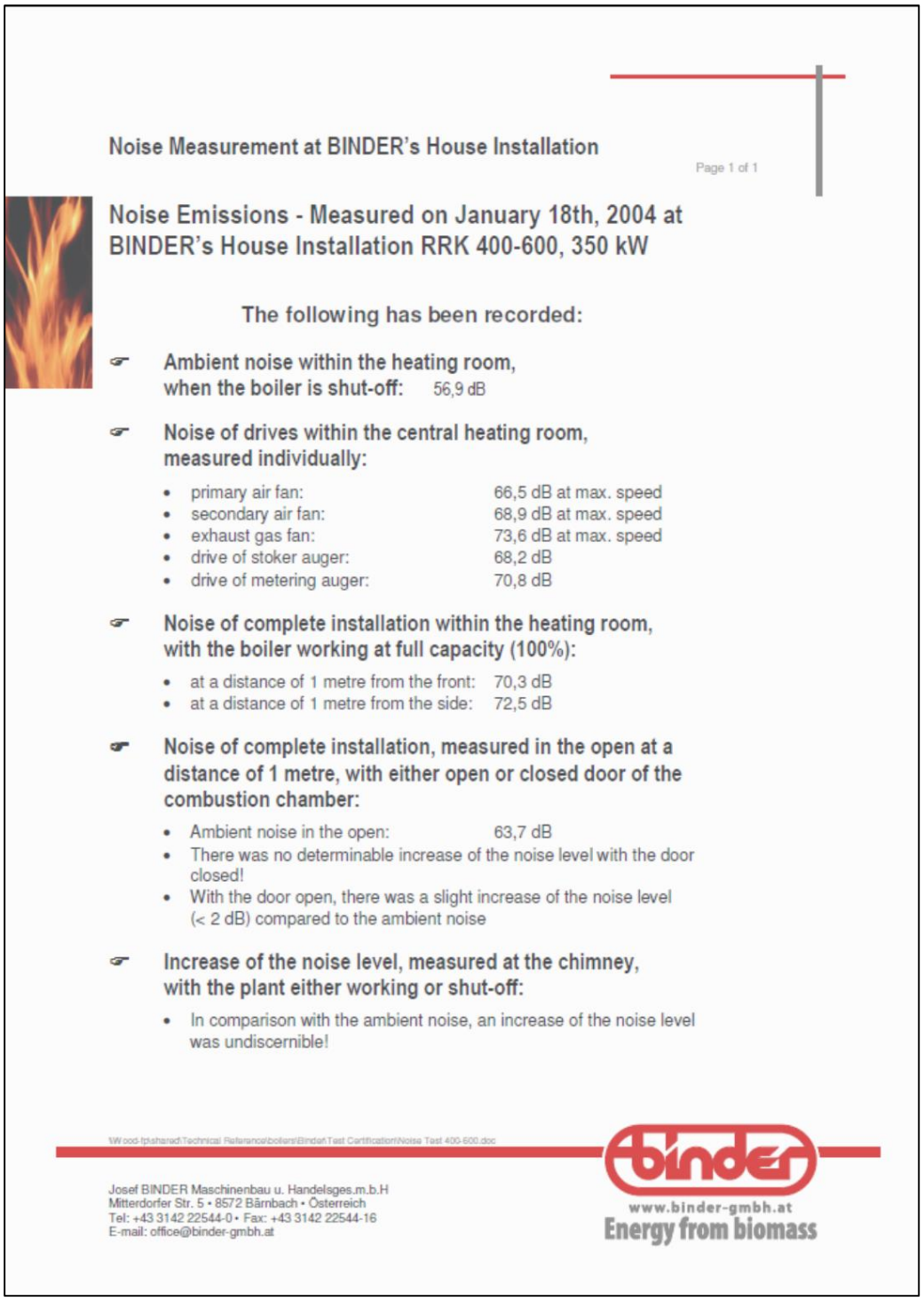
Fan Shaft Power :		
@ 20 Deg C :	9.29	kW
@ Duty Temp :	9.29	kW
Tip Speed :	50.3	m/s
Inlet Velocity :	7.7	m/s
Outlet Velocity :	8.3	m/s
Temp Rise :	1.3	Deg.C.



