enzygo
environmental consultants

Noise Impact Assessment

Energy Recovery Facility, The Moor Business Park, Ellough Road, Beccles, NR34 7TQ

V C Cooke Ltd

CRM.0157.001.NO.R.001

'Experience and expertise working in union'

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Noise Impact Assessment

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1 Introduction

1.1 Project Introduction

1.1.1 Enzygo Limited has been commissioned by V C Cooke Ltd to undertake a noise impact assessment to support a planning application for their proposed Energy Recovery Facility (ERF) within The Moor Business Park, Ellough Road, Beccles.

1.1.2 The noise assessment has been undertaken to assess the potential impacts, in accordance with the relevant standards and guidance, at the nearest noise-sensitive properties to the site and to provide outline mitigation advice if considered necessary.

1.1.3 Details of the assessment methodology employed, together with the results of the noise survey, predictions, assessment and conclusions are presented within this report.

1.2 Site Description

1.2.1 The proposed ERF is to be located within an existing building on The Moor Business Park, Ellough Road, Beccles, NR34 7TQ. The site is located at grid reference TM 44082 88418 approximately, as shown in Figure 1-1 below.

1.2.2 The site already has consent and operates as a waste transfer station, importing and sorting waste materials for onward transport. This use will remain for the site, with the ERF being an additional consented operation.

1.2.3 To the north of the development site is Beccles Southern Relief Road with open fields and Ellough Road beyond. PCE Group factory, warehouse and offices occupy a parcel of land to the west of Ellough Road just north of the roundabout junction with Beccles Road, Ellough Road and the Southern Relief Road. Further open fields are beyond as far as the residential properties on Cedar Drive.

1.2.4 To the east of the proposed development are further businesses within The Moor Business Park, beyond which are other businesses on either side of Beccles Road within Ellough Industrial Estate. Ellough Park Kart Circuit is located to the east-southeast with a large solar farm beyond and south and Beccles Airfield further east.

1.2.5 To the south is Playters Solar Farm with open farmland beyond to the west of Church Road. There are sporadic residential properties/farms on the western side of Church Road. To the west is Playters Solar Farm and open farmland to Cucumber Lane with open farmland beyond as far as the Southern Relief Road.

1.2.6 The nearest identified, existing noise-sensitive residential properties to the proposed development site are shown in Figure 1-1, namely:

1. Cedar Drive, approximately 760m to the north.
2. Farm Cottages, approximately 640m to the west.
3. The Homestead, approximately 500m to the south.

1.2.7 The open land to the north of the Beccles Southern Relief Road is understood to be allocated in the Waveney Local Plan (2019) for a future, mixed use development comprising residential,

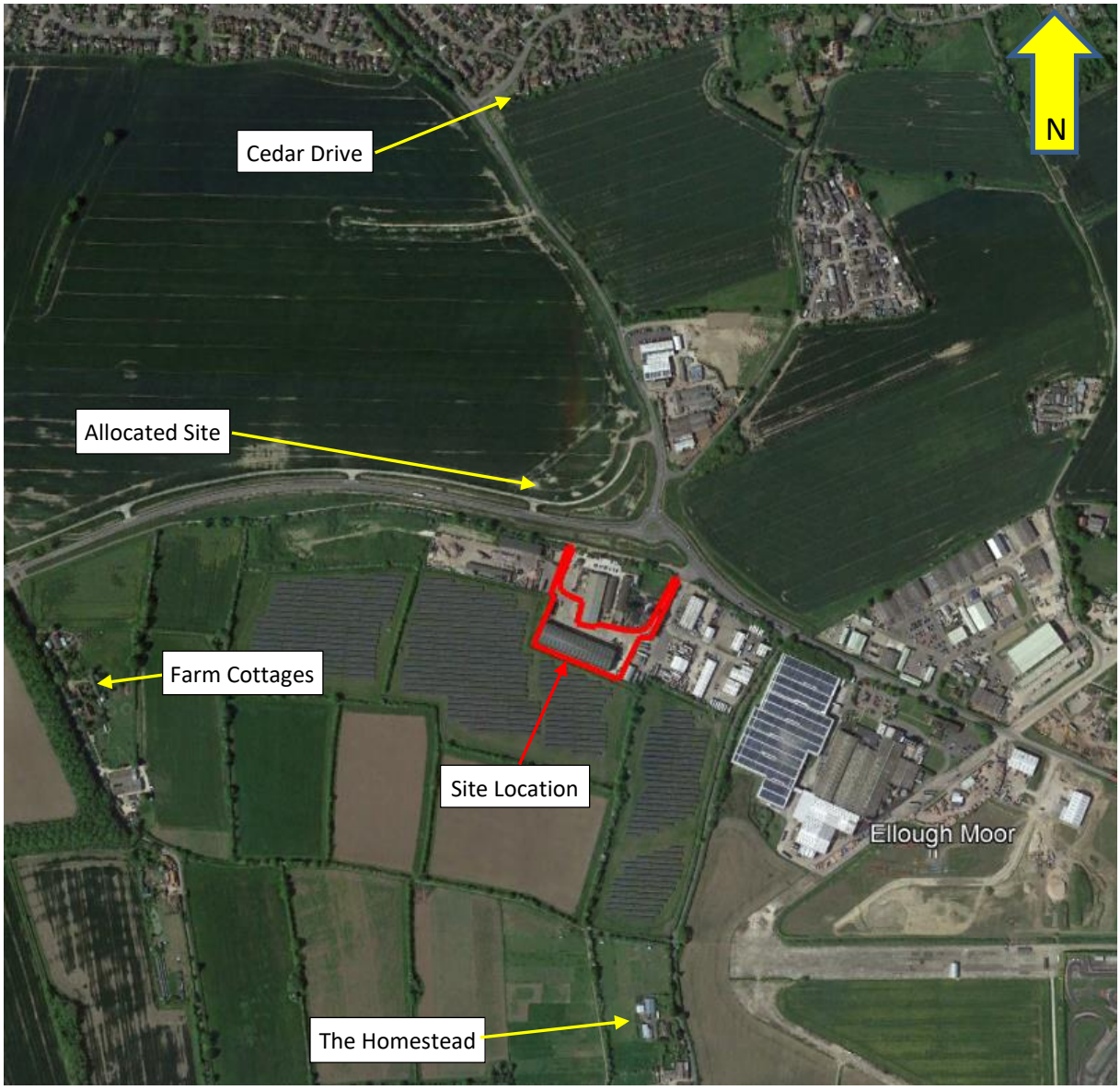
community and employment uses. No formal planning application has been submitted to planning at this time. However, an EIA screening opinion has been issued by East Suffolk Council which included an outline masterplan indicating that the sensitive, residential uses would be slightly removed from the Beccles Relief Road junction, with employment uses located in closest proximity to this application site.

1.2.8 Given this, an additional receptor location has been included in this assessment, approximating the closest point of the allocated land to the proposed ERF site.

1.3 Development Proposals

1.3.1 The proposed ERF would be located within an existing building on The Moor Business Park which would be modified to suit the development proposals. The site location and application boundary (red line) are presented in Figure 1-1 below.

Figure 1-1: Site Location Plan



Google ©

1.3.2 The existing building is of steel frame construction with a single apex roof approximately 12m high. Large, roller shutter doors are located on the northern façade and would remain closed when not in use.

