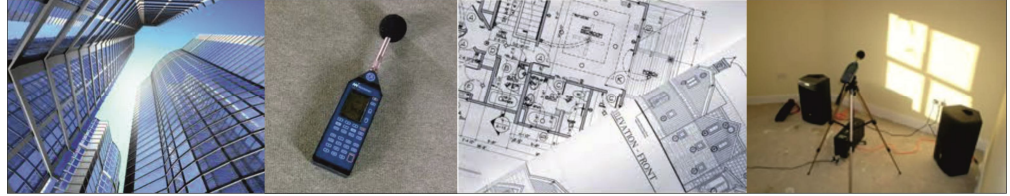


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RENEWABLE ENERGY GENERATION FACILITY PEBBLE HALL, THEDDINGWORTH

ADDENDUM CONSIDERING THE ACOUSTIC IMPACT ON HOTHORPE HALL ECO-LODGES

Client: **Carbonarius Limited**
Blythe House
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Cresswell
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Ref: M2744-ADD1-v1
7th April 2014

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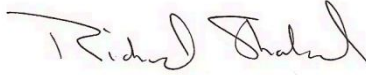
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Project Reference	M2744-ADD1
Issue No.	1
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Date	7th April 2014

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1. SUMMARY

- 1.1 An acoustic impact assessment has been undertaken at the site of a proposed Renewable Energy Generation Facility (REGF) at Pebble Hall, Theddingworth, Northamptonshire.
- 1.2 Ambient noise surveys have previously been undertaken around the site by the Walker Beak Mason Partnership, with further acoustic studies undertaken by Sound Barrier Solutions. The latter refers to a new Thermophilic Aerobic Digester plant on land adjacent to the REGF plant. Data from both reports have been adopted within this assessment.
- 1.3 Criteria of acceptability have been discussed for the night time periods, referencing the comparative targets of BS4142 and the absolute targets offered by BS8233 and WHO guidelines (Section 4).
- 1.4 Noise emissions from the likely plant have been considered, and calculations have predicted the levels of noise reaching the Eco Lodges set in the ground of Hothorpe Hall. The calculations detail specific assumptions regarding the acoustic integrity of the new building, and specific requirements for noise attenuation (Section 5.2)
- 1.5 An assessment of the predicted noise levels against the recommended criteria confirms that the residual noise at the residential properties will be within appropriate design criteria, (Section 6).
- 1.7 It is therefore concluded that operation of the REGF will have negligible impact of adjacent residential properties.
- 1.8 Section 7 of this report provides a brief comment on the cumulative impact of this proposal and a new Thermophilic Aerobic Digestion (TAD) facility on the same site. The analysis does indicate a modest increase in overall noise when the REGF plant noise is added to the TAD plant noise.
- 1.9 However, it is noted that the absolute levels remain comfortably below the BS8233 and WHO guidelines.

2. INTRODUCTION

- 2.1 A noise impact assessment has been undertaken at the site of a proposed development at Pebble Hall, near the village of Theddingworth, Northamptonshire (see Figure 1)
- 2.2 The site is situated in a largely agricultural area, some 500m off the A4304 Bosworth Road.
- 2.3 Over a number of years, the site has established a variety of industrial/commercial concerns and a waste management operation.
- 2.4 Figure 2 indicates the location of the new REGF amongst the existing buildings on the site. Figure 3 provides elevations of the proposed building.
- 2.5 In brief, the REGF recovers energy from the process of gasification. Wood is delivered to the open yard at the east end of the site, where it is shredded and stored. From here, it will be transferred into the REGF building for the generation of energy in a CHP ready plant. Some electricity will be used within the plant with the majority exported to the grid.
- 2.6 Through the process, there are a number of items of equipment which will each generate varying degrees of noise.
- 2.7 Whilst the area immediately around the site is agricultural, it is also noted that there are residential properties to the north, west and east of the development. These have been considered in a previous noise impact assessment and discussed in the ISL report Assessment of Environmental Impact, M2744-v5, dated 6th January 2014. This addendum report considers additional noise-sensitive properties, a group of "Eco-Lodges" set in the grounds of Hothorpe Hall.
- 2.8 As part of the formal Planning Application, it will be necessary to demonstrate to the Local Authority that the new plant may operate with no adverse impact on the existing residential neighbours.
- 2.9 The current assessment has therefore been commissioned to demonstrate how this aim may be met, and the formal objectives of the exercise may be summarised as follows:
 - (i) To discuss the existing ambient noise climate in the vicinity of the EcoLodges;
 - (ii) To predict noise levels due to operation of the proposed plant;
 - (iii) To assess the predicted levels in comparison with the existing noise climate and other relevant standards of acceptability;
 - (iv) To review the impact of additional site-related traffic on residential properties.
- 2.10 This report details the investigations carried out in respect of each of these objectives and summarises the conclusions which have been reached.