Noise Details :	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	Total
Internal SWL dB	95	101	108	105	96	89	83	78	**111**
Free Inlet SPL dBA	60	79	95	98	92	86	80	73	**101**
Free Outlet SPL dBA	58	77	94	97	91	85	79	72	**100**
Outside Casing dBA	48	63	73	76	70	64	58	49	**79**

Motor noise is NOT included in the figures above.
Sound Pressure levels (SPL) assume Free Field Hemispherical Radiation at 1 metre(s)
Breakout at 1 metre from 4 mm thick casing(inside Near Field range).
Casing levels assume the inlet / outlet are ducted and noise does not breakout through duct.
All values are averages. Free Inlet assumes that outlet is ducted and vice versa.

Figure 5. Burner units



Noise Measurement at BINDER's House Installation

Page 1 of 1

Noise Emissions - Measured on January 18th, 2004 at BINDER's House Installation RRK 400-600, 350 kW

The following has been recorded:

- **Ambient noise within the heating room, when the boiler is shut-off:** 56,9 dB
- **Noise of drives within the central heating room, measured individually:**
  - primary air fan: 66,5 dB at max. speed
  - secondary air fan: 68,9 dB at max. speed
  - exhaust gas fan: 73,6 dB at max. speed
  - drive of stoker auger: 68,2 dB
  - drive of metering auger: 70,8 dB
- **Noise of complete installation within the heating room, with the boiler working at full capacity (100%):**
  - at a distance of 1 metre from the front: 70,3 dB
  - at a distance of 1 metre from the side: 72,5 dB
- **Noise of complete installation, measured in the open at a distance of 1 metre, with either open or closed door of the combustion chamber:**
  - Ambient noise in the open: 63,7 dB
  - There was no determinable increase of the noise level with the door closed!
  - With the door open, there was a slight increase of the noise level (< 2 dB) compared to the ambient noise
- **Increase of the noise level, measured at the chimney, with the plant either working or shut-off:**
  - In comparison with the ambient noise, an increase of the noise level was undiscernible!

\\Wood-fp\shared\Technical Reference\boilers\Binder\Test Certification\Noise Test 400-600.doc

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binder
www.binder-gmbh.at
Energy from biomass

The boilers will be located within the building. As no specific drawings have been made available it is assumed that the noise source is the building itself. Considering the absolute sound level inside the buildings, there would be a maximum level of 85dB(A) due to the fan units (doubling sound from 1 to 2 units 79dB to 82dB (for 2 fan units) and again from 82dB to 85dB for 4 fan units). *For the purposes of calculation only, the worst case is considered as having all four boilers operational simultaneously in the building, i.e. an overall sound level of 85dB*. This is considered to comprise a worst case scenario, as it assumes a reverberant field of 4 working boilers and ancillary plant.

NB: Observations from other existing facilities show the levels to be typically in the mid-70s dB. Furthermore, the proposed level is coincidentally the maximum sound level permitted under Noise at Work legislation, as such this can be considered a mandatory maximum level.

The maximum level for operation of a boiler is confirmed as 72.5dB for the combined sources, the overall increase in level compared to the fans noted above is therefore not significant. This confirms that sound from the boilers themselves will be masked by sound from the fans.

The site will have four hoppers which will feed the boilers (located internally). These hoppers and associated screw feed plant are inaudible beyond the site building as the noise climate is dominated by noise from the fans.

The emission stacks are the only part of the devices outside the process buildings. Sound levels from end of pipe have not been considered as a suitably constructed stack is not normally a significant source of noise. This is because, for new installations, they are appropriately isolated to prevent vibration and noise. If this is not the case, or if there are unusual anomalous noise problems, baffle silencers can be readily fitted to remove any residual problem, and would be selected based on the specific acoustic reductions required. There have been no such problems with any of the existing plants.

These source figures are then used for comparison with existing noise climate.

3.2 Existing Noise Climate

The ambient soundscape is that of a small business park/industrial estate. There is a sound of distant road traffic mixes with local agricultural and industrial sounds. One unit manufacturers furniture and there are noticeable sounds of power tools and extraction equipment. Part of the site has grain drying and agricultural storage.

Ambient levels are likely to be low in the wider rural area with night time LA90 levels of 25-30dB with ambient LAEQ ambient levels approximately 30-35dB LAEQ and daytime levels significantly higher. During the day levels would normally rise significantly to account for local farming activities and other ambient sources.

The existing acoustic environment, for planning purposes, ought to include the farming activity in particular grain driers that are active 24/7 during harvesting. However, it is not possible to measure this activity as harvesting is not occurring, hence the above estimates will be considered as a worst case. These figures represent early hours of the morning (the most sensitive time of the night).