1.3.3 The proposed ERF would process up to 24,369 tonnes of waste per annum generating a maximum electrical output of 2.5Mwe. The facility would operate 24/7 though vehicle movements would be limited to 07:00 to 18:00 hours Monday to Friday and 07:00 to 16:00 hours on Saturdays.

1.3.4 The primary internal noise sources for the operation include:

- Fuel stock movements;
- ID Fans and ash conveyor units;
- Furnace and biomass boiler; and,
- Flue and filtration system.

1.3.5 Externally, the most significant noise sources would be the flue stack, with a termination at 36m above local ground level.

1.3.6 The ERF will occupy a building currently used as a waste transfer station. The operation of the ERF will reduce the volume of material being exported from the site and, by extension, reduce the number of vehicle movements to and from the site. This is discussed in further detail in section 4.2.

1.4 Planning History

1.4.1 Consent for a waste processing (transfer) facility was first granted by Suffolk County Council in April 2014 under application reference W/13/3452. The consent was granted with conditions, a number of which are relevant to noise. These include:

- Condition 16 – Building Construction;
- Condition 17 – Acoustic Treatment of the Generator;
- Condition 18 – Reversing Alarms;
- Condition 19 – Roller Shutter Doors;
- Condition 20 – Loudspeakers;
- Condition 21 – Silencers; and,
- Condition 22 – Noise during Construction

1.4.2 Conditions 16 and 19 are particularly pertinent to this assessment, and are summarised as follows:

- Condition 16 – The building envelope should achieve R_w 25dB; and,
- Condition 19 – Roller shutter doors should remain closed when not in use.

1.4.3 For the full wording of the conditions, reference should be made to the original decision notice.

2 Standards and Guidance

2.1.1 A noise assessment for the development has been undertaken in accordance with the guidance contained in British Standard 4142:2014+A1:2019 *Method for rating and assessing industrial and commercial sound* (BS4142) with reference made to the internal noise criteria outlined in British Standard 8233:2014 *Guidance on sound insulation and noise reduction for buildings* (BS8233).

2.1.2 Noise levels generated by the operation of the proposed facility, at the nearby noise-sensitive receptors, has been predicted using the calculation methodology outlined in ISO9613:1996 '*Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*' (ISO9613) using the proprietary noise modelling software CadnaA.

2.1.3 A summary of the relevant standards and guidance is presented below.

2.2 Planning Practice Guidance: Noise

2.2.1 The Planning Practice Guidance: Noise is the Government's online guidance on managing potential noise impacts from new developments.

2.2.2 The guidance includes a noise exposure hierarchy table which relates response to noise and example outcomes to effect levels. The hierarchy table also identifies actions required for each effect level.

2.2.3 Of particular relevance to this assessment are the No Observed Effect Level and the No Observed Adverse Effect Level (NOAEL) and to which the guidance states the following:

Table 2-1: Noise Hierarchy Table Excerpt

Response	Example of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not present	No effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life	No Observed Adverse Effect	No specific measures required

2.3 British Standard 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*

2.3.1 BS4142 provides a methodology for rating and assessing sound associated with both industrial and commercial premises. The purpose of the Standard is clearly outlined in the opening section where it states that the method is appropriate for the consideration of:

- Sound from industrial and manufacturing processes.

- Sound from fixed installations which comprise mechanical and electrical plant and equipment.
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises.
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

2.3.2 The methods described in the standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

2.3.3 The standard states that sound of an industrial/commercial nature does **not** include sound from the passage of vehicles on public roads and railway systems.

2.3.4 The Standard is based around the premise that the significance of the noise impact of an industrial/commercial facility can be derived from the numerical subtraction of the background noise level (not necessarily the lowest background level measured, but the typical background at the receptor) from the measured/calculated rating level of the specific sound under consideration. This comparison will enable the impact of the specific sound to be concluded based upon the premise that typically "*the greater this difference, the greater the magnitude of the impact*". This difference is considered as follows:

- 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 upon 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.

2.3.5 BS4142 further states that "*where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact*" again depending upon the specific context of the site. The standard further qualifies the assessment protocol by outlining conditions to the comparative assessment and stating that "*not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact*", thus implying that all sites should be assessed on their own merits and specifics.

2.3.6 The standard quantifies the typical reference periods to be used in the assessment of noise, namely:

Typical Daytime	07:00 – 23:00	1-hr assessment period
Typical Night-time	23:00 – 07:00	15-min assessment period

2.3.7 The Standard outlines methods for defining appropriate "*character corrections*" within the rating levels to account for tonal qualities, impulsive qualities, other sound characteristics and/or intermittency. These are a) the Subjective Method, b) the Objective Methods for tonality and c) the Reference Method. It is noted by the Standard that where multiple features are present the corrections should be added in a linear fashion to the specific level.

2.3.8 The Subjective Method is based on the following corrections:

Table 2-2: BS4142 Subjective Method Rating Corrections

Level of Perceptibility	Tonal Correction	Impulsivity Correction	Correction for "Other sound characteristics"	Intermittency Correction
No Perceptibility	+0 dB	+0 dB	Where neither tonal nor Impulsive but clearly identifiable +3 dB	If intermittency is readily identifiable +3 dB
Just Perceptible	+2 dB	+3 dB		
Clearly Perceptible	+4 dB	+6 dB		
Highly Perceptible	+6 dB	+9 dB		

2.3.9 It is noted that the standard goes on to states that *"where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night"*.

2.4 British Standard 8233:2014 *Guidance on sound insulation and noise reduction for buildings*

2.4.1 BS8233 provides guidance and recommendations for the control of noise from outside sources to maintain an internal acoustic environment appropriate for the intended use. The Standard suggests appropriate criteria and limits for differing situations which are, primarily, intended to guide the design of new or refurbished buildings undergoing a change of use rather than to assess the effect of changes to the external noise climate. However, it is considered that the guidance provides suitable criteria for the assessment of internal noise levels in this instance.

2.4.2 The Standard suggests suitable guidance values for residential dwellings shown in Table 2-3.

Table 2-3: BS8233 Indoor Ambient Noise Levels for Dwellings

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

2.4.3 The guidance values are generally taken as applying to noise sources without specific character, previously termed 'anonymous noise' in earlier versions of the standard.

2.4.4 Whilst it is considered desirable to achieve these internal noise levels with the windows open, it is not stipulated within the Standard which states:

"*If relying on closed windows to meet the guide values, there needs to be appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.*"

2.4.5 The Standard suggests that the level of noise reduction provided by a partially open window would be approximately 15dB.

2.4.6 BS8233 also sets out a design-criteria for external noise in external amenity spaces such as gardens and patios stating:

"*it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments.*"

2.4.7 These guideline design-criteria values are meant for new residential development rather than for assessing new noisy development being introduced into a residential area. However, the guideline values provide good noise limits to attain in this instance.

2.5 ISO9613 *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*

2.5.1 The noise levels generated by the operation of the proposed development have been predicted using the calculation methodology set out in ISO9613-2. The methodology considers the distance between the sources and the receptors and applies the amount of attenuation due to atmospheric absorption and other site-specific characteristics.

2.5.2 The methodology assumes downwind propagation, i.e., a wind direction that assists the propagation of noise from the source to all receptors.