3. EXISTING NOISE CLIMATE

- 3.1 Figure 1 provides an aerial photograph of the development site, and indicates the proximity of the Eco-Lodges to the development site.
- 3.2 The existing noise climate has recently been established by the Walker Beak Mason Partnership. Their report 4169 "Pebble Hall Farm, Theddingworth - Noise Assessment" dated 28th May 2013, details noise measurements taken across four noise sensitive locations. A long terms survey was conducted at Pebble Hall Farm, and then additional measurements undertaken on the edge of the village of Husbands Bosworth, to the west of Woodside Farm, and on Hothorpe Road to the east.
- 3.3 Full details of the exercise were provided in Appendix C of the original ISL acoustic report dated 6th January 2014 (v.5).
- 3.4 A summary of the background noise levels from the surveys are provided in the table below:

Location	Minimum Background Level dB L _{A90} , 15 mins			
	Morning	Afternoon	Evening	Night
Hothorpe Road	41	37	35	20

- 3.5 A subsequent survey by Sound Barrier Solutions at Hothorpe Hall (rather than the Walker Beak Mason samples on the road close to the Quiet Fields lane¹) indicated a lower evening background noise level of 31 dB(A) LA90 (but the same night time minimum of 20 dB(A)). This lower evening figure will be adopted.
- 3.6 It is noted that the L_{A90} parameter is used in assessments of noise impact carried out under the guidance of BS4142, as described in Section 4 below. If the background levels are lower than 30 dB(A) LA90, the Standard indicates that the methodology may not be applicable. If it were suggested that evening or night time conditions at the Eco-Lodges were in fact lower than those reported above, it is confirmed that the situations would then be below this threshold, and BS4142 may not then be applicable.
- 3.7 Of course, it is possible that ambient noise conditions at the Eco-Lodges are similar or higher than those reported above. In that case, the assessments described below will be a pessimistic indication of the potential noise impact.

¹ It is noted that Blue Tree Acoustics, in their letter dated 9th September 2013, themselves suggested that 'background noise levels at Hothorpe Hall are likely to be similar' to those recorded by WBM on Hothorpe Road.

4. PLANNING POLICY & CRITERIA OF ACCEPTABILITY

4.1. National Planning Policy Framework

4.1.1 The recently introduced National Planning Policy Framework (March 2012) defines the Government's planning policies for England and how these are expected to be applied. It sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so. It provides a framework within which local people, and their answerable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

4.1.2 Section 123 states

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.*

4.1.3 The Framework states that the planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of noise pollution. It does not, however, provide any specific formal guidelines.

4.2. National Policy Statement for England

4.2.1 The document "Noise Policy Statement for England", referenced within the NPPF, sets out the following vision for on-going noise policy:

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

This vision should be achieved through the following Noise Policy Aims:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development: avoid significant adverse impacts on health and quality of life; mitigate and minimise adverse impacts on health and quality of life; and where possible, contribute to the improvement of health and quality of life".

4.2.2 To achieve these objectives the Noise Policy Statement sets out three noise levels to be defined by the assessor:

- **NOEL** - No Observed Effect Level
This is the level below which no effect can be detected. In simple terms, below this level there is no detectable effect on health and quality of life due to the noise.
- **LOAEL** - Lowest Observed Adverse Effect Level
This is the level above which adverse effects on health and quality of life can be detected.
- **SOAEL** - Significant Observed Adverse Effect Level
This is the level above which significant adverse effects on health and quality of life occur.

4.2.3 The Noise Policy Statement considers that noise levels above the SOAEL would be seen to have, by definition, significant adverse effects and would be considered unacceptable. Where the assessed noise levels fall between the LOAEL and the SOAEL noise levels, the Policy Statement requires that:

"all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development... .. This does not mean that such adverse effects cannot occur."

4.2.4 Where noise levels are below the LOAEL it is considered there will be no adverse effect. Once noise levels are below the NOEL there will be no observable change. No objective values are offered within the NPSE, as the document does indicated that each site should be considered on its own merits.

4.2.5 Guidance as to a numerical definition of LOAEL may therefore be given by the following Standards.

4.3 BS4142

4.3.1 The impact of commercial noise sources on existing residential properties is commonly judged using the methodology of British Standard 4142:1997 "Method for rating industrial noise affecting mixed residential and industrial areas".

4.3.2 In brief, this rating method determines "specific noise level" generated by the REGF, assessed immediately outside the residential properties most likely to be affected. The value may be measured, if the centre is operating, or calculated, if the centre is being designed. If the centre has equipment which is limited in its hours of operation, separate assessments may be made for the differing operating conditions. During the period 0700 -

2300, the assessment is made over the loudest 1 hour period. At night, the assessment period is limited to 5 minutes.

