From:	Geoff Bullock
To:	Emre Williams
Cc:	White Rose CCS; Jim Doyle; Jake Barnes-Gott
Subject:	EN10048 - White Rose CCS Project - Amendment to Deadline 7 Document
Date:	07 October 2015 15:25:26
Importance:	High

Dear Emre,

It has come to our attention that there was a typographical error in Document Ref. 9.10 - Rev. 1, submitted for Deadline 7.

The error is at paragraph 5.1, which is reproduced below:

"The Applicant has assessed the impacts at specific Noise Sensitive Receptors and has identified that at Drax Abbey Farm and Foreman's Cottage, the unmitigated impact overnight would exceed exterior levels identified by the WHO guidance and British Standard 8233 (30dB LAeq, 2300-0700) thus resulting in unacceptable internal noise levels for restful sleep."

The word *'exterior'*, highlighted in yellow, should instead be *'internal'*.

I have attached an amended version of the document.

I trust that this minor correction can be accepted by the ExA.

Kind regards

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White Rose Carbon Capture and Storage (CCS) Project

Document Ref: 9.10 - Rev.2
PINS Ref: EN10048

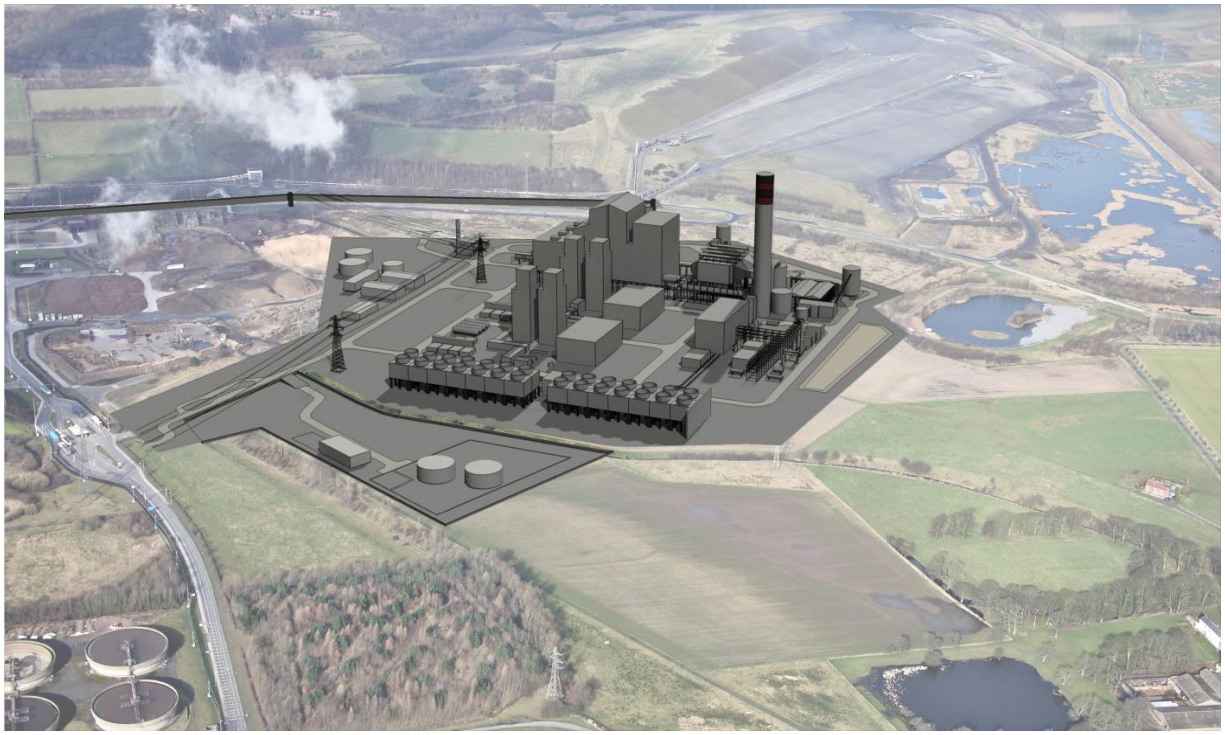
The White Rose CCS (Generating Station) Order

Land adjacent to and within the Drax Power Station, Drax, near Selby, North Yorkshire

Summary of Noise Mitigation Measures

The Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 - Regulation 5(2)(q)