3 Baseline Survey Information & Results

3.1 Introduction

3.1.1 Environmental baseline noise surveys were undertaken at the nearest representative locations to the identified noise-sensitive residential receptors, over a period considered sufficient to obtain a representative baseline/background noise climate. The monitoring locations are detailed in Table 3-1 and shown on Figure 1.1.

3.1.2 The monitoring was undertaken on Saturday 20th and Sunday 21st August 2022 to quantify noise levels during the quietest daytime and night-time periods at the weekend.

Table 3-1: Noise Monitoring Locations

Monitoring Location	Approx. Distance from Site	Reflecting Surfaces between Source & Receptor	Topography of Intervening Ground	Justification for Choice of Measurement Location
Cedar Drive	760m	None	Relatively flat farmland	Nearest residential property to the site in a northerly direction
Farm Cottages	640m	Solar Farm	Relatively flat land, though includes solar panels	Nearest residential property to the west of the site
The Homestead	500m	Solar Farm	Relatively flat land, though includes solar panels	Nearest residential property to the south of the site

3.2 Weather Conditions

3.2.1 Weather conditions during the survey periods are summarised in Table 3-2 below.

Table 3-2: Weather Conditions

Period	Wind Speed & Direction	Rain	Fog or Mist	Ground Conditions	Cloud Cover	Temp
Day	Light breeze SW Direction	None	Clear	Dry	20%	20°C
Night	Light breeze SW Direction	None	Clear	Dry	50%	16°C

3.2.2 The recorded weather conditions are within appropriate parameters and would have no detrimental effect on the measured survey data.

3.3 Measuring Equipment

3.3.1 The noise monitoring equipment used during the surveys is shown in Table 3-3 and was set to record the $L_{Aeq,T}$, L_{A90}, L_{A10} and L_{Afmax} parameters.

3.3.2 The following set-up parameters were used on the sound level meter during all the noise measurements undertaken:

Time Weighting: Fast

Frequency Weighting: "A"

3.3.3 The sound level meters were field calibrated, using an acoustic calibrator, prior to and upon completion of the overall survey. No significant drift in calibration was noted.

Table 3-3: Noise Monitoring Equipment

Location	Equip. Make & Model	Class	Calibration Level, dB	Serial No.	Calibration Date Prior to Survey
Cedar Drive	Cirrus CR171:B Sound Level Meter	1	94.0	G301158	November 2021
	Cirrus CR:515 Acoustic Calibrator	-	-	90331	November 2021
Farm Cottages	01dB Solo Sound Level Meter	1	94.0	65396	February 2022
	Cirrus CR:515 Acoustic Calibrator	-	-	67243	February 2022
The Homestead	01dB Solo Sound Level Meter	1	94.0	65446	November 2020
	Cirrus CR:515 Acoustic Calibrator	-	-	59522	February 2022

3.3.4 The external calibration documentation for the equipment used is available upon request.

3.4 Survey Details and Results

3.4.1 The results of the baseline surveys are summarised in Table 3-4 below and can be found in full in Appendix A. The table includes the average and lowest measured background noise level.

Table 3-4: Summary of Baseline Survey Results

Location	Duration Hh:mm	Period	$L_{Aeq,T}$, dB[1]	L_{Afmax}, dB[2]	Background Sound Level, L_{A90} dB[3]	
					Average	Minimum
Cedar Drive	03:00	Day	68.7	98.7	43.3	39.3
	03:00	Night	60.6	98.2	27.9	24.6
Farm Cottages	08:45	Day	45.4	69.7	34.1	28.6
	08:00	Night	37.2	62.9	28.5	24.2
The Homestead	03:00	Day	56.8	81.6	34.4	33.1
	03:00	Night	39.2	70.9	22.1	20.5

1) The logarithmic average of the L_{Aeq} parameter is presented.
2) The maximum recorded L_{Amax} event is reported.
3) The arithmetic average and minimum background sound level (L_{A90}) are presented.

3.4.2 The night-time noise measurements made at Cedar Drive and The Homestead were made between 01:00 and 04:00. Analysis of the longer duration measurements made at Farm

Cottages demonstrates that this period is generally representative of the quieter portions of the night-time period in the area.

3.4.3 Irrespective of this, the background sound levels during the night-time period are very low in absolute terms. Analysis of the time history chart for Farm Cottages demonstrates that 30dB L_{A90} is only exceeded between 23:00 and 23:30 and again from 05:15 onwards. Outside of these periods the night-time background sound level falls below 30dB L_{A90}.

3.5 Existing Context

3.5.1 The daytime noise climate, across all locations was governed primarily by road traffic noise on the surrounding network. Additional noise sources of note included livestock / farm animals in the vicinity of The Homestead and other general environmental noise, i.e. bird song etc.

3.5.2 The night-time noise climate was similar to the daytime period, being governed by road traffic noise and noise from farm animals. Road traffic volumes were lower than the daytime period and vehicle movements were sporadic in nature.

4 Assessment of Impacts

4.1 Introduction

4.1.1 Specific sound levels generated by the proposed development have been predicted to the site facing façade or site facing outdoor amenity space of the nearest noise-sensitive receptors identified using the calculation methodology outlined in ISO9613.

4.1.2 The resulting predicted levels have then been assessed in accordance with the guidance contained in BS4142 with reference made to sleeping conditions in bedrooms at night in accordance with the guidance contained in BS4142 and BS8233.

4.2 Sources Being Assessed

4.2.1 The noise source data is a combination of information provided by the client, or their agent, and Enzygo library data. A summary of noise sources is shown in Tables 4-1 and 4-2.

4.2.2 Table 4-1 below details the noise sources inside the building envelope. It is noted that the calculations assume the access doors to the building would be rapid closing, only opening when necessary.

Table 4-1: Noise Source Information – Internal

Sound Source	Equipment	Modelled Noise levels
4No. ID fans	Various fans located internally at various points in the process.	76dB(A) @ 1m
Internal Fuel Loading	Loading of fuel into process	79dB(A) @ 10m
Ash Conveyors	Removing residual ash from the process	35dB(A) @ 2m
Flue filter system	Filtration system of exhaust gases etc	85dB(A) @ 2m
Boiler	Combustion and steam production	64dB(A) @ 1m

4.2.3 The building envelope is assumed to be as required by the extant planning consent, i.e. the building envelope achieving R_w 25dB and roller shutter doors remaining closed when not in use.

4.2.4 Outside the building envelope there are a number of other noise sources. These are detailed in Table 4-2 below:

Table 4-2: Noise Source Information – External

Sound Source	Equipment	Modelled Noise levels
Exhaust Stack	Exhaust to include sufficient attenuation to achieve the noise levels detailed. Stack termination located at 36m above local ground height	85dB(A) @ 1m

4.2.5 Fuel stocks are to tipped directly in to the ERF reception hall and moved to the process by means of a walking floor. No additional material handling will take place outside the building envelope.

HGV Movements

4.2.6 The site has extant planning consent for processing up to 100,000 tonnes per annum of waste material. The current operation sees the residual waste exported from the site to landfill.