- 4.3.3 A correction of + 5 dB(A) is made to the "specific noise level" if the new noise is noticeably tonal in content or intermittent. The result of any such adjustment is then termed the "Rating Noise Level".
- 4.3.4 A comparison is then made between the Rating Noise Level and the ambient background noise level², at each location of interest and, if relevant, in each of the operating conditions.
- 4.3.5 If the Rating Noise Level exceeds the ambient background noise level by more than 10 dB(A), complaints are to be expected. An excess of 5 dB(A) is said to be "of marginal significance". If the Rating Noise Level is 10 dB below the ambient background noise level, this is a positive indication that complaints would not be expected.
- 4.3.6 It is likely that the Local Authority would seek to avoid marginal situations at the planning stage, and may try to ensure a positive likelihood that no complaints would be forthcoming. As such, they might recommend a noise target which limits the Rating Noise Level to a maximum which is as low as 10 dB(A) below the minimum background level currently experienced.
- 4.3.7 However, there are limitations to BS4142 if noise levels are very low, and in such circumstances, it may not be necessary to follow the normal guidance in order to achieve this aim. Indeed, within the Scope of the Standard, it is stated:

"The method is not suitable for assessing the noise measured inside buildings or when the background and rating noise levels are both very low.

Note: for the purpose of this Standard, background noise levels below about 30 dB and rating noise level below about 35 dB are considered to be very low."

- 4.3.8 It will be demonstrated later that noise levels in this instance are below both thresholds at night and therefore it is confirmed that the usual guidance of BS4142 is inapplicable here.

² That is the noise level which would prevail at that time and place, in the absence of any noise from the new plant under consideration. The background noise is normally measured and described as the L_{A90} parameter

4.4 BS8233

- 4.4.1 Where as BS4142 provides an assessment of impact by comparing the new noise to the current conditions, BS8233:1999 'Sound insulation in buildings, a code of practice' provides guidance on absolute conditions of acceptability within residential properties.
- 4.4.2 The table below summarises the recommended limits for living rooms during the day time and bedrooms at night. The guidance is given in terms of a range, covering a 'good' standard and a 'reasonable' standard.

Room	Recommended Limit Internally
Living Rooms	30 - 40 dB(A) $L_{Aeq,t}$
Bedrooms	30 - 35 dB(A) $L_{Aeq,t}$

- 4.4.3 It is usually taken that, if a bedroom or living room window is ajar, the difference in noise level inside the room and immediately outside would be some 10 - 15 dB(A). This would imply that the equivalent limits externally would be as follows:

Room	Recommended Limit at Affected Facades
Living Rooms	40 - 50 dB(A) $L_{Aeq,t}$
Bedrooms	40 - 45 dB(A) $L_{Aeq,t}$

- 4.4.4 It is noted that the day time criterion for living rooms compares closely with that derived from the methodology of BS4142. The night time criterion above is somewhat higher than that derived from BS4142, and it would therefore be good practice to demonstrate a predicted noise level which is closer to the BS4142 derived target.

4.5 World Health Organisation Guidelines

- 4.5.1 Further advice is provided in the 1999 WHO report "Guidelines for Community Noise"
- 4.5.2 This indicates that the steady noise level in external amenity areas, such as gardens or outdoor living areas should not exceed 55 dB(A) $L_{Aeq,t}$, and should preferably be designed below 50 dB(A) $L_{Aeq,t}$.

5. PREDICTION OF EXTERNAL NOISE LEVELS

5.1 Plant Schedule

5.1.1 Final details of the proposed plant are to be confirmed. To provide an indication of the ability to meet the recommended noise targets, the table lists the equipment which is likely to be incorporated within the new building, alongside the likely noise levels and location.

5.1.2 A similar plant, located in Birmingham, has recently been designed and, where equivalent equipment is to be used here, noise levels from that site have been quoted below. Where equipment differs, the manufacturers' data is quoted:

Noise Source	Assumed Plant, Location and relevant means of attenuation	Typical Noise Rating
Telehandler / Wood Shredder	Located in Wood Processing Area . Conveyor limited to 70 dB(A)@1m	Measured Levels within a reception hall, 78 - 80 dB(A).
Separation Equipment	Main gas-fans, Gardner Denver 2BH19107HD36-Z fans. On the south-east elevation, there may be personnel doors, and on the north-west elevation, two standard roller shutter doors.	Gas fans rated at 84 dB(A) @1m each. Measured levels of typically 80 - 85 dB(A) through the area.
Boiler Room	South end of the main process building, containing main boilers and associated combustion fans	Boiler rated at 85 dB(A) @1m, Combustion fans est. at 84 dB(A) @1m
Turbine Room	Located adjacent to the south end of the main process building, containing the turbines, gearboxes etc	General area noise levels of 85 dB(A)
Main ID Fan	Woodcock & Wilson backward curved aerofoil centrifugal fan. Note, exhaust will run through a catalytic converter and exhaust silencer before leaving the stack	Overall sound power 116 dBW. Break-out SPL, 75 dB(A) @1m
Dry Air Coolers	Two sets of AIACALC VX2 Dry air coolers, located externally at the south end of the building.	66 dB(A) @10m each
Compressors	In separate compressor plant room, with acoustic louvres to north-west elevation of building.	2 Units, each at 67 dB(A)
Air Cooled Condensers	Located externally at south end of the main process building	6-Fan system incorporating Cofimco 4m diameter fans. 90 SWA attenuated down to 70 dB(A) @1m
Extract Fans/AHUs	Ventilation plant to be confirmed	