Other sounds in the vicinity include distant agricultural sounds and farming activities in and around fields locally and distant road traffic and loading and unloading and adjacent units.

No current complaints exist in respect of the existing soundscape.

4 Policy aspects

4.1 National Planning Policy Framework (NPPF)

The National Planning Policy Framework sets out the Government's planning policies for England and how these are expected to be applied. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities. The NPPF requires that Local Planning Authorities develop their own specific planning policies, particularly favouring sustainable developments.

Paragraph 123 outlines general requirements in terms of noise:

"*Planning policies and decisions should aim to:*

- *avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established and;*
- *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."*

The NPPF replaces previous planning policy and guidance but does not provide specific design criteria or guidance. The NPPF makes reference to the Noise Policy Statement for England (*NPSE*).

4.2 Noise Policy Statement for England (NPSE)

The Noise Policy vision is 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'.

The NPSE refers to the World Health Organisation guidance, and deals with noise in the context of health. Health is defined as 'physical and mental well-being', and is quoted in terms of standards with 'observed' health impacts. Additionally, quality of life is also mentioned which is a subjective measure and can be considered to promote of amenity standards and in all cases equate to prevention of nuisance. The NPSE makes reference is made to two concepts documented by the WHO, namely:

- No Observed Effect Level (*NOEL*): the level below which no effect can be detected
- Lowest Observed Adverse Effect Level (*LOAEL*): the level above which adverse effects on health and quality of life can be detected.

And (by extrapolation from WHO criteria), a further level, Significant Observed Adverse Effect Level (*SOAEL*): the level above which significant adverse effects on health and quality of life occur.

There is no specific definition of how these levels are to be calculated, however it is noted that methodologies comparing results (either measured or calculated) to background and ambient levels are considered appropriate.

The determination as to how these impacts are to be demonstrated will depend on the nature of the noise, acoustic properties of the noise, and the site specific locations in which the noise is present. In this instance it is appropriate to consult with the local council within whose area the application site exists to provide additional guidance on what is required to determine impact in accordance with local policy that will, by definition, have regard to local conditions and circumstances.

Noise Impact

The standards required to be met depend on the nature of the sound and the acoustic environment within which the sound is perceived. The National Planning Policy Guidance recommends an approach on determining the impact of sounds as follows:

*"**How to determine the noise impact?***

Local planning authorities' plan-making and decision taking should take account of the acoustic environment and in doing so consider:

- *whether or not a significant adverse effect is occurring or likely to occur;*
- *whether or not an adverse effect is occurring or likely to occur; and*
- *whether or not a good standard of amenity can be achieved.*

In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation. As noise is a complex technical issue, it may be appropriate to seek experienced specialist assistance when applying this policy."

The NPPG also stipulates the appropriate actions in accordance with the likely response to noise exposure:

Perception	Examples of Outcomes	Increasing effect level	Action
Not Noticeable	No effect	No observed Effect	No specific measures
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No observed Adverse effect	No specific measures
		Lowest Observed Adverse Effect Level	
Noticeable and Intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Source: http://planningguidance.planningportal.gov.uk/blog/guidance/noise/noise-guidance/

The determination of noise impact and the level of effect is normally determined by compliance with appropriate standards.

4.3 Local Planning Policy

North Hertfordshire District Council has no specific saved local planning policies in respect of noise. The old local plan dated 1996 has one policy (Guideline 10) that is more directed to road, rail and aircraft noise than industrial/commercial sources.

Guideline 10

Noise Outside most dwellings, noise from motor traffic causes the most disturbance. In some areas, noise from trains or aircraft may disturb residents. In addition, certain activities result in noise. The design and layout of buildings, including the use of the right building materials and the building of soil mounds can noticeably reduce the disturbing effects of noise. Noise limits are given: In Policy 54 for road traffic; in Policy 53 for trains; and Policy 23 for aircraft.

District Local Plan No.2 with Alterations Originally adopted in April 1996 http://www.north-herts.gov.uk/sites/northherts-cms/files/written_statement_sep_2007.pdf

4.4 Standards

Standards for determination of impact are normally based on absolute fixed levels or derived values using comparisons. They are normally divided into standards set externally to sensitive developments or internally for particular rooms/activities.

The particular standard(s) to be applied depends on the character of the noise to be assessed, the sensitives of the receptors and the area. In this case for screening purposes only internal standards have been considered in line with the screening assessment criteria.