Applicant: Capture Power Limited
Date: October 2015

Document History

Document Number	9.10		
Revision	2		
Author	Drax Power Limited (DPL)		
Signed	Jim Doyle (JD)	**Date**	07.10.15
Approved By	JD		
Signed	JD	**Date**	07.10.15
Document Owner	DPL		

Revision History			
Revision No.	**Date**	**Reason for Revision**	**Authorised By**
1	23.09.15	Deadline 7 version.	JD
2	07.10.15	Amendment to paragraph 5.1	JD

Glossary	
ASU	Air Separation Unit
CCS	Carbon Capture and Storage
CO_2	Carbon Dioxide
CPL	Capture Power Limited
dB	Decibel
DCC	Direct Contact Cooler
DCO	Development Consent Order
DPL	Drax Power Limited
ES	Environmental Statement
ESPS	Electrostatic Precipitator Units
ExA	Examining Authority
GPU	Gas Processing Unit
ID Fan	Induced Draft Fan
NSRs	Noise Sensitive Receptors
PEIR	Preliminary Environmental Information Report
SDC	Selby District Council

CONTENTS

TABLES

1.0 INTRODUCTION

1.1 Request for Further Information Question 1.3 issued by the Examining Authority ('ExA') on the 7 September 2015 is addressed to Selby DC and asks:

"Has the applicant adopted all necessary and appropriate mitigation in terms of noise? If this has not been possible, have the reasons been fully explained"

1.2 The Applicant and SDC discussed Question 1.3 during a meeting to discuss the noise impacts of the Project on 15 September 2015. At that meeting, the contents of an earlier version of this document were discussed.

1.3 Whilst the parties are agreed that noise mitigation is necessary, and that the measures proposed by the Applicant are within the range of measures typical for a power station, SDC will not agree that the Applicant has adopted "all" necessary and appropriate mitigation in terms of noise. The Applicant is satisfied that the Project incorporates all necessary and appropriate mitigation in terms of noise.

1.4 As a positive step intended to assist the ExA in relation to Question 1.3, the parties agreed at the meeting that the Applicant should produce this document to demonstrate its position that all necessary and appropriate mitigation has been adopted in terms of noise. It provides a description of the Applicant's proposed mitigation at source and at receptors, and how the design of that mitigation has evolved, including an explanation of why certain alternatives were not adopted.

1.5 The Applicant's approach to designing appropriate mitigation for noise impacts was explained previously in its response to the ExA's Second Written Question 4.3 (Document Ref. 9.7). The Applicant's response to Second Written Question 4.1 also addressed the potential use of a bund. The text of those responses is not repeated here.

1.6 The Applicant has discussed with SDC the methodology it used when considering mitigation of noise sources and their relative impacts on noise sensitive receptors ('NSRs').

2.0 ITERATION OF DESIGN

2.1 This section identifies the modifications made to the specifications of various pieces of plant and equipment following the generation of the Preliminary Environmental Information Report ('PEIR') submitted in June 2014 and explains the reductions in noise impacts that have been achieved as a result.

2.2 Generally speaking, the power plant elements have the greatest impact from a noise perspective on the two Drax properties; Foreman's Cottage and Drax Abbey Farm. The Applicant has undertaken a number of reviews of key plant and equipment in an attempt to drive the noise impacts down.

2.3 The turbine hall ventilation including the feedwater tower and air compressor buildings have undergone re-design. Wall mounted fans have been re-specified in terms of the noise output and silencers will be fitted on both inlets and outlets.

2.4 The boiler building has been re-designed with a modified specification including louvers, ventilation systems and the coal bay. Air intake louvers on the north east and south east facades will be fitted with silencers. Air extraction fans will be fitted with silencers on the intake and outlet of the system.

2.5 The primary air and forced draft fans have both been re-specified with additional insulation added to the ductwork to reduce noise levels. The induced draft ('ID') fan has also been re-designed and re-specified. Additional insulation has been specified which has reduced the noise levels being generated by these pieces of equipment.

2.6 The vacuum pump skids have been specified with appropriate silencers to reduce the noise levels emitted.

2.7 The hybrid cooling towers have undergone a re-design and re-specification with the various elements of the system considered and modified. The various fan systems have been modified (both inlets and outlets).

2.8 The Gas Processing Unit ('GPU') has also undergone a re-design, with acoustic enclosures specified and additional insulation added to pipework and valves where appropriate. For both the Air

Separation Unit ('ASU') and the GPU, the large compressor systems are placed within machine houses.

