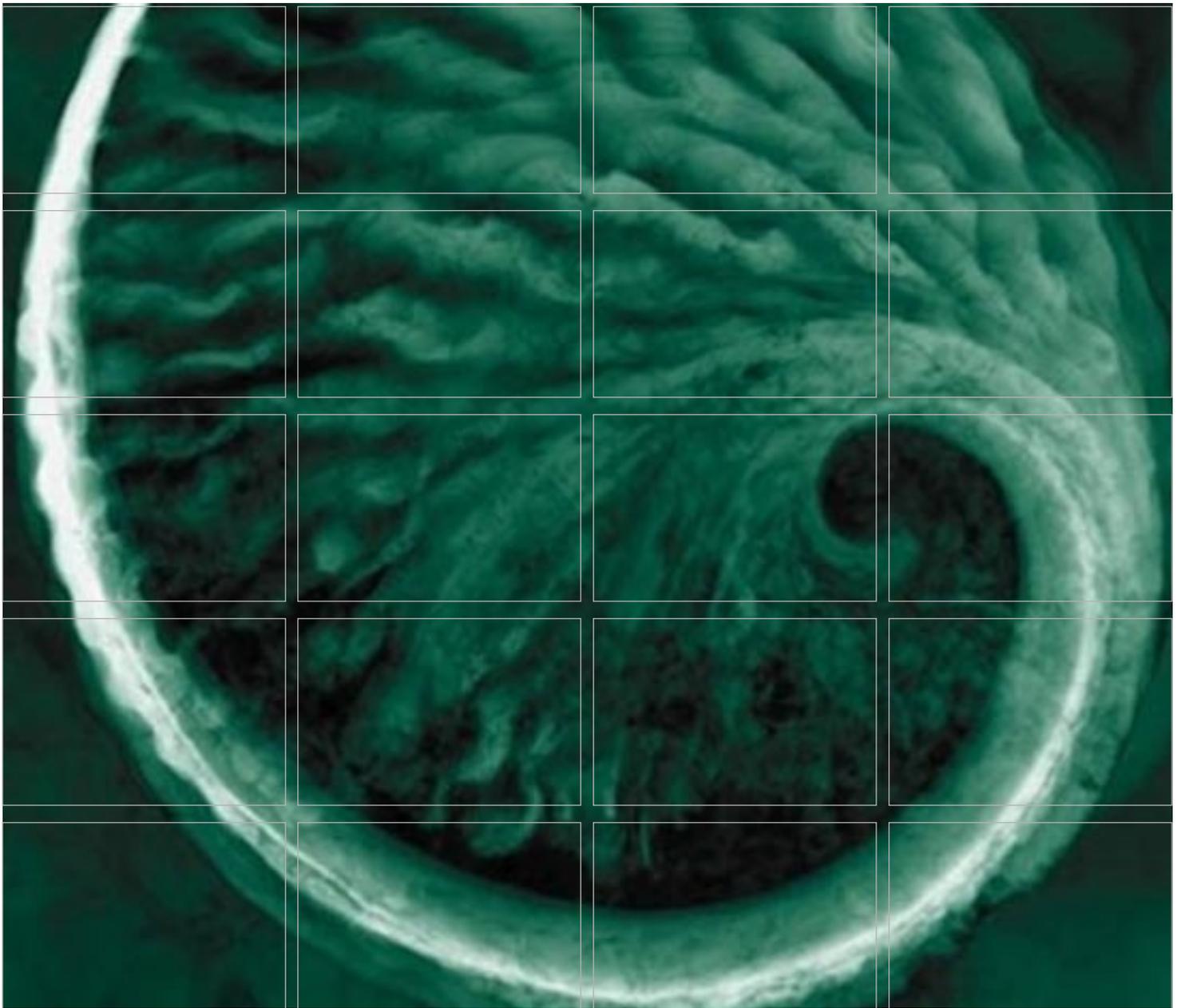


Q4.12 - APPENDIX 1 - ANALYSIS OF THE IMPLICATION OF THE REVISED BS 4142 STANDARD



The White Rose CCS Project

Analysis of the Implication of the Revised BS 4142 Standard in terms of the Operational Noise Model

May 2015

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*Analysis of the Implication of the
Revised BS 4142 Standard in terms of
the Operational Noise Model*

May 2015

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The assessment of operational noise carried out in the *Noise and Vibration Technical Report* ⁽¹⁾ for the White Rose Carbon Capture and Storage (CCS) Project (*The Project*) was based on the version of BS 4142 ⁽²⁾ which was current at the time that discussions were held with Selby District Council regarding the criteria for the noise assessment. The White Rose CCS Project DCO (with ES) was submitted on 24th November 2014, although technical assessment work for the Environmental Impact Assessment was completed substantially before this date. However on 31st October a revised BS 4142 ⁽³⁾ was published. In light of the revised BS it is worthwhile reviewing any changes in the way that sound is assessed using this standard, and whether any of the changes are material in the context of the noise assessment reported for White Rose CCS Project.