4.4.1 Internal Standards

BS8233:2014 provides guidance for noise levels inside habitable rooms based on their sensitivity. Table 1 Indoor ambient noise levels for dwellings lists the acceptable sound levels inside properties:

Activity	Location	07:00 to 23:00 hours	23:00 to 07:00
Resting	Living Room	35 dBA $L_{Aeq,16hour}$	
Dining Room	Dining Room/Area	40 dBA $L_{Aeq,16hour}$	
Sleeping (daytime resting)	Bedroom	35 dBA $L_{Aeq,16hour}$	30 dBA LAeq,8hour

This is consistent with the WHO guidelines on Community Noise standards which recommend:

Specific environment	Critical health effect(s)	LAeq [dB]	Time base [hours]	LAmax, fast [dB]
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	45
Inside bedrooms	Sleep disturbance, night-time	30	8	

4.4.2 Defra Guidance

DEFRA guidance has also been released on what constitutes unacceptable impact in respect of entertainment noise as follows:

> *"The permitted noise level using A-weighted decibels (the unit environmental noise is usually measured in) is:*
> - *34 dB(A) adjusted if the underlying level of noise is no more than 24 dB(A)*
> - *10 dB(A) above the underlying level of noise if this is more than 24 dB(A)"*

(https://www.gov.uk/noise-nuisances-how-councils-deal-with-complaints)

This should be considered an absolute level for individual impacts, and may be useful as a means of placing measurements into context for other sources.

This figure relates to absolute level of sound as measures (or predicted by calculation). In this instance with an assumed background level of 25dB the value is 35dB.

5 Methodology

The noise screening assessment is sufficient to determine impact of the proposed activities on the nearest sensitive receptor. The following methodology was used.

Calculation of sound levels for the operation of the site was based on a worst case scenario. For clarity this assumed:

- Operation of all 4 wood chip boilers
- Operation of all fans

The total sound level for site operation was then compared to the assumed ambient noise and background noise levels for the nearest sensitive receptor.

Assumptions made for the attenuation of noise from sources contained within the building was limited to 20dB reduction. As a modern agricultural unit with significant thermal lining, the actual figure given the construction is likely to be much higher, particularly as agricultural stores are normally very well sealed to prevent pest encroachment.

Assumptions made for attenuation due to distance were based on distances from the source to the nearby sensitive receptors identified in paragraph 2.2 above.

Assumptions where barrier effects occur (in this case other farm/industrial buildings) are that where line of site is broken, a maximum reduction of 5dB can be applied. Where the barrier clearly increases the path difference, a correction based on that path difference can be applied. For ease, a figure of 10dB reduction has been assumed which is a typically the lowest level of sound reduction afforded by barriers.

Other than incidental sound from transport, which would only occur during the normal working, sound from process plant will be contained inside the building with doors closed. Loading and unloading operations will also be carried out during the day.

The method is considered to be an overestimate of potential impact; the actual impact will be lower than that stated.

No assessment of vehicular movement has been considered as part of this report as the site historically has significant numbers of agricultural vehicular movements, and those are significantly greater than those anticipated for the application site. Additionally, vehicle movements will be restricted principally to normal working hours.

The locations of the boilers are within the building but no specific locations have been identified. Hence for the purposes of calculation, the entire building is considered to contain a reverberant field noise source of 85dB. This is considered to reflect a worst case scenario. Wood chipping operations have been assessed independent of this.

No account has been taken in respect of air or ground absorption within these calculations; as such the levels predicted at receptor will be reduced still further when taken in account.

Where levels have been calculated and compared to fixed standards, 10dB reduction for sound passing through a window has been assumed.

BS4142:2014 assessments have only been provided where the calculated sound level for the specific source is noted to be greater than a value of -5dB (or more) of the LA90 background. Below -5dB, the source, even with corrections is unlikely to be audible at the receptor and a BS4142:2014 assessment will return a result below 0dB and as such would represent NOEL. The result of this determination is that only the wood chipping activity needs a BS4142:2014 assessment.

6 Calculations

The calculations and results for the identified receptors, are set out in Table 1 below. The results assume that the most sensitive part of the night is considered, i.e. the quietest period.