2.9 Pumps, e.g. the CO_2 pumps, will also be enclosed in acoustic enclosures and pipework will also be insulated. The pumps associated with the Direct Contact Cooler ('DCC') will also have an acoustic enclosure again with associated insulated pipework.

2.10 The Applicant also looked at the extent to which noise could be reduced by modifying the operation of equipment in terms of their timing and length of operation. As an example, it was considered whether conveyors could be operated only during the day. However, this option would give rise to concerns regarding the operational flexibility of the plant. In addition, turning conveyors on and off can result in early failure of motors and drives leading to longer maintenance and outage schedules removing low carbon generating capacity from the UK's energy mix. Such operational changes can also be material when assessing the financial viability of the project.

2.11 As a general observation, beyond a certain point for a given piece of equipment, acoustic cladding cannot practically be extended or made thicker to increase noise attenuation. This is because it can alter the thermal performance of equipment being clad and/or result in a redesign of plant and equipment due to the increase in the masses of the structures, and a consequent increase in structural materials such as steel and concrete.

2.12 Table 2.1 below demonstrates the evolution of noise mitigation from what was consulted upon at PEIR (June, 2014) and what was submitted as part of the Application. A positive figure in columns six and seven represent a decrease in noise levels from PEIR to the ES whereas a negative figure demonstrates an increase in noise levels form the PEIR to the ES. Of the 16 noise levels (eight locations at day time and night time), 10 show a decrease in noise levels, three remain unchanged and three show increases. Of the three points which show increases, two of them remain at or below the +5dB levels which SDC have indicated as acceptable.

Table 2.1 - Comparison of deltas between background levels and combined noise levels at the NSRs from PEIR and submitted ES

NSR	PEIR (Day)	PEIR (Night)	ES (Day)	ES (Night)	Difference (Day)	Difference (Night)
Foreman's Cottage	14	19	14	17	0	2
Wren Hall	4	4	4	3	0	1
Camblesforth	-11	-8	-11	-5	0	-3
Barlow	4	9	5	10	-1	-1
Drax Abbey Farm	12	16	10	13	2	3
Long Drax	4	6	3	5	1	1
Old Lodge	9	11	5	7	4	4
Landing Lane	8	10	5	7	3	3

2.13 Table 2.1 also demonstrates that for those locations where a specific piece or pieces of noise – emitting equipment has been identified and could be appropriately mitigated, the Applicant has done so and reduced the noise impacts at those locations, e.g. Old Lodge shows a reduction of 4dB for both daytime and night-time.

3.0 MITIGATION FOCUSSED ON HIGHEST RANKING NOISE SOURCES

3.1 Ranking the various noise sources in terms of their impacts on the specific receptors shows that the benefits of mitigating plant diminishes rapidly as one moves from the noisiest plant (position number 1 in the list of sources) to the quietest.

3.2 By way of illustration, Table 2.2 shows the theoretical impact of completely removing the relevant pieces of equipment in the rank ordered list, in relation to Foreman's Cottage. Removing equipment which has the greatest impact at a receptor reduced the noise impact by 0.57dB. Removing the piece of equipment which has the tenth greatest impact reduces the noise impact by 0.08dB. Mitigating equipment which is not ranked within the top ten or twenty noise sources will not deliver any measurable reduction in impacts. This can be illustrated by the fact that the impact of removing all but the top 20 pieces of equipment from the noise model (there are over 440 separate noise sources within the model), would result in a reduction in noise levels of only 1.57dB (Foreman's Cottage). The same analysis applied to other NSRs produces a similar trend (i.e. minimal reductions) except for NSRs where the project has no impact, e.g. Camblesforth, where there is almost no reduction at all.

Table 2.2 - Rank order of noise sources and reduction in noise associated with theoretical removal of equipment (NSR is Foreman's cottage)

Rank of noise source	Reduction in dB levels	Cumulative reduction in dB levels
1	0.57	0.57
10	0.08	0.65
20	0.05	0.70
50	0.01	0.71
100	0.01	0.72

3.3 It is evident that different NSRs are impacted by different noise sources and this can be demonstrated by Table 2.3 which shows the top 20 noise sources within the CADNA model for each NSR.

3.4 When considering Table 2.3, for example the impacts of equipment at Barlow Village, the noise sources with the greatest impacts were the conveyors. The specification for the conveyors and associated plant was then examined. Where mitigation could be added, it was, e.g. acoustic enclosures of the motors and drives, specification of the enclosures and materials of construction and finally the reduction in contingency associated with the conveyors. The option of reducing contingency could not be done with all plant due to the risks involved in specifying plant which cannot be commercially delivered; however, the noise data for the conveyors was based on similar sized motors and drives and hence the decision was taken to reduce the contingency.