4.2.7 The introduction of the ERF at the site will remove the need to export materials, reducing the number of overall vehicle movements. This is detailed more succinctly in the Transport statement which states:

'1.4 The new facility will be located in an existing building on the site. The proposal will not change the existing planning consented (100,000tpa) or permit licence (75,000tpa), but it will enable the material to be processed within the site. This will provide a material betterment in terms of reducing the requirement to export to Eye and Tilbury resulting in environmental efficiencies by reducing the amount of waste to landfill, creating a sustainable energy resource and also through the reduction in the number of vehicle kilometres of export material generated by the site.

1.5 The proposal will therefore reduce the number of vehicles associated with current permission at the site….'

4.2.8 Given the above, vehicle movements have been omitted from the noise assessment.

4.3 Noise Modelling Protocols

4.3.1 The noise model was constructed using the proprietary noise modelling software package CadnaA utilising Google Earth geo-referenced 1:1 scaled aerial photography, openstreetmap.org mapping data, DEFRA online ground height data. The noise source information is as detailed in section 4-2 above.

4.3.2 It is assumed that the ground between the site and the receptors would be soft, typified by grass lands/agricultural land, i.e. G = 1.0. Wind and temperature gradient assisted sound propagation has been assumed to all receptors.

4.4 Predicted Sound Levels

4.4.1 For the purposes of this assessment the predicted sound levels assume that all internal plant associated with the ERF would be operating simultaneously and at 100% capacity during both the daytime and night-time periods.

4.4.2 Specific sound levels have been predicted to a height of 1.5m during the daytime period, to represent outdoor amenity space and 4.0m for a first-floor bedroom window during the night-time period. It is reiterated that the night-time period omits any noise from external vehicle movements.

4.4.3 The predicted specific noise levels are shown in Table 4-3.

Table 4-3: Predicted Specific Sound Levels at the Receptors

Receptor Location	Period (hrs)	Receptor Height (m)	Predicted Specific Sound Level, L_{As}
Cedar Drive	07:00 – 23:00	1.5	21.2
	23:00 – 07:00	4.0	24.6
Farm Cottages	07:00 – 23:00	1.5	23.0
	23:00 – 07:00	4.0	26.4
The Homestead	07:00 – 23:00	1.5	26.2
	23:00 – 07:00	4.0	29.6
Allocated Site	07:00 – 23:00	1.5	33.2
	23:00 – 07:00	4.0	36.1

4.4.4 During the daytime period, noise levels are slightly elevated when compared with the night-time. However the predictions to receptors at 1.5m benefit from a more complex propagation path, attenuating the noise levels slightly.

4.4.5 The noise levels predicted above are relatively low in absolute terms, not exceeding 30dB at any of the existing residential properties during the daytime or night-time periods.

4.4.6 Noise levels at the allocated site are higher during the daytime and night though it is noted that these are predicted to an indicative receptor located at the closest point to the ERF. This may not reflect the location of an actual residential dwelling once the site is developed.

4.5 Sound Rating Levels

Existing Context

4.5.1 The site is in a semi-rural area, on the edge of an existing industrial/commercial area. The site already operates as a waste transfer facility therefore has a history of noise generating operations of the type proposed.

4.5.2 The nearest existing noise-sensitive receptors are separated from the site by at least 500m of open agricultural/rural land.

Derived Sound Rating Levels

4.5.3 The site is relatively removed from the nearest existing noise sensitive dwellings, being separated by at least 500m. This distance would provide significant attenuation, particularly to any higher frequency tonal content of the specific noise levels.

4.5.4 Furthermore, all static plant is to be located within a robust, existing building which, with doors closed, would provide significant attenuation to any breakout noise.

4.5.5 The proposed facility is to be in an existing industrial/commercial building which is, already located in an existing industrial/commercial estate. To that end, there is likely to be an existing level of noise associated with operations such as the proposed and a degree of habituation associated with it. Given this, any intermittent or impulsive noise associated with the proposed operation would be typical of the existing noise climate.

4.5.6 Given the above, no corrections have been made for these acoustic features in the derivation of the rating noise level.

4.6 Assessment of the Impacts

4.6.1 BS4142 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.*"

4.6.2 A comparative assessment has been undertaken to determine the potential impact of the predicted sound rating levels at the nearest existing residential receptors upon the typical background sound levels in the vicinity.

4.6.3 The typical background sound level is derived through consideration of the measured noise levels and, in this instance, is either derived from the mean (arithmetic) value or the modal value.

4.6.4 Table 4-4 summarises the results of the assessment. The assessment has been undertaken to integer values in accordance with BS4142.

Table 4-4: BS4142 Assessment

Location	Period	Location	Rating Level dB $L_{Aeq,T}$	Typical Background Noise Level, dB L_{A90}	Difference, dB
Cedar Drive	Day (07:00 – 23:00 hrs)	Amenity	21	43	-22
	Night (23:00 – 07:00 hrs)	1F Bedroom	25	28	-3
Farm Cottage	Day (07:00 – 23:00 hrs)	Amenity	23	34	-11
	Night (23:00 – 07:00 hrs)	1F Bedroom	26	27	+/-0
The Homestead	Day (07:00 – 23:00 hrs)	Amenity	26	34	-8
	Night (23:00 – 07:00 hrs)	1F Bedroom	30	22	+8

4.6.5 Table 4-4 shows that predicted daytime noise levels generated by the ERF fall well below the prevailing background noise levels at all existing residential receptors, indicating that the specific sound level would have a low impact in accordance with BS4142.

4.6.6 During the night-time period, Table 4-4 demonstrates that, generally the rating noise level would not exceed the background sound level. The exception being The Homestead, where the rating noise level is 8dB above the background sound level.

4.6.7 With reference to the night-time period, it is noted that both the background sound level and rating noise levels are very low in absolute terms, not exceeding 30dB in either case. In this instances BS4142 suggests the absolute noise level may be as, or more important that the difference, particularly during the night-time period. This is discussed further in section 4.8 below.

4.6.8 As the masterplan for the allocated has not been formalised at this time, it has been omitted from the BS4142 assessment presented above. It is not possible to establish accurate background sound levels in the vicinity of the sensitive portions of the allocated site, nor is it

possible to accurately model noise to the sensitive portions of the site. To that end, the potential impact on the proposed dwellings has been considered in accordance with the absolute noise limits detailed in BS8233, presented in Section 4.8 below.

4.7 Context

4.7.1 BS4142 states that where the initial estimate of impact needs to be modified due to the context, all pertinent factors should be taken into consideration.

Sensitivity of the Receptors

4.7.2 The nearest identified existing receptors are residential in nature and as such are sensitive to noise impact during both the day and overnight.

4.7.3 The allocated site is included to be indicative of the potentially sensitive use of the identified land parcel. It is not clear is this will be a sensitive receptor once the allocated site plan is further developed.

The Absolute Level of the Specific Sound

4.7.4 The specific sound levels generated by the development proposals are predicted to fall below the prevailing average ambient $L_{Aeq,1hr}$ noise levels at the receptors assessed during both the day and night. Indeed, the specific noise levels falls well below the background sound level in the majority of instances. This would indicate that noise from the operational ERF is not readily audible under normal listening conditions.

The Character and Level of the Residual Sound

4.7.5 The specific sound levels from the proposed facility are generally in keeping with the existing use of the site, i.e. waste management operations. All fixed plant associated with the ERF is to be located within the existing building therefore external noise from the proposed use would generally be in keeping with the current noise climate in the area, i.e. HGV movements, handling and movement of materials, etc.