Table 1: Noise calculations for Fans/boiliers

Receptor	Noise sources	Level and impact	Comments
Receptor 1 House to South 50m from source	Internal noise (boilers/fans etc)	LEQ1 – LEQ2 = 20log (R2/R1) 85 – LEQ2 = 20 log (50/1) 85 – LEQ2 = 33.9 LEQ2 = 85 – 33.9 **LEQ2 = 51.1dB**	20dB SRI reduction due to containment inside buildings **31.1dB** **Barely Audible at façade at night** 10dB reduction for intervening building **21.1dB** 10dB reduction for open window **11.1dB** **Not likely to be audible in bedroom - NOEL**
	Wood chipper	Sound power Lw = Leq + 20 log r + 7.8dB 121 = Leq +20 log r +7.8 121 – 20 logn50 -7.8 = Leq 121 – 38.1 – 7.8 = Leq **LEQ = 75.1dB.** where r is 80m from sensitive receptors	Chipping carried out Inside unit 8. 20dB reduction due to inside/shielded by building **55.1dB** Small further reduction due to intervening building (barriers). **45.1dB** **May be audible during day dependent on ambient levels. LOAEL**
Receptor 2 House to East 240m from source	Internal noise (boilers/fans etc)	LEQ1 – LEQ2 = 20log (R2/R1) 85 – LEQ2 = 20 log (240/1) 85 – LEQ2 = 47.6 LEQ2 = 85 – 47.6 **LEQ2 = 37.4dB**	20dB reduction due to insider/shielded by building **17.4dB** **Inaudible outside** 10dB reduction for open window **7.4dB** **Inaudible inside bedroom - NOEL**
	Wood chipper	Sound power Lw = Leq + 20 log r + 7.8dB 121 = Leq +20 log r +7.8 121 – 20 log240 -7.8 = Leq 121 – 47.6 – 7.8 = Leq **LEQ = 65.6dB.** where r is 240m from sensitive receptors	Chipping carried out Inside unit 8. 20dB reduction due to inside/shielded by building **45.6dB** Reduction likely for ground and air absorption (could be 5-7dB) but not included to maintain worst case. **45.6dB** **May be audible during day dependent on ambient levels. LOAEL**
Receptor 3 Houses to North west 350m from source	Internal noise (boilers/fans etc)	LEQ1 – LEQ2 = 20log (R2/R1) 85 – LEQ2 = 20 log (350/1) 85 – LEQ2 = 50.9 LEQ2 = 85 – 50.9 **LEQ2 = 31.1**	20dB reduction due to insider/shielded by building **11.1dB** **Inaudible outside** 10dB reduction for open window **1.1dBdB** **Inaudible inside bedroom – NOEL**

	Wood chipper	Sound power Lw = Leq + 20 log r + 7.8dB 121 = Leq +20 log r +7.8 121 – 20 log350 -7.8 = Leq 121 – 50.8 – 7.8 = Leq **LEQ = 62.4dB.** where r is 80m from sensitive receptors	Chipping carried out Inside unit 8. 20dB reduction due to inside/shielded by building **42.4dB** Small further reduction due to intervening building (barriers). **42.4dB** **May be audible during day dependent on ambient levels.**

Results for all receptors for internal noise from fans and boilers are well below the background and ambient levels and hence not subjected to BS4142:2014 assessment. However, they will also be present when chipping is taking place inside Unit 8. Hence the calculated LAEQ's have been acoustically added to the overall sound from the chipper. The chipper will operate approximately once per week.

Table 2. Combined impact of chipping and Fans/Boilers

Receptor	Noise sources	Level and impact	Comments
Receptor 1 House to South 80m from source	Internal noise (boilers/fans etc) + chipping	LEQ_{total} = 10Log($10^{2.11}$+ $10^{4.51}$) LEQ_{total} = 10Log(128.8+32359.4) LEQ_{total} = **45.2dB**	Indicates that chipping when operational is the dominant source
Receptor 2 House to East 240m from source	Internal noise (boilers/fans etc) + chipping	LEQ_{total} = 10Log($10^{1.74}$ + $10^{45.6}$) LEQ_{total} = 10Log(55+36307.8) LEQ_{total} = **45.6dB**	Indicates that chipping when operational is the dominant source
Receptor 3 Houses to North west 350m from source	Internal noise (boilers/fans etc) + chipping	LEQ_{total} = 10Log($10^{1.11}$ + $10^{4.24}$) LEQ_{total} = 10Log(12.9+17378) LEQ_{total} = **42.4dB**	Indicates that chipping when operational is the dominant source

The highest LAEQ calculated (45.6dB) is used as a benchmark to determine impact.