5.2 Confirmation of Noise Control Measures

- 5.2.1 The walls and roof of the new buildings will be constructed with composite panels, such as the Kingspan KS1000 Rw or acoustically equivalent similar product. In the main hall, the walls and roof will be lined with a 12.5kg/m² mass barrier board, set on sheeting rails. These will create a void of nominally 100mm, into which there will be installed 50mm insulation slabs.
- 5.2.2 External access doors to all process areas should as a default be specified to the rated at Rw 30 dB (inferring a solid core leaf, set into a rebated timber frame, with acoustic seals to the perimeter). Roller shutter doors will be a standard construction, with nominal acoustic performance only.
- 5.2.3 The Dry Air Coolers are selected with a nominal sound pressure level of 66 dB(A) @10m. An acoustic package or other treatment will need to be designed, to provide an attenuation of 15 dB on this figure.
- 5.2.4 The main stack will require an in-line attenuator, and the required performance of this is quoted in the calculations shown in Appendix 1.
- 5.2.5 The Air Cooled Condensers are specified with an overall sound power level of 90 dB(A) L_w (from the six fans operating together). An acoustic package or other treatment will need to be designed, to provide an attenuation of 10 dB on this figure.
- 5.2.6 Roof extracts AHU's and main Supply AHU's have yet to be designed. These fans will be suitable for attenuation by means of atmospheric side silencing. The calculations of Appendix A define that the sum total of noise from these units will be limited to 23 dB(A) at each residential property.

5.3 Predicted Noise Levels

- 5.3.1 Appendix B details a calculation for the noise transmission from each area of the development to the nearest residential locations. The table below summarises the predicted façade levels during day time and night time conditions (with no external loading activity taking place overnight):

<i>Location</i>	<i>Predicted Façade Noise Level Day Time L_{Aeq}, 5 mins</i>	<i>Predicted Façade Noise Level Night Time L_{Aeq}, 5 mins</i>
Hothorpe Hall Eco-Lodges	29	26

6. ASSESSMENT OF PREDICTED NOISE LEVELS

6.1 BS4142

6.1.1 The table assesses the predicted noise levels against the methodology of BS4142:

Location	Predicted Day Time Façade Noise Level L_{Aeq}	Predicted Night Time Façade Noise Level L_{Aeq}
<i>Specific Noise Level</i>	29	26
<i>Tonal Correction</i> ³	+0	+0
<i>Rating Noise Level</i>	29	26
<i>Min Background Noise Level</i>	30	20
<i>Rating</i>	-1	+6

6.1.2 Given the levels of Specific Noise Level during both day time operation and night time operation, and the and minimum Background Noise Level during both periods, it is confirmed that BS4142 is not a valid means of assessing the noise impact.

6.1.3 That notwithstanding, the numerical Rating would still indicate that the night time situation would be of marginal significance, and that the day time situation would have less impact still.

6.1.4 The following paragraphs will confirm that, in absolute terms, the noise levels at this location (and indeed the others) will be quite acceptable.

6.2 BS8233

6.2.1 The table below summarises the predicted noise levels, alongside the recommended limits from BS8233 for noise levels outside living rooms and bedrooms:

Location	Predicted Day Time Façade Noise Level $dB(A) L_{Aeq}$	Predicted Night Time Façade Noise Level $dB(A) L_{Aeq}$
BS8233 Recommendation	<40 – 50	<40 – 45
Holthorpe Hall Eco-Lodges	29	26

6.2.2 It can be seen immediately that the predicted noise levels during the day and the night are significantly better than the 'Good' standard set out in BS8233. This difference would subjectively be very noticeable, approaching a condition one-half as loud as the threshold value.

³ Measurements from a similar process in Stoke on Trent and manufacturer's data do not indicate a likelihood of tonal elements. The developer confirms, however, that in the event of any tonal noise being observed during commissioning, attenuation works will be carried out to eliminate the tonal contribution and/or to reduce the emitted noise by 5 dB(A).

6.3 WHO Guidelines

6.3.1 The table below summarises the predicted noise levels, alongside the recommended limits from the WHO for external noise levels in amenity space:

<i>Location</i>	<i>Predicted External Level dB(A) L_{Aeq}</i>
<i>WHO Guideline Value</i>	<i><50 - 55</i>
Hothorpe Road Eco-Lodges	29

6.3.2 Again, it can be seen that the predicted noise levels are significantly lower than the recommended limits

7. CUMULATIVE IMPACT ASSESSMENT

- 7.1 It is understood that a TAD plant is proposed for an adjoining site within the Pebble Hall complex, the location of which can be seen in Figure 2. A formal assessment of noise from this development is contained within the Walker Beak Mason report appended to this study.
- 7.2 This work has subsequently been developed by Sound Barrier Solutions Limited. Their report "Environmental Noise Barrier Design Study, Thermophilic Aerobic Digester, Pebble Hall Farm" provides details of predicted noise emanating from the TAD plant.
- 7.3 The tables below indicate the predicted day time and night time noise levels from each development, along with the combined noise level.