3.5 The mitigation at source as described in section 4.0 below demonstrates that the majority of those noise sources which appear in Table 2.3 at various NSRs have been mitigated, e.g. molecular sieves, conveyors, induced and forced draft fans and air intake systems.

Table 2.3 - Top 20 noise sources for each NSR demonstrating that focusing mitigation on two or three specific pieces of equipment would not reduce the noise impacts at all NSRs

Rank Order	Foreman's Cottage	Landing Lane	Carr Lane (Wren Hall)	Camblesforth	Barlow	Drax Abbey Farm	Old Lodge	Long Drax
1	Mol Sieve Train 01.1 lower	CT air intake wet	CT air intake dry	BC1A	BC5A	CT air intake dry	CT air intake wet	CT air intake dry
2	Mol Sieve Train 01.1 upper	CT air intake dry	Mol Sieve Train 02.1 upper	BC1B	BC5B	CT air intake wet	CT air intake dry	CT air intake wet
3	Mol Sieve Train 01.1 lower	OX-7A	BC5A	BC4A	OX-7A	Mol Sieve Train 02.1 upper	FG recirculation GPU to PA fan	ID fan casing walls 22
4	Mol Sieve Train 01.2 lower	BC5A	BC5B	LC-03	BC4A	Mol Sieve Train 02.1 upper	Mol Sieve Train 02.1 upper	Mol Sieve Train 02.1 upper
5	Mol Sieve Train 01.1 upper	BC5B	Mol Sieve Train 02.1 upper	BC4B	LC-03	Piping - general	OX-7A	Mol Sieve Train 02.1 upper
6	CT air intake wet	Mol Sieve Train 01.1 upper	CT air intake wet	OX-C6	BC4B	Mol Sieve Train 02.1 lower	BC5A	FG recirculation GPU to PA fan
7	Mol Sieve Train 01.1 lower	Mol Sieve Train 01.1 upper	OX-7A	HEX Box 01 NORTH	OX-C6	FG recirculation GPU to PA fan	BC5B	OX-7A
8	Mol Sieve Train 01.2 upper	FG recirculation GPU to PA fan	Mol Sieve Train 02.1 lower	BC5B	CT air intake wet	Mol Sieve Train 02.1 lower	ID fan casing walls 22	BC5A
9	CT air intake dry	Mol Sieve Train 01.2 upper	Mol Sieve Train 02.2 lower	BC5A	GC-03B	HEX Box 02 NORTH	FGD absorber walls	BC5B
10	Mol Sieve Train 01.1 upper	GC-04	Mol Sieve Train 02.2 upper	OX-7A	GC-03A	Mol Sieve Train 02.1 upper	OX-C6	OX-C6
11	CT air intake wet	Mol Sieve Train 01.1 upper	Piping - general	HEX Box 02 NORTH	Mol Sieve Train 01.2 upper	OX-7A	LC-03	Mol Sieve Train 01.1 upper
12	FG recirculation GPU to PA fan	Mol Sieve Train 02.1 upper	Unit Transformer	LC-01	Mol Sieve Train 01.1 upper	BC5A	BC4A	compressor air outlet 08

Rank Order	Foreman's Cottage	Landing Lane	Carr Lane (Wren Hall)	Camblesforth	Barlow	Drax Abbey Farm	Old Lodge	Long Drax
13	CT air intake dry	Roof fan	Unit Transformer	BC2B	Mol Sieve Train 01.1 upper	Mol Sieve Train 01.1 upper	BC4B	Mol Sieve Train 02.1 upper
14	ID fan casing walls 22	ID fan casing walls 22	Unit Transformer	BC2A	GC-04	BC5B	Mol Sieve Train 02.1 upper	ID fan casing top 22
15	FGD absorber walls	Aux. boiler stack outlet	Main Transformer 2	OX-C4	Mol Sieve Train 01.1 upper	agitator drive 1	GC-04	LC-03
16	service water pump	GC-03B	Mol Sieve Train 01.1 upper	Mol Sieve Train 02.1 upper	CT air intake dry	Piping - general	TH WM fan	HEX Box 02 NORTH
17	CT Fan 27	GC-03A	ID fan casing walls 22	Mol Sieve Train 02.1 upper	ID fan casing walls 22	CT Fan 28	Unit Transformer	Mol Sieve Train 01.2 upper
18	CT Fan 28	FGD absorber walls	CT air intake wet	Mol Sieve Train 02.1 lower	Aux. boiler stack outlet	FGD absorber walls	CT Fan 28	Mol Sieve Train 01.1 upper
19	GPU CO2 Pumps	OX-C6	CT air intake dry	Mol Sieve Train 01.1 upper	Mol Sieve Train 01.1 lower	CT Fan 27	CT Fan 27	compressor air outlet 03
20	GC-04	FGD building	LC-01	GC-03B	BC1A	ID fan casing walls 22	CT Fan 26	Mol Sieve Train 01.1 upper