Table 3. BS4142:2014 Assessment

Results	Levels	Relevant BS4142 Clause	Comments
Calculated level	45.6dB	7.3.2	Assumed to be 4 plants operating as worst case plus wood chipping
Acoustic correction on time (actual chipping is not continuous operates 50% of the time)	10lg(1800/3600) = -3dB	7.3.8	Wood chippers tend not to be operated continually, it is normal to have pauses between loading. Particularly when logs are chipped.
Acoustic feature correction (night)	+3dB	9.2	Broadband hum with no tones. Constant, unlikely to be distinct or audible (other correction +3dB applied.
Rating level	46dB	9.2	
Background sound level	35dB	8.1.1 8.1.3 8.3	Background level estimated for day time.
Excess of rating over background sound level	+11dB	11	**Signiant Adverse impact**
Assessment	**11** Assessment indicates that further reduction or mitigation measures are required based on worst case.		

	It is likely noise from operating plant would be audible outside as noticeable low level hum. Inside the home assuming an open window the sound would be inaudible. **Further mitigation:** Chipping would occur only during the day, and with doors shut. **Reduction:** The estimated SRI for the building (20dB) is considered low (a worst case) and should be significantly better (30-35dB). The presence of the intervening building will provide a barrier effect of up to 10dB which would mitigate the sound produced. The chipping operation would occur typically only one day per week. The impact would be unlikely to cause concern during the day, particularly in the context of other B2 general industrial and agricultural uses and where other operations on the business park were carried out.
Uncertainty of the assessment	**10** The background level has been estimated at 35dB this could be low, but is considered a worst case and will overestimate impact. The estimate of sound reduction at 20dB for the building is considered low and will overestimate impact. Residual levels in the area are likely to be higher than 45dB during the day and will mask the sound of chipping. The faint buzz of chipping is very unlikely to be distinctly noticeable given the high ambient levels. No account for wind direction has been undertaken. Prevailing wind is likely to blow directly away from the sensitive receptor and the impact could be 3dB less. No account for ground or air absorption has been made within calculations. Intervening buildings and plant are present that provide some screening at least 10dB.

The assessment for fixed plant indicates that significant adverse impact might occur. However, the context of that impact is discussed in section 7.1 below. BS4142:2014 is a screening tool that can be used to establish the overall level of mitigation required. It then expects that mitigation measures, and an evaluation of those measures effectiveness should also be provided in order to evidence context (see section 7 below).

In this case comparison of the results to fixed standards indicates that the sound will well below WHO recommended levels for external area based on worst case, moreover, even considering the overall calculated levels when adjusted for an open window will reduce internal levels noted by a further 10dB, the internal sound levels recommended by WHO for habitable rooms are also met.

The presence of an intervening building and likely high residual levels in normal daytime operation make it unlikely that wood chipping will be a significant concern.

7 Conclusions

7.1 Impact Assessment

Review of the noise data (figures 4 and 5) shows that the fans are more than 5dB louder than the boilers. On that basis, acoustically the boiler sound levels have little impact on increasing the internal sound level as the fans are the dominant noise source, hence no adjustment to internal sound levels to account for boiler derived sound has been made (and in any event a continuous level of 85dB has been assumed which is considered a worst case). The Impact will be significantly less in practice as a more realistic source level would be up to 10dB less. Additionally, the cladding for the building is likely to provide a higher standard of acoustic performance than the 20dB SRI assumed in the calculations.

The normal operation of the proposed boiler plant and associated equipment for installation should not have measureable impact during normal daytime operation for any of the receptors levels, calculated levels on worst case are very (the highest being 17.4dB) and therefore well below the assumed background.

The level of impact at each of the receptors is as follows:

7.1.1 Internal boiler and fans

Receptor 1
The predicted sound level is 21.1dB (external) based on worst case scenario. The sound from the activities is likely to be inaudible at this location if:

- Doors on the unit remain closed during operation at night except for access

Receptor 2
Overall level predicted to be 17.4dB based on worst case scenario. The sound from the activities will be inaudible at this location even at night based on a worst case.
Receptor 3
Overall level predicted to be 11.1dB based on worst case scenario. The sound from the activities will be inaudible at this location even at night based on a worst case.

If required, a condition requiring doors to remain closed except when in use, might be applicable.

7.1.2 Wood chipping

The results of the BS4142:2014 assessment are shown in Table 3 above. That assessment is specific to **Receptor 2** which was the highest level noted in assessments. The BS4142:2014 assessment indicates that a significant adverse impact may exist based on worst case.
In practice, as identified in the uncertainty calculations, there are a number of factors that will make this unlikely, these are:

- The sound insulation in Unit 8 is likely to provide far more than the estimated 20dB sound attenuation. 150mm of thermal insulation on top of the existing steel sheet construction is likely to reduce levels by another 5-10dB.
- The Receptor is more than 240m from the main process building, the effects of ground absorption and air absorption are likely to be significant over that distance. Estimates of further reductions assume 0.25dB/100m for air absorption and 1dB/100m for ground absorption.