Location	Predicted Day Time Façade Noise Levels L_{Aeq}, 16 hrs		
	<i>REGF Development⁴</i>	<i>TAD Development</i>	<i>Combined</i>
Hothorpe Hall Eco-Lodges	29	30	33
Location	Predicted Night Time Façade Noise Level L_{Aeq}, 8 hrs		
	<i>REGF Development</i>	<i>TAD Development</i>	<i>Combined</i>
Hothorpe Hall Eco-Lodges	26	24	28

- 7.4 During the day, the cumulative noise would be 3 dB above the noise from the TAD alone. However, it is noted that the combined noise level would remain significantly below the limits of BS8233 and the WHO guidelines, as described earlier in Paragraphs 6.2 & 6.3.
- 7.5 At night, the effect of the second development will be an increase in noise level of some 4 dB over the first development. However, it is again the case that the absolute levels would be well within the guidelines of BS8233 and the WHO report, and sufficiently low that BS4142 would not apply.

⁴ Including the additional noise of REGF related vehicle movements.

8. CONCLUSIONS

- 8.1 The assessment above has considered the impact of noise from the proposed REGF, and demonstrated that residual noise levels at the Eco-Lodges at Hothorpe Hall will be below the British Standard and WHO guidelines.
- 8.3 Finally, in respect of the cumulative impact of the REGF and TAD developments, it is confirmed that the development of the REGF would have marginal impact over the noise from the TAD development.