This note describes the implications of revisions to BS 4142 for the daytime and night-time noise assessments that are presented in the *Technical Report*.

The main revisions that could affect the assessment according to BS 4142 are:

- treatment of uncertainty has been added;
- lower cut-off of baseline noise levels (and lower limit on assessment criteria) have been removed;
- tonality and other acoustic feature corrections have been revised;
- new definitions of impact significance have been provided; and
- the need to consider the context of any noise changes including absolute noise levels has been specifically added.

Section 2 provides a comparison of the aspects listed above for the two assessments. *Section 3* compares the assessment results for the two versions of the standards.

(1) PINS Ref: EN10048

(2) BS4142: 1997 Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas, BSI, 1997.

(3) BS4142: 2014 Methods for Rating and Assessing Industrial and Commercial Sound

Table 2.1 contains a comparison of our approach to key assessment aspects. This is carried out for the BS4142: 1997 and BS4142: 2014.

Table 2.1 *Comparison of Approaches in BS4142*

Aspect of Noise Assessment	Approach in BS4142: 1997	Approach in BS4142: 2014	Change
Treatment of uncertainty	Included in cautious approach to modelling data and baseline noise	Included in cautious approach to modelling data and baseline noise	No change
Lower cut-off of baseline noise levels	Applied at night at receptors 1,4,6,7 and 8.	Lower cut-off not applied at night at any receptors. May result in greater difference between L_{A90} and rating level.	BS4142: 2014 is potentially more stringent in this respect at night. However, impacts are still subject to context check (see below), and it is the consideration of the noise relative to the absolute night-time criterion (45 dB $L_{Aeq, 8 hr}$) which determines the noise impact rather than the difference between L_{A90} and rating level. The lower limit is not triggered during the day, and so has no effect in this case.
Revised tonality and other acoustic feature corrections	None applied	None applied	No change, since a correction has not been applied. BS4142: 2014 would potentially be more stringent if it was necessary, but CPL has committed to design procedures that will ensure that tonal noise or other acoustic features are not associated with the Project (see the <i>Technical Report</i>).
New definitions of impact significance. (All noise levels represent the difference between L_{A90} and rating level.)	+ 5 dB described as "marginal significance" and impacts generally considered significant above this level. +10 dB "indicates complaints are likely" These were core elements of the assessment in BS4142: 1997 and would	+ 5 dB to < 10 dB considered "adverse impact" subject to context including absolute noise levels. +10 or above, "significant adverse impact" The above margins are described as initial estimates of impact, and	BS4142: 2014 is potentially less stringent because "significant" noise impacts occur at (5 dB) higher difference. This is counteracted to some extent by the loss of the lower cut-off of baseline noise levels (discussed in row 2). The effect of this is up to 4 dB at receptors except

Aspect of Noise Assessment	Approach in BS4142: 1997	Approach in BS4142: 2014	Change
	tend to determine the conclusion of the assessment. However, experienced practitioners also referred to a broader range of standards including absolute sound level guidance in BS8233.	the need to consider context is a central part of the standard. The need to consider absolute noise levels and BS8233 is directly referenced in this respect.	Receptor 4 – Barlow where the noise level is 6 dB below 30 dB at night. Therefore, at most receptors the new standard is less stringent. At Barlow the BS4142: 2014 version would be potentially 1 dB more stringent. However, both the assessment in the <i>Technical Report</i> and an assessment under the revised BS 4142 would reference BS8233 which ultimately provides the context on which the impact is determined in both cases (see below).
Consideration of context including absolute noise levels	Although not actually specified by BS4142: 1997, absolute levels in BS 8233 have been used to put the noise from the site into context.	As implicitly required by BS4142: 2014, absolute levels in BS 8233 have been used to put the noise from the site into context.	No change, and the specific reference in BS 4142 2014 to taking the façade noise insulation into account when considering the context of sound validates the approach that was taken in the <i>Technical Report</i> .

3.1 INTRODUCTION

The following Sections show the results of the assessment of operational sound. *Section 3.2* describes the results using BS4142: 1997 and *Section 3.3* describes the results using BS4142: 2014.

3.2 BS4142: 1997

The *Technical Report* summarised the differences between the adopted baseline and the predicted Rating Level as shown in *Figure 3.1*.