4.7.6 Furthermore, the specific noise levels are predicted to be below the measured background noise level at all existing receptors during the day. As such, the character and level of the sound are likely to be indistinguishable against the residual noise climate.

4.7.7 During the night-time period the background sound level is very low in the area therefore, it is possible that noise from the facility may be audible during quieter portions of the night-time period.

4.8 BS8233 Assessment

4.8.1 The predicted, daytime, specific noise levels (ref Table 4-3) are relatively low and would fall well below the noise levels for external amenity spaces as detailed in BS8233 (ref Table 2-3). Indeed, the predicted specific level is sufficiently low that it would not be a prohibitive factor in achieving the required noise levels, i.e. cumulatively noise from the ERF would not result in any rise above the guideline values.

4.8.2 With regards the allocated site, the predicted specific noise level is relatively low and would fall well below the noise levels for external amenity spaces as detailed in BS8233.

4.8.3 At night residents are likely to be indoors and may have windows open for ventilation. Inside dwellings residual sound will likely provide masking sound from the proposed development. BS8233 states that a window left partially open for ventilation would give a sound reduction of approximately 15dB.

4.8.4 As indicated in Section 4.7 above, the specific noise levels are sufficiently low as to be considered indistinguishable/inaudible against the prevailing residual noise climate. To that end, it would be reasonable to consider the specific noise levels as being 'anonymous' or without specific character to apply the criteria from BS8233.

4.8.5 An assessment has been made against the guideline values for internal ambient noise levels for sleeping in bedrooms at night, i.e. 30dB $L_{Aeq,8hr}$. Table 4-5 details the results of the assessment.

Table 4-5: BS8233 Assessment of Internal Noise Levels at Night - Residential

Location	Predicted External Noise Level, dB $L_{Aeq,T}$	Predicted Internal Noise Level, dB $L_{Aeq,T}$	Guidance Levels dB $L_{Aeq,8hr}$	Difference, dB
Cedar Drive	25	10	30	-20
Farm Cottage	26	11		-19
The Homestead	30	15		-15
Future Development Site	36	21		-9

4.8.6 Table 4-5 shows that predicted internal night-time noise levels, with windows open, would fall well below the guideline value detailed in BS8233. This would indicate that operation of the facility during the night-time period would not result in any adverse loss of amenity.

4.9 Assessment Summary

4.9.1 The assessments presented in this report demonstrate that, during the daytime period, noise from the proposed ERF would fall well below the existing background sound level at all existing sensitive receptors in the vicinity of the site. Further to this, noise levels in the vicinity of the allocated development site to the north are sufficiently low as to not be a preventative factor in achieving appropriate levels of residential amenity.

4.9.2 During the night-time period, noise from the ERF would generally fall below the background sound level in the area. The exception being The Homestead, where the rating noise level would exceed the very low background sound level. However, the impact in this case is likely to be very low given the absolute noise levels. This, and the BS8233 assessment presented in Table 4-5 indicate that the amenity of the property would not be compromised as a result of the proposed ERF.

5 Conclusion

5.1.1 Enzygo Limited has been commissioned by V.C Cooke to undertake a noise impact assessment to support a planning application for their proposed Energy Recovery Facility on land at The Moor Business Park, Ellough Road, Beccles.

5.1.2 The noise assessment has been undertaken to assess the potential impacts, in accordance with the relevant standards and guidance, at the nearest exiting noise-sensitive properties to the site. In addition, consideration has been given to an allocated mixed-use site to the north.

5.2 Noise Assessment

5.2.1 Sound levels generated by the proposed development have been predicted using CadnaA and assessments have been made in accordance with the guidance contained in both BS4142:2014+A1:2019 and BS8233:2014.

5.2.2 The BS4142 assessment has shown that, when considering context, the proposed facility would have a low impact during the daytime period, with predicted levels falling well below the background sound level at the existing receptors and well below the guideline values of BS8233 at the allocated development site. This is considered to fall within the 'No Observed Effect Level' detailed in the Planning Practice Guidance.

5.2.3 During the night-time period, background sound levels and rating noise levels are very low. Notwithstanding this, the resultant noise impact in accordance with BS4142 is generally low.

5.2.4 The BS8233 assessment indicates that appropriate internal noise levels are comfortably achieved, even with windows open for ventilation. Given this, the night-time assessment is considered to be at the No Observed Adverse Effect Level, where noise from the ERF may be audible but does not cause any change in behaviour.

5.2.5 Given the above, it is demonstrated that there are no reasons, on noise grounds, why planning consent for the proposed ERF cannot be granted.

Glossary of Terminology

Noise is defined as unwanted sound. The range of audible sound is known to be from 0dB (threshold of hearing) to 140dB (threshold of pain). Examples of typical noise levels relating to 'everyday' occurrences are given in Table G-1 below.

Table G-1: Typical Noise Levels

Source	Sound Pressure Level in dB(A)	Subjective Level
Gun shot	160	Perforation of eardrum
Military Jet take-off	140	Threshold of pain
Jet Aircraft at 100m	120	Very Loud
Rock Concert, front seats	110	Threshold of Sensation
Pneumatic Drill at 5m	100	Very Loud
Heavy goods vehicle from pavement	90	
Traffic at kerb edge	70 – 85	Loud
Vacuum Cleaner, Hair Dryer	70	
Normal conversation at 1m	60	Moderate
Typical Office	50 – 60	
Residential area at night	40	Quiet
Rural area at night, still air	30	
Leaves Rustling	20	
Rubbing together of fingertips	10	
	0	Threshold of hearing

The frequency response of the human ear to noise is usually taken to be around 18Hz (number of oscillations per second) to 18,000Hz. However, the human ear does not respond equally to different frequencies at the same level; it is more sensitive in the mid-frequency range than lower and higher frequencies and, because of this when undertaking the measurement of noise, the low and high frequency components of any given sound are reduced in importance by applying a filtering (weighting) circuit to the noise measuring instrument. The weighting which is widely accepted to correlate best with the subjective nature of human response to noise and is most widely used to quantify this is the A-weighted filter set. This is an internationally accepted standard for noise measurement.

For variable noise sources within an area an increase of 3dB(A) would be the minimum perceptible to the human ear under normal conditions. It is generally accepted that an increase/decrease of 10dB(A) corresponds to a doubling or halving in perceived loudness. The 'loudness' of a noise is a purely subjective parameter, dependant not only upon the sound pressure of the event but also on the dynamics of the listener's ear, the time of the day and the general mood of the person.

With regards to environmental noise levels (in the open air), these are rarely steady but rise and fall according to the activities being undertaken within the surrounding area at any given time. Attempting produce a figure that relates this variable nature of noise to human subjective response, various statistical noise metrics have been developed. These and other useful terminology and descriptors are presented in Table G-2 below.