Figure 1 - Location Plan



Figure 2 - Site Layout

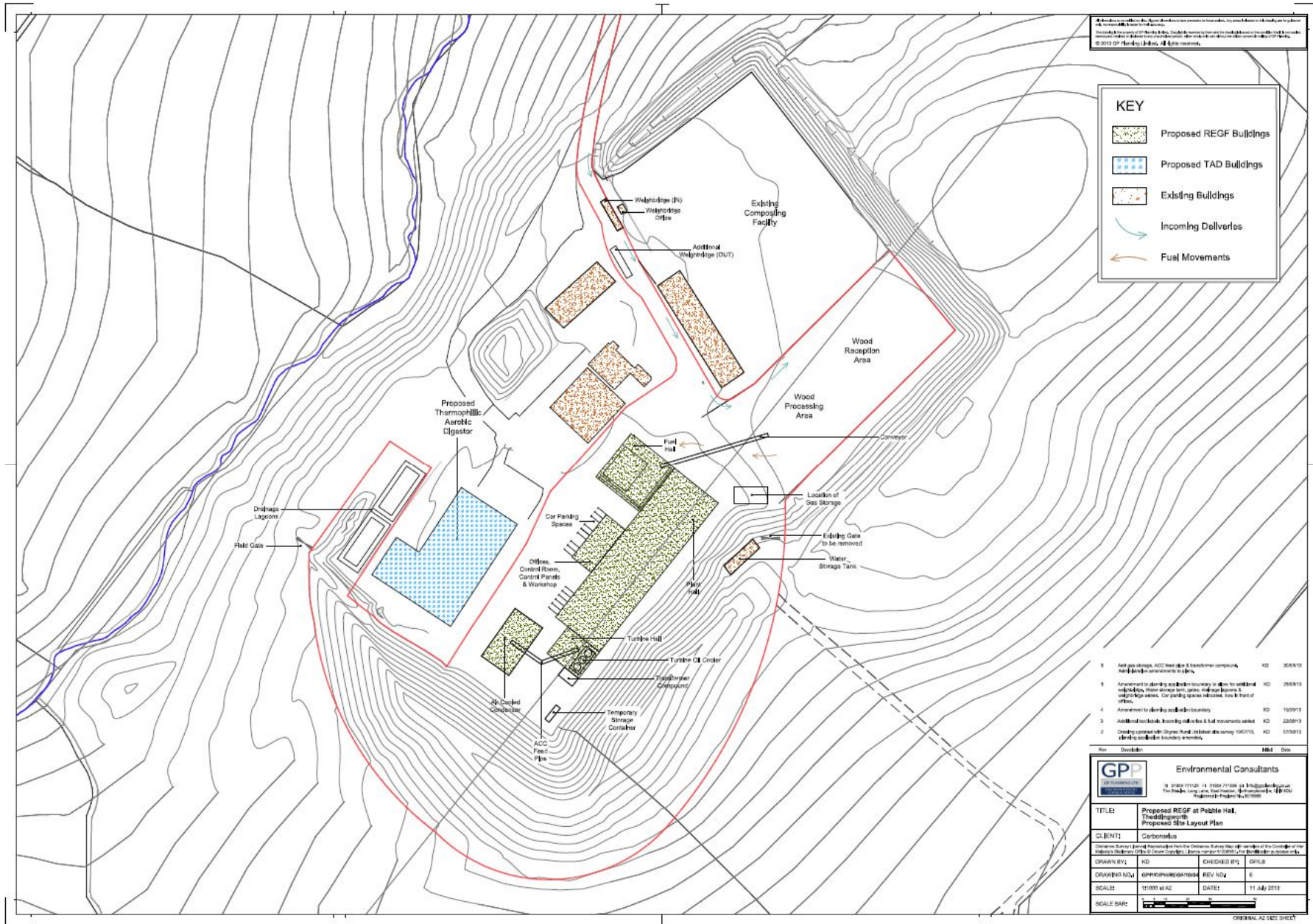
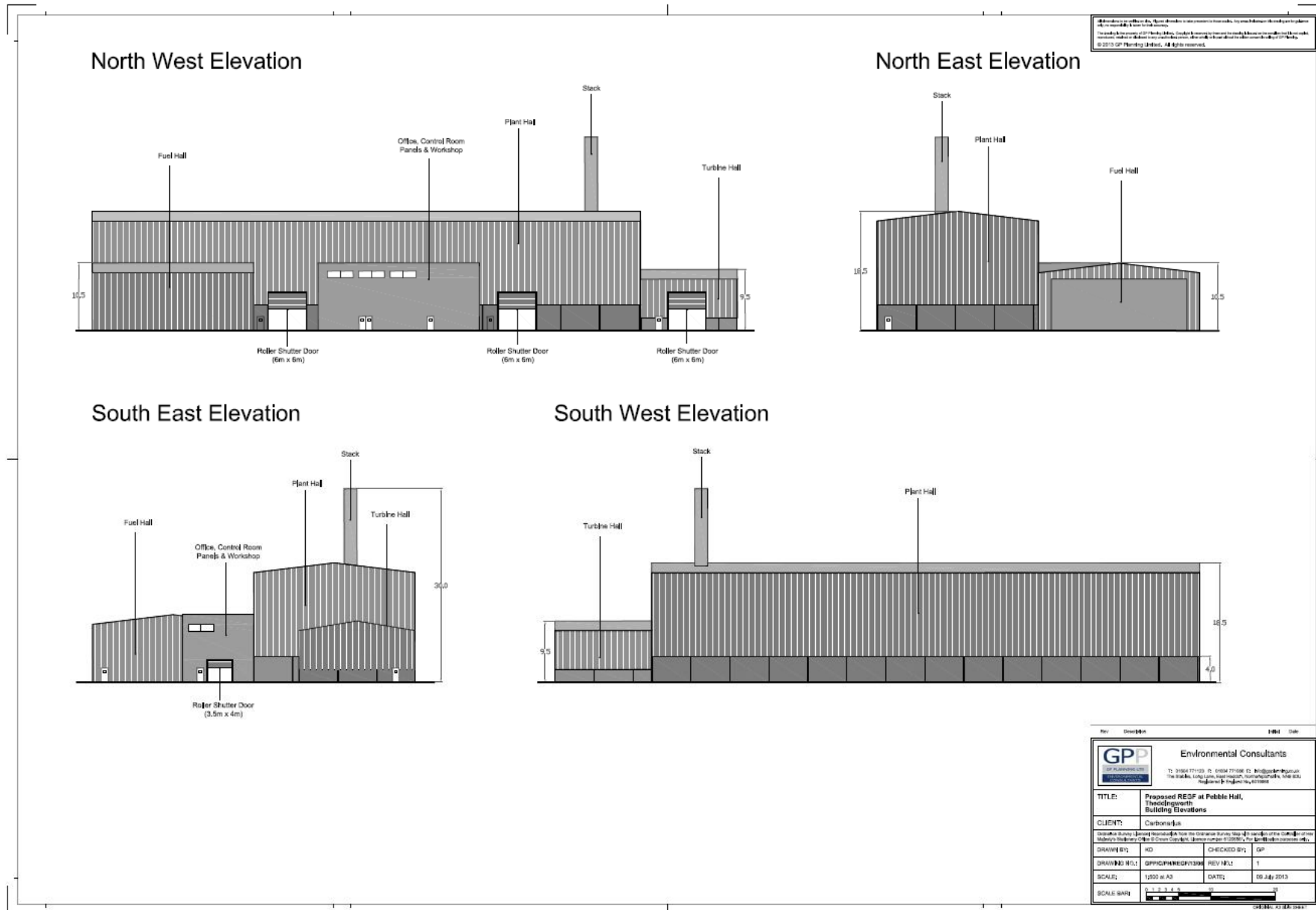