Figure 3.1 *Summary of Sound Level Changes from Technical Report*

Table 4.2 *Operational Noise Level Predictions and Assessment (BS4142 Criteria)*

	Monitoring /Prediction Location	Predicted Noise Level dB L _{A90}		Adopted Background L _{A90} for BS4142 Assessment		Exceedance of L _{A90} BS4142 Assessment	
		Day	Night	Day	Night	Day	Night
1	Foreman's Cottage	49	47	35	30	14	17
2	Wren Hall (equivalent to Carr Lane)	39	38	35	35	4	3
3	Camblesforth	35	34	43 to 46	40	-8 to -11	-5
4	Barlow	40	40	35 to 41	30	+5 to -1	10
5	Drax Abbey Farm	46	45	36	32	10	13
6	Long Drax	35	35	32	30	3	5
7	Old Lodge	37	37	32	30	5	7
8	Landing Lane	37	37	32	30	5	7

The 1997 version of BS 4142 does not include guidance on considering the absolute sound level as part of the assessment. However, the assessment carried out does go on to consider this aspect as noted in *Table 3.1* in accordance with good practice and professional judgement. *Table 3.1* summarises the impacts taking this into account.

(The term “low” has been used to describe the magnitude of impacts when appropriate criteria are shown to be met. It is noted that this term was not used in the *Technical Report*, and has been used so that the results can be compared on a standard basis with the revised BS 4142 standard.)

Table 3.1 Summary of Noise Impacts in Technical Report Using BS4142: 1997

		Impact Day	Impact Night
1	Foreman's cottage	Low probability of impact due to absolute noise level being below BS8233 daytime criterion.	Low probability of impact inside the building at night. Absolute noise level outside building is 2 dB above BS8233 night-time criterion, and BS 4142 indicates likelihood of complaints. However, provision of noise insulation to the property will achieve satisfactory internal noise conditions.
2	Wren Hall	Low probability of impact due to absolute noise level being below BS8233 daytime criterion, and BS 4142 less than marginal significance.	Low probability of impact due to absolute noise level being below BS8233 night-time criterion, and BS 4142 less than marginal significance.
3	Camblesforth	Low probability of impact due to absolute noise level being below BS8233 daytime criterion, and BS 4142 less than marginal significance.	Low probability of impact due to absolute noise level being below BS8233 night-time criterion, and BS 4142 less than marginal significance.
4	Barlow	Low probability of impact due to absolute noise level being below BS8233 daytime criterion, and BS 4142 just marginal or less than marginal significance.	Low probability of impact due to absolute noise level being below BS8233 night-time criterion, despite BS 4142 indicating complaints could be likely.
5	Drax Abbey Farm	Low probability of impact due to absolute noise level being below BS8233 daytime criterion, despite BS 4142 likelihood of complaints.	Low probability of impact due to absolute noise level meeting BS8233 night-time criterion, despite 4142 indicating complaints could be likely.
6	Long Drax	Low probability of impact due to absolute noise level being below BS8233 daytime criterion, and BS 4142 less than marginal significance.	Low probability of impact due to absolute noise level being below BS8233 night-time criterion, and BS 4142 just marginal or less than marginal significance.
7	Old Lodge	Low probability of impact due to absolute noise level being below BS8233 daytime criterion, and BS 4142 just marginal or less than marginal significance.	Low probability of impact due to absolute noise level being below BS8233 night-time criterion, despite BS 4142 above marginal significance, but below level which would indicate that complaints are likely.

		Impact Day	Impact Night
8	Landing Lane	Low probability of impact due to absolute noise level being below BS8233 daytime criterion, and BS 4142 just marginal or less than marginal significance.	Low probability of impact due to absolute noise level being below BS8233 night-time criterion, despite BS 4142 above marginal significance, but below level which would indicate that complaints are likely.

3.3

BS4142: 2014

The 2014 version of BS4142 contains a commentary on the need to consider 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. It is suggested that an initial estimate should be undertaken considering the former factor, and some boundaries are given which indicate various rating levels, and these have been used to derive the following rating bands.

- Equal to or above 10 dB – *Significant Adverse Impact*;
- Equal to or greater than 5 dB, but less than 10 dB (5 to 9 dB) – *Adverse Impact*;
- Above 0 dB but less than 5 dB – (1 to 4 dB) – *Possible Adverse Impact* (decreasing likelihood with decreasing difference between L_{Art} and L_{A90}); and
- < or equal to 0 dB – *Low Impact*.

These definitions have been applied to the initial assessment ratings in *Table 3.2*. The results of further consideration of context including reducing the rating of significance are also shown. These represent the overall significance ratings and include comparison with appropriate external noise criteria (50 dB $L_{Aeq,16\text{ hr}}$ during the day and 45 dB $L_{Aeq, 8\text{ hr}}$ at night ⁽¹⁾. Where these are met, or the receptor sensitivity will be reduced by providing noise insulation to achieve satisfactory levels inside a building at night, the sound impact overall has been reduced to 'low'.