4.0 MITIGATION AT SOURCE

4.1 The Applicant has fully explained the necessary and appropriate mitigation which is inherent in the design of the Project.

4.2 The design of the Project includes mitigation on all the key noise generating plant items. The types of mitigation that will be applied generally include the following:

- placing loudest noise sources indoors;
- procuring low noise equipment (transformers, cooling tower fans etc.);
- adding silencers on air intakes/outlets and upstream/downstream of main boiler fans;
- using acoustic screens or enclosures on major outdoor items such as pumps and motors; and
- acoustically insulating valves and pipes.

4.3 The text below, taken from the Applicant's Document Ref. 6.5 'Environmental Statement Mitigation Annex' - Revision 2 (submitted at Deadline 5), identifies the mitigation which is inherent in the design, i.e. specified by the Applicant, and the additional mitigation which has been applied through the evolution of the Project. That is followed by an explanation of how that mitigation has been improved from the position presented in PEIR.

DRAX INTERCONNECTIONS COMPRISING CONVEYORS AND PROCESSING RAW MATERIALS

4.4 The conveyor system has been modelled assuming that it will be fitted with a local shielding/enclosure. The conveyor drives are either located in transfer towers in which case it is assumed that the transfer tower provides acoustic screening, or they are assumed to be enclosed. For sources such as conveyor drives and tails that are located inside transfer towers a reduction of 15dB(A) has been assumed, and for conveyor belts and idlers noise levels are assumed to be reduced by 10dB(A).

4.5 The gypsum silo dewatering system will be enclosed inside a penthouse placed on top of the concrete silo. This penthouse will be constructed with single steel sheet cladding.

4.6 The limestone ball mill sets (2 x 100%) will be located inside a building which will limit the transmission of the internal emitted noise to the outside environment. The limestone preparation building walls and roof will provide an average sound insulation R = 35dB(A).

4.7 Air compressors will be located inside noise hoods. Noise hoods will be located inside a light construction steel machine house. Air intakes of compressors and air intake/outlet of noise hoods will be equipped with silencers.

AIR SEPARATION UNITS

4.8 Expansion turbines will be located inside noise hoods and there will be in-line silencers between the expansion turbines and the cold box.

4.9 The molecular sieve will have in-line silencers for pressure valves, acoustic insulation on piping and a blow-off silencer between the expansion turbine and the cold box.

4.10 Large motors associated with pumps will be fitted with low-noise cooling fans. Additionally sound insulation will be provided for the piping if required. For large pumps, noise hoods will be considered, if required.

4.11 Low noise valves will be specified as required. For gas and steam service, special-design low-noise valves are preferred or alternatively in-line silencers may be used. For liquid flows, valves will be selected that will prevent cavitation, erosion, and vibration and hence reduce the noise generated.

4.12 Acoustic sound insulation for piping will be provided where required.

TURBINE HALL

4.13 The turbine hall building walls and roof will provide sound insulation. Furthermore, the vertical walls will have a sound absorbing inner liner in order to limit the reverberant noise level due to sound reflections.

4.14 Silencers will be provided for the air inlet and outlet openings for the turbine hall building.

4.15 Sound insulation will be achieved by installing the main pump and its coupling inside an acoustic enclosure.

BOILER HOUSE

4.16 The boiler house building walls and roof will provide a significant sound insulation. In this case the design work undertaken to date showed that cladding, but no acoustic absorption is required to control the noise contribution from this source.

4.17 Silencers for air outlet openings will be provided for some openings.

4.18 The maximum surface sound pressure level (free-field conditions) at a distance of one metre from any equipment item in the boiler area, other than mentioned above, will be limited to an overall sound power level of 85dB(A).