Figure 3 - Proposed Elevations



APPENDIX A - GLOSSARY OF TERMS

dB	Decibel: a logarithmic scale applied to acoustic units such as sound pressure and sound power. Decibels are always the ratio between two numbers. Sound Pressure in Pascals becomes "Sound Pressure Level re 2×10^{-5} Pa" in decibels. Sound Power in watts becomes "Sound Power Level re 10^{-12} W" in decibels. It is also used for sound reduction or sound insulation and is the ratio of the amount of sound energy incident upon a partition and the proportion of that energy which passes through the partition. The result is stated as a "decibel reduction".
dB(A) A-weighting:	This is an electronic filter which attenuates sound levels at some frequencies relative to the sound levels at other frequencies. The weighting is designed to produce the relative response of a human ear to sound at different frequencies. The A-weighted sound level is therefore a measure of the subjective loudness of sound rather than physical amplitude. A-weighting is used extensively and is denoted by the subscript A as in L_{A90} , L_{Aeq} etc. (Levels given without the subscript A are linear sound levels without the A-weighting applied, e. g. L_{90} , L_{eq} etc.).
$L_{Aeq,T}$	The "A" weighted equivalent continuous sound pressure level. This may be thought of as the "average" sound level over a given time "T". It is used for assessing noise from various sources: industrial and commercial premises, construction sites, railways and other intermittent noises.
$L_{A90,T}$	The "A" weighted sound pressure level that is exceeded for 90% of the time T. It reflects the quiet periods during that time and is often referred to as the "background noise level". It is used for setting noise emission limits for industrial and commercial premises.
L_{Amax}	The maximum "A" weighted sound pressure level during a given time on fast or slow response.
L_{Ae}	The sound exposure level, SEL, is an L_{eq} normalised to 1 second. It can therefore be used to compare the energy of noise events which have different time durations
R	Is the sound reduction index of a construction element in octave or 1/3 octaves and can only be measured in a laboratory. There must be no flanking transmission.
R _w	To get the weighted sound reduction index (R _w) of a construction, the R values are measured in octave or 1/3 octave bands covering the range of 100Hz to 3150Hz. The curve is adjusted so that the unfavourable deviation (or shortfall of the actual measurements below this standard curve) averaged over all the octave or 1/3 octave bands is not greater than 2dB. The value of the curve at 500Hz is the R _w

APPENDIX B - CALCULATED NOISE LEVELS FROM THE PROPOSED TRRC

1. Noise transmission to Hothorpe Hall Eco Lodges											
Frequency		Hz	63	125	250	500	1000	2000	4000	8000	dB(A)
Wood Reception/Processing Areas											
Typical SPL @1m			73	71	75	78	76	72	67	60	80
D to receiver	780m	dB	-58	-58	-58	-58	-58	-58	-58	-58	
Façade Reflection		dB	3	3	3	3	3	3	3	3	
Net SPL at receiving position		dB	18	16	20	23	21	17	12	5	25
Total SPL at receiving position due to External Areas											
		dB	18	16	20	23	21	17	12	5	25
Frequency											
		Hz	63	125	250	500	1000	2000	4000	8000	dB(A)
Main Process Hall & Plant Room											
Gasifiers/Separators/Conveyors/Boilers/Compressors											
SPL in main hall			75	77	80	83	80	76	76	71	85
Roof											
Area of Roof	85*25m2	dB	33	33	33	33	33	33	33	33	
SRI Composite Cladding	Kingsan KS1000 RW + I + L	dB	-13	-14	-29	-38	-40	-45	-55	-55	
Directivity		dB	-14	-14	-14	-14	-14	-14	-14	-14	
D to receiver	825m	dB	-58	-58	-58	-58	-58	-58	-58	-58	
Façade Reflection		dB	3	3	3	3	3	3	3	3	
Net SPL at receiving position		dB	26	27	15	9	4	-5	-15	-20	14
Roller Shutter Doors on North-West Elevation											
Area of Doors	72m2	dB	19	19	19	19	19	19	19	19	
SRI Rw Roller Shutter Door		dB	-8	-13	-15	-16	-17	-18	-20	-15	
Directivity		dB	-14	-14	-14	-14	-14	-14	-14	-14	
D to receiver	825m	dB	-58	-58	-58	-58	-58	-58	-58	-58	
Façade Reflection		dB	3	3	3	3	3	3	3	3	
Net SPL at receiving position			16	13	14	16	12	7	5	5	17
Walls											
Area of NW & NE elevations	18mH x 85+25	dB	33	33	33	33	33	33	33	33	
SRI Composite Cladding	Kingsan KS1000 RW + I + L	dB	-13	-14	-29	-38	-40	-45	-55	-55	
Directivity		dB	-14	-14	-14	-14	-14	-14	-14	-14	
D to receiver	785m	dB	-58	-58	-58	-58	-58	-58	-58	-58	
Self Shielding of Building		dB	0	0	0	0	0	0	0	0	
Façade Reflection		dB	3	3	3	3	3	3	3	3	
Net SPL at receiving position			26	27	15	9	4	-5	-15	-20	14
Total SPL at receiving position due to Main process hall break-											
		dB	29	30	20	18	13	8	5	5	20
DRY AIR COOLERS											
Sound Pressure Level @10m		dB	74	69	69	65	60	54	49	39	66
2 No. Systems		dB	3	3	3	3	3	3	3	3	
D Correction	825m	dB	-58	-58	-58	-58	-58	-58	-58	-58	
Acoustic Package/Enclosure		dB	-15	-15	-15	-15	-15	-15	-15	-15	
Screening of new and existing buildings		dB	0	0	0	0	0	0	0	0	
Façade Relection		dB	3	3	3	3	3	3	3	3	
Net SPL at receiving position due to Dry Air Coolers		dB	7	2	2	-2	-7	-13	-18	-28	-1