Table G-2: Terminology

Term	Definition
Sound	Pressure fluctuations in a fluid medium within the audible range of amplitudes and frequencies which stimulate the organs of hearing.
Noise	Unwanted sound emitted from a source and received by the sensitive receptor.
Decibel (dB)	Unit most often used to describe the sound pressure level. A logarithmic number, it correlates closely to the way in which humans perceive sound. Its wide range of values helps quantify sound pressures from a large variety of magnitudes.
A-Weighting (dB(A))	Human perception of sound is frequency dependant. A-weighting applies a range of corrections at each frequency to provide a 'human-averaged'. Can be frequency band or broadband values.
Frequency (Hz)	The number of cycles per second, for sound this is closely related (and often mistaken for) pitch.
Frequency Spectrum	A more detailed analysis of the frequency components that comprise a sound source.
$L_{A10,T}$	The 10th statistical percentile of a measurement period, i.e., the level that is exceeded for 10% of the measurement duration. Closely correlates with traffic sources, A-weighted.
$L_{A90,T}$	The 90th statistical percentile of a measurement period, i.e., the level that is exceeded for 90% of the measurement duration. Used to describe background sound levels, as this value is affected less by short, transient sound sources, A-weighted.
L_{Amax}	The root mean square (RMS) maximum sound pressure level within a measurement period, A-weighted.
Ambient Sound	The total sound climate of all noise sources incident at one location, both in the near- and far-field (*The ambient sound comprises the residual sound and the specific sound when present)*.
Ambient Sound Level $L_a = L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T.
Background Sound Level $L_{A90,T}$	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.
Equivalent Continuous A-weighted Sound Pressure Level $L_{Aeq,T}$	Value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, $T = t_2 - t_1$, has the same mean-squared sound pressure as a sound that varies with time, and is given by the following equation:

Term	Definition
	$$L_{Aeq,T} = 10lg_{10}\left\{\left(\frac{1}{T}\right)\int_{t1}^{t2}\left[p_A\frac{(t)^2}{{p_0}^2}\right]dt\right\}$$ Where p_0 is the reference sound pressure (20µPA); and $P_A(t)$ is the instantaneous A-weighted sound pressure level at time t.
Measurement Time Interval T_m	Total time over which measurements are taken (*This may consist of the sum of several non-contiguous, short-term measurement time intervals)*
Rating level $L_{Ar,Tr}$	Specific sound level plus any adjustment for the characteristic features of the sound, over time, T.
Reference Time Interval, T_r	Specified interval over which the specific sound level is determined (This is 1hr during the day from 07:00 to 23:00 hours and a shorter period of 15-min at night from 23:00 to 07:00 hours).
Residual Sound	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
Residual sound level $L_r = L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level of the residual sound in a given situation at the assessment location over a given time interval, T.
Sound Pressure Level	The level of fluctuation in air pressure, caused by airborne sound sources. Measured in Pascals (Pa).
Sound Power Level	The rate at which sound is radiated by a source. This parameter is useful as it describes sound energy before environmental or decay factors. Quantified in dB and notated usually as L_w or SWL.
Specific sound level $L_s = L_{Aeq,Tr}$	Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given time interval, T.
Specific Sound Source	Sound source being assessed.

Statement of Uncertainty

This report is based upon a range of measurements, a system of calculations and noise predictions. As such, this report attempts to quantify fluctuations in air pressure and is subject to the effects of meteorology, physical and perceived anomalies, tolerances within the measuring and monitoring equipment and accuracy margins within the noise modelling software. In the interests of repeatability, this report must be considered as being affected by common factors involved in the measurement and calculation of noise propagation.

All measurement values, outcomes and assumptions are subject to a margin of uncertainty. This has been quantified and assessed as follows:

- Rounding errors – systemic tolerance of ±1dB;
- Meteorology – allowance of ±1.9dB; and
- CadnaA noise propagation modelling software – operational accuracy of ±2.1dB

The most influential uncertainty factors for the assessment of noise are deemed to be equipment tolerances, meteorology and software accuracy. A root-sum-square statistical average has been used to provide an overall margin of uncertainty of ±3dB.

Statement of Competency

The assessment has been undertaken by Mr Mark Harrison, Principal Acoustic Consultant at Enzygo Limited. Mr Harrison holds a Batchelor of Science degree in Music Technology and a post graduate Diploma in Acoustics and Noise Control.

Mr Harrison has worked in acoustic consultancy since 2007 and has worked on noise and vibration assessments in several sectors including industrial / commercial developments; power generation and distribution; residential developments; transport schemes; and mineral extraction and processing.

The report has been prepared under the supervision of Mr. Darren Lafon-Anthony who is the Director of Acoustics at Enzygo Limited. Mr. Lafon-Anthony holds a Master of Science Degree in Applied Acoustics and has been a Corporate Member of the Institute of Acoustics since July 2004 having previously been an Associate Member of the institute since October 2001. Mr. Lafon-Anthony is also a Fellow of the Institute of Quarrying based on his contribution to minerals and mining noise assessment and mitigation, a qualification he has held since September 2014.

Mr. Lafon-Anthony has worked in acoustics since January 1981. Initially as an engineer designing and overseeing manufacture of noise control equipment for the water industry, standby power diesel generator and power generation markets for several noise control equipment manufacturers and, since February 2004, as an environmental noise consultant in various sectors, including mineral and mining sites, waste disposal and recycling sites, large industrial developments, energy supply projects (EfW, STOR and Battery Energy sites) and residential developments in the UK, Europe and sub-Saharan Africa.

APPENDICES

Appendix A – Baseline Noise Data

Table A-1: Cedar Drive

Start Time	$L_{Aeq,T}$, dB	L_{A90}, dB	L_{A10}, dB	L_{AFmax}, dB
21/08/2022 10:00	66.7	40.3	71.1	82.4
21/08/2022 10:15	69.7	43.1	72.5	92.2
21/08/2022 10:30	67.0	43.1	71.3	82.8
21/08/2022 10:45	67.5	44.5	71.3	82.6
21/08/2022 11:00	67.5	42.5	71.4	83.8
21/08/2022 11:15	67.5	42.2	71.6	88.6
21/08/2022 11:30	67.5	44.8	71.9	83.4
21/08/2022 11:45	68.9	47.8	73.4	82.9
21/08/2022 12:00	68.3	46.7	72.4	88.9
21/08/2022 12:15	73.6	44.5	71.7	98.7
21/08/2022 12:30	66.5	41.2	70.1	82.4
21/08/2022 12:45	66.9	39.3	70.3	84.8
Overall (Daytime)	**68.7**	**43.3**	**71.6**	**98.7**
21/08/2022 01:00	56.4	29.4	51.0	79.4
21/08/2022 01:15	53.9	28.4	52.0	79.1
21/08/2022 01:30	70.4	29.6	54.8	98.2
21/08/2022 01:45	55.8	29.5	44.6	80.4
21/08/2022 02:00	56.3	29.2	37.1	84.1
21/08/2022 02:15	51.4	29.5	45.1	74.1
21/08/2022 02:30	45.8	28.7	36.6	72.7
21/08/2022 02:45	48.9	27.1	33.7	75.4
21/08/2022 03:00	57.8	27.4	50.5	83.0
21/08/2022 03:15	52.3	24.6	37.1	80.0
21/08/2022 03:30	49.9	24.6	31.7	77.5
21/08/2022 03:45	51.5	26.2	38.0	78.6
Overall (Night-time)	**60.6**	**27.9**	**42.7**	**98.2**