4.19 To reduce the noise emission of upstream ducts, silencers or insulation will be provided upstream of the primary air fan. The downstream duct is located within the building and does not require specific mitigation. In order to meet the noise limits, as far as practicable, at off-site receptors the primary air fan (fan casing plus drive) will be enclosed in a building or acoustic enclosure.

4.20 To reduce the noise emission of upstream ducts, silencers or insulation will be provided upstream of the forced draft fan. In order to meet the noise limits, as far as practicable, at offsite receptors, the forced draft fan (fan casing plus drive) will be enclosed in a building or acoustic enclosure.

ESPS

4.21 The sound power level will be emitted by the whole electrostatic precipitator units including precipitator insulated walls and roof, insulated flue gas ducts between air heater and precipitator, hammer drives, high voltage transformers and blow tanks for fly ash. The noise level will be limited to the lowest practicable level.

ID FAN

4.22 To reduce the noise emissions of the induced draft fan, it will be necessary to put a sound insulation cover on the fan casing, typically made of minimum 250 mm of high density mineral wool (~130 kg/m3) + 1.6mm heavy visco-elastic layer fixed on the inner side of the jacketing steel sheet + 1 mm jacketing steel sheet. To reduce the noise emission of upstream and down-stream ducts, insulation will be provided. In order to fulfil the far field noise requirement, the whole induced draft fan (fan casing plus drive) will be by a noise barrier (without roof).

BALANCE OF PLANT

4.23 No air intake louvers will be installed on the northeast and southeast sides of the buildings. The vent for the vacuum pump will be equipped with a suitable silencer (with an attenuation of about 10dB(A)).

4.24 Each oxidation air blower will be equipped with an acoustic enclosure, and with a silencer inside the outlet pipe. A silencer will be installed on each blower air intake opening made in the building wall (in the southwest direction).

4.25 The sound power level at the stack mouth including self-induced noise caused by the flow will be specified to the supplier to not exceed 103dB(A).

4.26 For the noise prediction calculation one cooling tower bank, consisting of 28 cells has been considered. For the complete cooling tower (wet air inlet, dry air inlet and outlet) silencers or sound absorbing louvers are likely to be required.

4.27 The main cooling water pumps will be located inside a building.

4.28 The de-mineralised water production plant will be housed inside a building, which will limit the noise emissions to the outdoor environment.

4.29 The equipment for compressed air production will be housed inside a building which will significantly limit the transmission of the internal noise to the outside environment. Suitable silencers will be installed in the compressor air inlet/outlet ducts.

4.30 The equipment for fly ash air production will be housed inside a building which will significantly limit the transmission of the internal noise to the outside environment.

4.31 The fuel oil pumps will be housed inside a building which will significantly limit the transmission of the internal noise to the outside environment. No acoustic measures are necessary, and standard weather protection will be provided for the air intake louvers.

GENERIC NOISE MITIGATION ACROSS THE PLANT

4.32 The sound power level will be limited to the lowest level practicable. Noise levels have been specified based on test data. Potential noise mitigation measures may include silencers and insulation, which will be specified during the detail design stage.

4.33 Plant design has included noise mitigation. The EPC contractor will ensure procurement of low noise equipment (transformers, cooling tower fans etc.).

4.34 Plant design has included noise mitigation including the addition of silencers on air intakes/outlets and upstream/downstream of main boiler fans.

4.35 Plant design has included noise mitigation including using acoustic screens or enclosures on major outdoor items such as pumps, motors and conveyors.

4.36 Plant design has included noise mitigation including acoustically insulating valves and pipes where applicable.

5.0 MITIGATION AT RECEPTOR

5.1 The Applicant has assessed the impacts at specific Noise Sensitive Receptors and has identified that at Drax Abbey Farm and Foreman's Cottage, the unmitigated impact overnight would exceed internal noise levels identified by the WHO guidance and British Standard 8233 (30dB LAeq, 2300-0700) thus resulting in unacceptable internal noise levels for restful sleep.

5.2 The Applicant's preferred draft DCO (Document Ref. 2.1, Rev. 5) submitted for Deadline 7 contains detail on the draft requirement regarding receptor based mitigation (draft requirement 23(3)(e)).

5.3 The Applicant has proposed that at these two properties which exceed the levels outlined above, should be fitted with appropriate mitigation, e.g. glazing systems and ventilation systems that will ensure that inside the bedrooms, the noise levels comply with those levels outlined in paragraph 5.1.