1. Noise transmission to Hothorpe Hall Eco Lodges (Contd)											
Frequency		Hz	63	125	250	500	1000	2000	4000	8000	dB(A)
TURBINE ROOM											
SPL in Turbine Room		dB	72	78	81	83	80	78	75	73	85
Doors on NW Elevation											
Area of Doors	36m2	dB	16	16	16	16	16	16	16	16	
SRI Rw Roller Shutter Door		dB	-8	-13	-15	-16	-17	-18	-20	-15	
Directivity		dB	-14	-14	-14	-14	-14	-14	-14	-14	
D to receiver	865m	dB	-59	-59	-59	-59	-59	-59	-59	-59	
Self-shielding of Reception Hall		dB	-10	-10	-10	-10	-10	-10	-10	-10	
Façade Reflection		dB	3	3	3	3	3	3	3	3	
Net SPL at receiving position			0	1	2	3	-1	-4	-9	-6	4
Walls											
Area of SW Elevation	15*9	dB	21	21	21	21	21	21	21	21	
SRI Composite Cladding	Kinspan KS1000 RW	dB	-20	-18	-20	-24	-20	-29	-39	-47	
Directivity		dB	-14	-14	-14	-14	-14	-14	-14	-14	
D to receiver	865m	dB	-59	-59	-59	-59	-59	-59	-59	-59	
Self-shielding of Reception Hall		dB	0	0	0	0	0	0	0	0	
Façade Reflection		dB	3	3	3	3	3	3	3	3	
Net SPL at receiving position			4	12	13	11	12	1	-12	-22	14
Roof											
Area over Turbine Room	15*18	dB	24	24	24	24	24	24	24	24	
SRI Composite Cladding	Kinspan KS1000 RW	dB	-20	-18	-20	-24	-20	-29	-39	-47	
Directivity		dB	-14	-14	-14	-14	-14	-14	-14	-14	
D to receiver	840m	dB	-58	-58	-58	-58	-58	-58	-58	-58	
Self-shielding of Reception Hall		dB	-5	-5	-5	-5	-5	-5	-5	-5	
Facade Correction		dB	3	3	3	3	3	3	3	3	
Net SPL at receiving position		dB	2	10	11	9	10	-1	-14	-24	12
Total SPL at receiving position due to Turbine Room											
		dB	7	14	15	13	14	4	-7	-6	16
STACK NOISE											
SWL of Fan		dB	120	118	115	113	111	108	105	102	116
Directivity		dB	-8	-8	-8	-8	-8	-8	-8	-8	
D Correction	900m	dB	-59	-59	-59	-59	-59	-59	-59	-59	
Acoustic Loss of Cataylst		dB	-5	-9	-13	-18	-25	-35	-54	-55	
Proposed Silencer Performance		dB	-12	-23	-40	-55	-55	-55	-55	-47	
Façade Reflection		dB	3	3	3	3	3	3	3	3	
Net SPL at receiving position due to main Stack		dB	39	22	-2	-24	-33	-46	-68	-64	14
AIR COOLED CONDENSERS											
FAN SPL@1m	Assumed spectrum	dB	73	75	71	68	65	57	53	49	70
D to receiver	825m	dB	-58	-58	-58	-58	-58	-58	-58	-58	
Screening of Adajcent Factory Building		dB	0	0	0	0	0	0	0	0	
Façade Reflection		dB	3	3	3	3	3	3	3	3	
Net SPL at receiving position due to Air Cooled Condensers		dB	17	19	15	12	9	1	-3	-7	14
VENTILATION PLANT											
No knowledge of Ventilation plant at, set limit of 23 dB(A) (NR13)											
Total Noise at Receiving Position from Ventilation Plant											
		dB	44	32	23	17	13	9	8	5	23
CUMULATIVE NOISE PREDICTION DAY TIME											
		dB	45	35	27	25	23	18	14	10	29
CUMULATIVE NOISE PREDICTION NIGHT TIME											
		dB	45	35	26	22	19	12	10	8	26