Note that at Landing Lane measurements were limited to checks in the evening and night to confirm that noise levels were below the lower threshold, and are not therefore presented in the full table of results. However, they were confirmed to be below 30 dB L_{A90} and this value has been presented in *Table 3.2*

(1) The noise from the Project is compared directly to the noise criteria in this note, which is equivalent to the total noise level at the critical receptors at times when the baseline noise is low and the new plant noise will become the major noise source i

Table 3.2 Summary of Noise Impacts Using BS 4142 : 2014

Location	Baseline day (L _{A90})	Baseline night (L _{A90})	Predicted Plant Rating Levels (Day)	Predicted Plant Rating Levels (Night)	Rating Level minus L _{A90} Day	Rating Level Minus L _{A90} Night	Initial Impact Day	Initial Impact Night	Impact Taking Context Into Account Day	Impact Taking Context Into Account Night
1. Foreman's cottage	35	28	49	47	14	19	Significant Adverse impact	Significant Adverse impact	Low (<BS 8233 criteria by 1 dB)	Low (>BS 8233 criteria by 2 dB, but provision of noise insulation will be fitted to reduce the receptor sensitivity)
2. Wren Hall	35	35	39	38	4	3	Possible adverse impact	Possible adverse impact	Low (<BS 8233 criteria by 11 dB)	Low (<BS 8233 criteria by 7 dB)
3. Camblesforth	43 to 46	40	35	34	-8 to -11	-5	Low impact	Low Impact	Low (<BS 8233 criteria by 15 dB)	Low (<BS 8233 criteria by 11 dB)
4. Barlow	35 to 41	24	40	40	5 to -1	16	Adverse Impact to Low Impact	Significant Adverse impact	Low (<BS 8233 criteria by 10 dB)	Low (<BS 8233 criteria by 5 dB)
5. Drax Abbey Farm	36	32	46	45	10	13	Significant Adverse impact	Significant Adverse impact	Low (<BS 8233 criteria by 4 dB)	Low (=BS 8233 criteria)
6. Long Drax	32	26	35	35	3	9	Possible adverse impact	Adverse Impact	Low (<BS 8233 criteria by 15 dB)	Low (<BS 8233 criteria by 10 dB)
7. Old Lodge	32	27	37	37	5	10	Adverse Impact	Significant Adverse impact	Low (<BS 8233 criteria by 13 dB)	Low (<BS 8233 criteria by 8 dB)
8. Landing	32	<30	37	37	5	>7	Adverse Impact	Adverse to	Low	Low

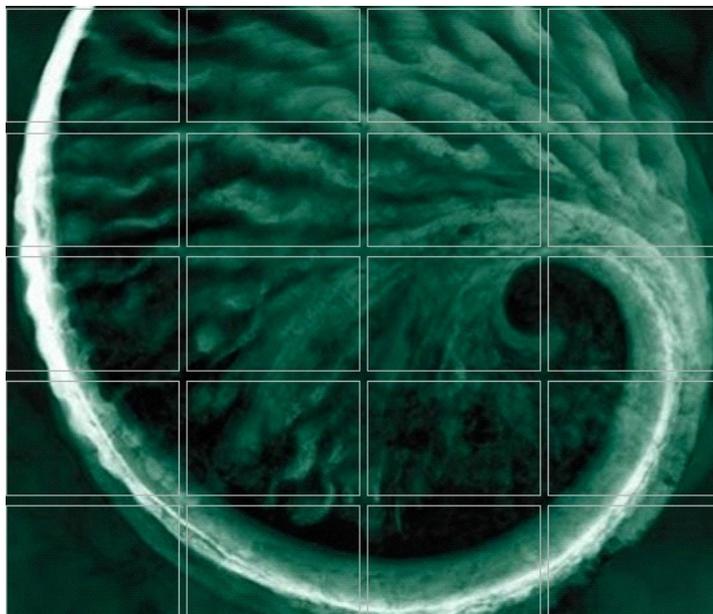
Location	Baseline day (L_{A90})	Baseline night (L_{A90})	Predicted Plant Rating Levels (Day)	Predicted Plant Rating Levels (Night)	Rating Level minus L_{A90} Day	Rating Level Minus L_{A90} Night	Initial Impact Day	Initial Impact Night	Impact Taking Context Into Account Day	Impact Taking Context Into Account Night
Lane								Significant Adverse impact	(<BS 8233 criteria by 13 dB)	(<BS 8233 criteria by 8 dB)
Data source for column	6.3.2 ES Volume 2 (page 18)	6.3.2 ES Volume 2 (page 18)	6.3.2 ES Volume 2 (page 24)	6.3.2 ES Volume 2 (page 24)						

This note has reported the potential effects on the *Noise and Vibration Technical Report* for the Project of the revised BS4142. In conclusion, whilst there are some different approaches in the standard, the most important of these is confirmation that noise assessments should include a consideration of absolute noise levels to establish the context of noise impacts. Since the noise assessment in the *Noise and Vibration Technical Report* already included this, no changes in the conclusions are expected.

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