Table A-2: Farm Cottages

Start Time	$L_{Aeq,T}$, dB	L_{A90}, dB	L_{A10}, dB	L_{AFmax}, dB
20/08/2022 20:15	41.1	32.1	44.2	57.3
20/08/2022 20:30	36.6	30.1	39.5	50.5
20/08/2022 20:45	38.6	28.6	37.8	59.1
20/08/2022 21:00	38.3	29.2	39.0	58.8
20/08/2022 21:15	38.6	29.9	40.2	58.4
20/08/2022 21:30	44.3	31.3	42.9	66.9
20/08/2022 21:45	36.9	32.2	39.6	48.8
20/08/2022 22:00	40.7	35.3	42.8	55.7
20/08/2022 22:15	39.6	35.5	41.6	49.1
20/08/2022 22:30	40.5	33.7	42.1	58.1
20/08/2022 22:45	36.1	32.2	38.3	46.7
21/08/2022 07:00	38.0	31.4	41.7	48.9
21/08/2022 07:15	38.6	31.2	41.9	50.9
21/08/2022 07:30	39.8	32.7	42.3	55.4
21/08/2022 07:45	43.5	33.6	45.2	61.0
21/08/2022 08:00	40.5	33.0	44.8	50.3
21/08/2022 08:15	41.2	33.6	44.3	54.2
21/08/2022 08:30	40.3	33.2	42.9	54.3
21/08/2022 08:45	43.1	34.6	44.2	61.5
21/08/2022 09:00	49.6	35.2	50.6	68.5
21/08/2022 09:15	46.9	35.5	48.6	67.8
21/08/2022 09:30	41.2	32.8	42.1	62.1
21/08/2022 09:45	43.0	34.1	46.2	61.9
21/08/2022 10:00	50.0	35.7	48.6	68.7
21/08/2022 10:15	50.1	38.6	53.0	68.8
21/08/2022 10:30	43.8	37.3	46.3	56.7
21/08/2022 10:45	47.1	36.1	49.3	64.2
21/08/2022 11:00	49.4	36.7	49.0	69.2
21/08/2022 11:15	48.4	36.7	49.8	63.8
21/08/2022 11:30	50.0	39.3	51.4	66.8
21/08/2022 11:45	47.7	36.5	46.3	65.5
21/08/2022 12:00	46.6	38.8	49.5	62.3
21/08/2022 12:15	42.7	34.8	45.2	58.7
21/08/2022 12:30	50.0	36.4	50.3	68.5
21/08/2022 12:45	49.1	36.8	46.2	69.7
Overall (Daytime)	**45.4**	**34.1**	**44.8**	**69.7**

Start Time	$L_{Aeq,T}$, dB	L_{A90}, dB	L_{A10}, dB	L_{AFmax}, dB
20/08/2022 23:00	36.2	31.1	39.0	46.9
20/08/2022 23:15	36.4	31.2	39.1	48.1
20/08/2022 23:30	34.9	29.7	37.9	46.4
20/08/2022 23:45	34.2	28.4	36.3	47.3
21/08/2022 00:00	34.8	27.9	38.4	47.3
21/08/2022 00:15	37.6	27.8	41.2	55.3
21/08/2022 00:30	37.2	28.2	39.4	59.1
21/08/2022 00:45	32.6	26.8	35.6	45.2
21/08/2022 01:00	32.3	26.6	34.2	46.7
21/08/2022 01:15	31.6	26.5	34.6	47.2
21/08/2022 01:30	30.9	26.4	33.3	45.1
21/08/2022 01:45	31.5	27.3	33.7	39.4
21/08/2022 02:00	29.7	26.7	31.6	40.1
21/08/2022 02:15	32.8	27.7	34.0	50.3
21/08/2022 02:30	29.0	26.8	30.5	37.1
21/08/2022 02:45	29.3	26.8	30.8	41.8
21/08/2022 03:00	30.4	28.2	31.3	39.5
21/08/2022 03:15	31.9	24.4	30.3	52.1
21/08/2022 03:30	29.5	24.8	31.4	44.0
21/08/2022 03:45	29.6	27.3	31.1	36.3
21/08/2022 04:00	30.1	26.8	31.8	40.6
21/08/2022 04:15	29.4	26.7	31.5	37.2
21/08/2022 04:30	32.5	27.1	36.3	44.3
21/08/2022 04:45	31.4	27.7	34.0	42.9
21/08/2022 05:00	35.2	28.9	38.5	51.9
21/08/2022 05:15	39.6	30.5	43.0	51.6
21/08/2022 05:30	38.0	30.3	41.6	48.8
21/08/2022 05:45	40.9	31.4	40.8	61.1
21/08/2022 06:00	38.9	30.9	42.3	52.5
21/08/2022 06:15	44.6	31.8	44.9	62.9
21/08/2022 06:30	43.5	34.1	43.9	62.6
21/08/2022 06:45	44.6	34.4	48.0	59.6
Overall (Night-time)	**37.2**	**28.5**	**36.6**	**62.9**

Table A-3: The Homestead

Start Time	$L_{Aeq,T}$, dB	L_{A90}, dB	L_{A10}, dB	L_{AFmax}, dB
21/08/2022 10:00	57.2	35.3	56.3	79.5
21/08/2022 10:15	54.8	35.1	52.6	73.3
21/08/2022 10:30	51.0	34.0	42.1	72.8
21/08/2022 10:45	59.0	33.3	54.0	76.5
21/08/2022 11:00	57.7	34.2	47.4	81.6
21/08/2022 11:15	57.4	33.1	47.7	78.2
21/08/2022 11:30	53.6	34.3	51.4	73.9
21/08/2022 11:45	59.0	34.4	56.1	77.6
21/08/2022 12:00	55.5	35.1	57.4	75.2
21/08/2022 12:15	53.0	34.4	48.9	76.2
21/08/2022 12:30	57.4	33.6	60.3	73.6
21/08/2022 12:45	58.6	35.9	53.3	81.2
Overall (Daytime)	**56.8**	**34.4**	**52.3**	**81.6**
21/08/2022 01:00	27.9	22.8	29.8	45.3
21/08/2022 01:15	27.5	22.1	29.2	42.4
21/08/2022 01:30	40.7	23.5	39.7	60.1
21/08/2022 01:45	44.6	22.5	38.1	70.9
21/08/2022 02:00	28.0	23.6	30.2	40.7
21/08/2022 02:15	26.5	22.3	28.9	38.1
21/08/2022 02:30	32.1	21.8	26.2	56.0
21/08/2022 02:45	42.1	21.8	29.2	65.8
21/08/2022 03:00	36.7	22.2	30.8	58.8
21/08/2022 03:15	27.5	20.7	30.3	41.4
21/08/2022 03:30	29.3	21.0	31.2	46.4
21/08/2022 03:45	45.1	20.5	41.4	69.3
Overall (Night-time)	**39.2**	**22.1**	**32.1**	**70.9**