Overall it is likely that these factors will further reduce incident sound by a minimum of 6.8dB which reduces the potential impact to +4.2dB. This would correspond with LOAEL and fall into the NPPG category of 'noticeable but not intrusive as it is likely that ambient levels at receptor locations from other activities are likely to mask this daytime operation.

The calculated level meets the WHO external standards.

No formal BS4142:2014 assessment was conducted for **Receptor 1**. However, the predicted sound level is 45.2dB (external) based on worst case scenario which is slightly less than that for receptor 2. The sound from the activities is likely to be only barely audible at this location as the same criteria for insulation of the building applies, and there is an intervening building which will provide a barrier effect, reducing the incident sound by 10dB or more. This assumes that:

- The wood chipping is carried out internally with doors closed.
- Wood chipping is carried out in normal office hours only.

Overall it is likely that these factors and the presence of the barrier effect will further reduce incident sound by a minimum of 10-15dB which reduces the potential impact to -4dB. This would correspond with NOEL and fall into the NPPG category of 'Not noticeable'. Additionally, it is likely that ambient levels at receptor locations from other activities are likely to mask this sound during daytime operation.

The calculated level meets the WHO external standards.

No formal BS4142:2014 assessment was conducted for **Receptor 3**. However, the predicted sound level is 42.4dB (external) based on worst case scenario which is slightly less than that for receptor 2. The sound from the activities is likely to be only barely audible at this location as the same criteria for insulation of the building applies (5-10dB benefit). The sound from the activities is unlikely to be audible at this location as the separation distance is very significant (350m). This assumes that:

- The wood chipping is carried out internally with doors closed.
- Wood chipping is carried out in normal office hours only.
- The Receptor is more than 350m from the main process building, the effects of ground absorption and air absorption are likely to be significant over that distance. Estimates of further reductions assume 0.25dB/100m for air absorption and 1dB/100m for ground absorption.

Overall it is likely that these factors will further reduce incident sound by a minimum of 10dB which reduces the potential impact to +1dB. This would correspond with NOEL/LOAEL and fall into the NPPG category of 'noticeable but not intrusive' as it is likely that ambient levels at receptor locations from other activities are likely to mask this daytime operation.

7.2 Summary

It is concluded that the calculations show there will be no observed effects from normal operations at the receptors during the day or at night. The levels of sound likely, even based on worst case, are well below 20dB which is itself likely to be below any ambient or background levels in the area even at night.

There is no acoustic reason why, subject to ensuring that Unit 8 doors remain closed except for access or egress, consent should be withheld on acoustic grounds. *A condition restricting the use of the doors on Unit 8 to remain closed except for access and egress would be appropriate*.

On days where wood chipping takes place, it is unlikely that this would be noticeable in the community. The most likely property affected would be receptor 2. The incident sound level based on worst case of 45.6dB would be broadly in line with expected ambient levels for the area during the day. It is far more likely that the incident sound would be much less than predicted due to the thick thermal cladding on Unit 8 and the attenuation due to ground and air absorption. The likely incident level is therefore 38.8dB which is unlikely to be audible.

There is no acoustic reason why, subject to ensuring that Unit 8 doors remain closed except for access or egress, consent should be withheld on acoustic ground for chipping of wood. *A condition restricting wood chipping to inside the unit with the doors closed would be appropriate. A further condition restricting wood chipping (only) to daytime hours 08:00hrs to 18:00hrs daily might also be appropriate.*

The following general observations should also be noted.

- The sound sources will be quieter than predicted; experience at other sites has shown boilers to be operation 60% of the time (with corresponding reduction in sound levels).
- The screening assessment overestimates the internal sound level (observations from other plants show mid 70's levels of internal noise – up to 10dB less than is used in the predictions).
- The existing construction is likely to reduce emitted sound by more than the specified 20dB
- Buildings on site offer some measure of screening which will further reduce impact on Receptor 1.
- All the measured levels are below those stipulated in WHO and BS8233:2014 guidance, and all meet the DEFRA absolute limit stated.

It is concluded that the proposed development is acceptable in acoustic terms. The Local Authority may wish to consider applying conditions in relation to closure of doors, and hours of delivery for daytime only in order to avoid opening doors at night, as well as the restrictions on wood chipper use indicated above.