Appendix B – Noise Contour Plots

Figure B-1: Daytime Noise Contour Plot – 1.5m

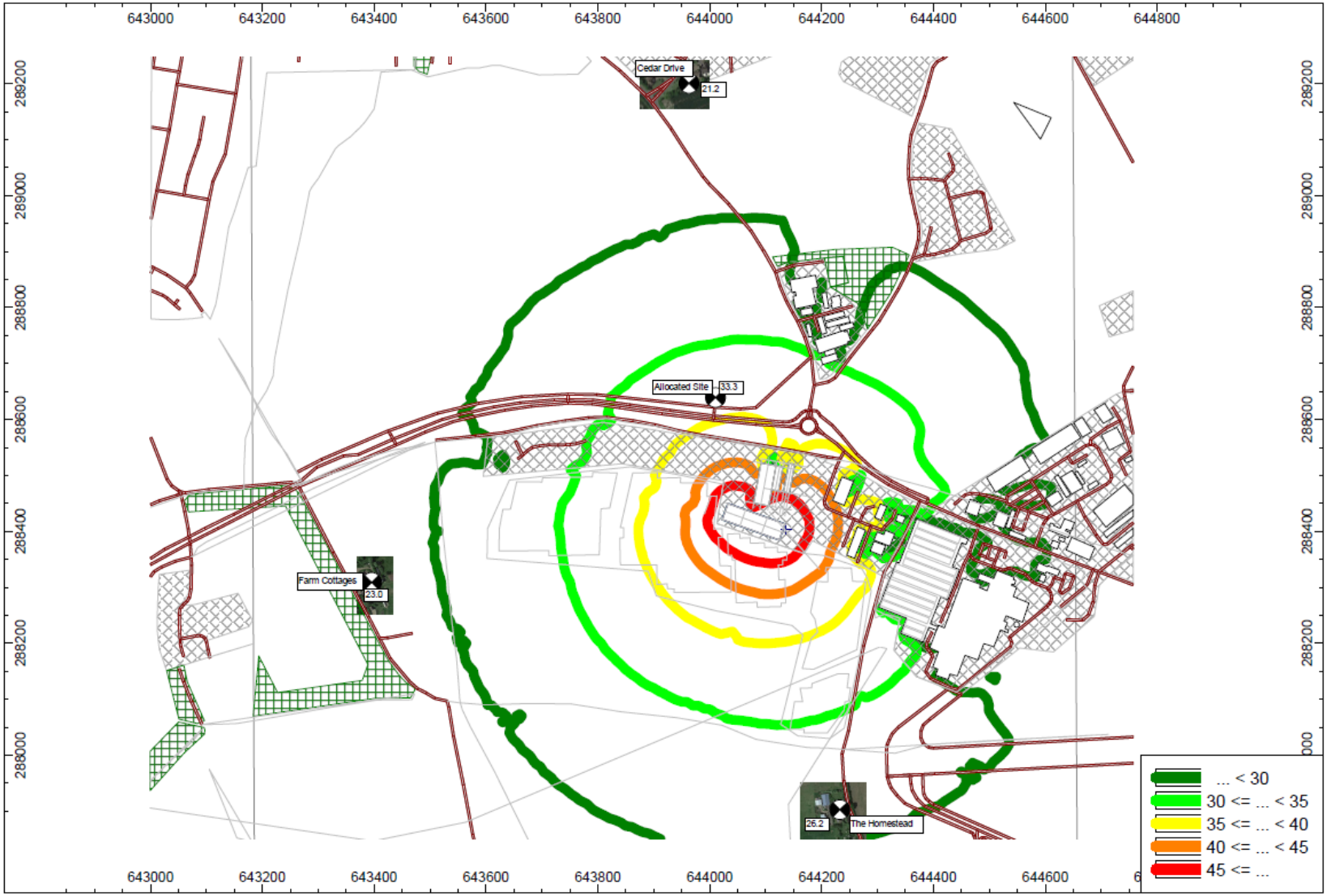
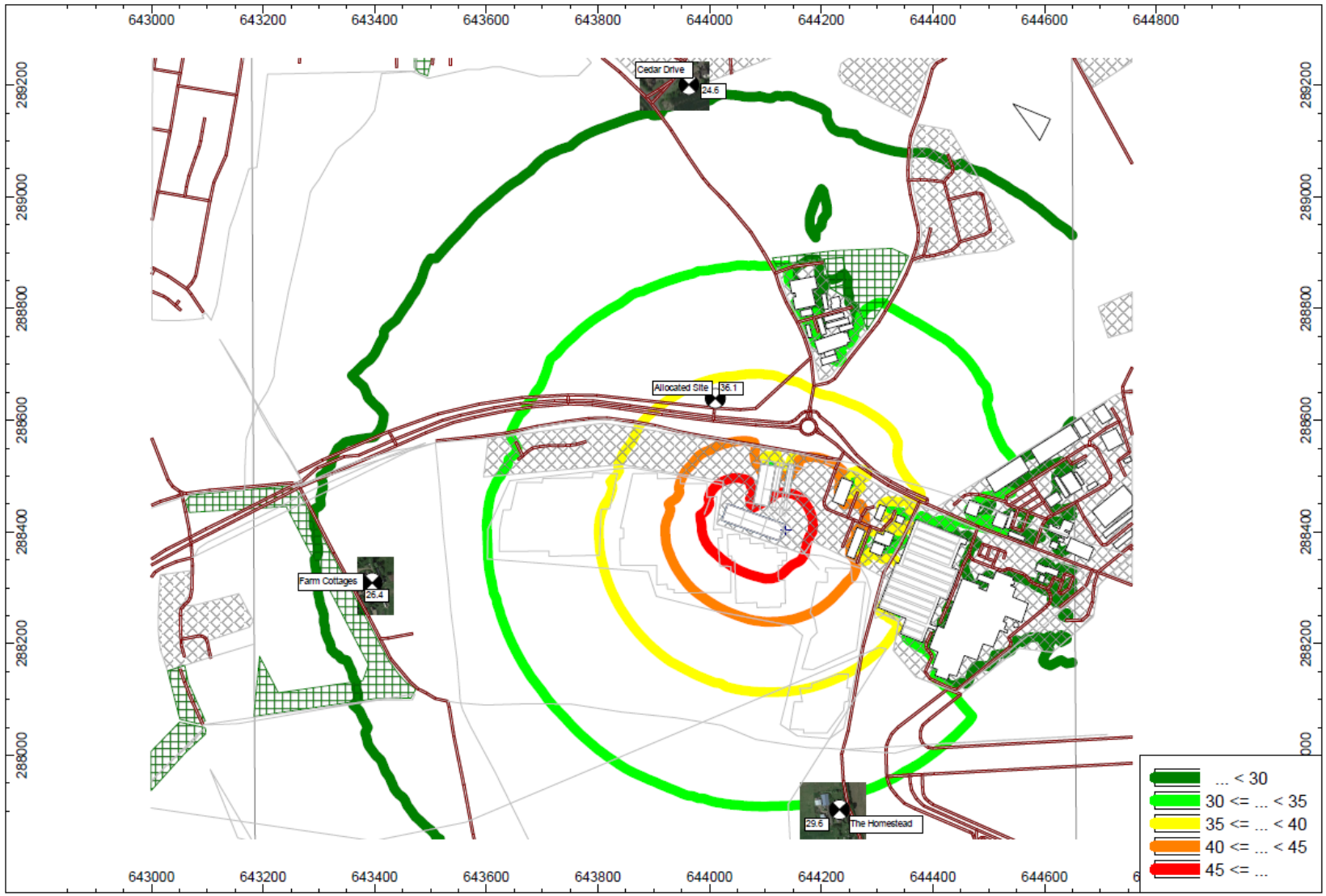


Figure B-2: Night-time Noise Contour Plot – 4.0m



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