For these reasons, it is concluded that there are no grounds for refusal of planning permission based on adverse impact of noise.

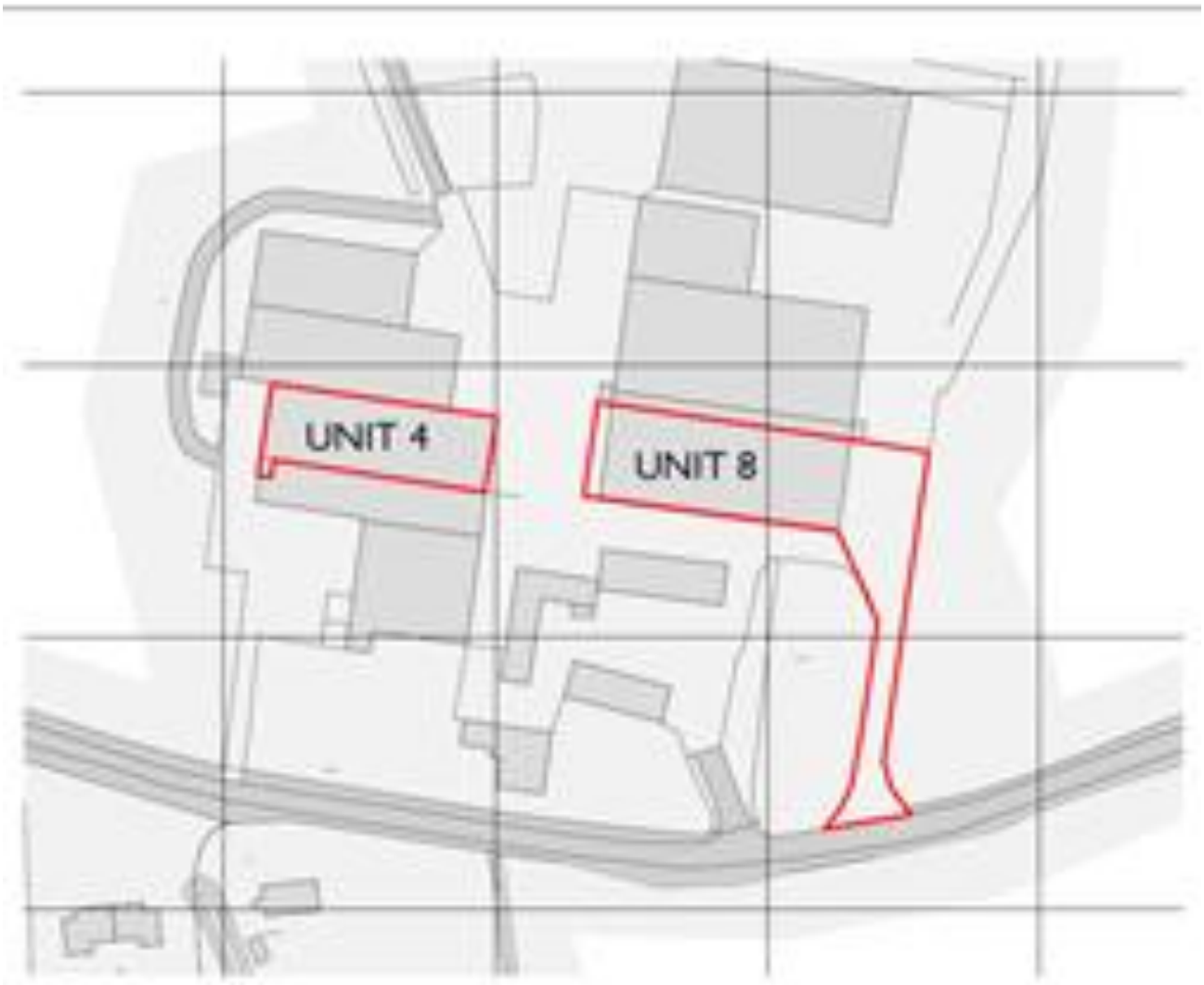
Prepared by:



Tony Higgins
Director

Appendix 1 Site Plan

Application site edged red.



Courtesy of Gareth Hickman Architects.

Appendix 2 Site Photographs

Main unit 8, access door and construction shown



Unit 8 Internal construction and thermal cladding 150mm thick



Unit 4 (Storage only)



Unit 4 and adjacent units



Unit 4 looking North, screening of other buildings.



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