Immingham Green Energy Terminal

TR030008

Volume 6

6.4 Environmental Statement Appendices

Appendix 7.C: Operational Noise Modelling Information

Planning Act 2008

Regulation 5(2)(a)

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended)

September 2023

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended)

Immingham Green Energy Terminal

Development Consent Order 2023

6.4 Environmental Statement Appendices

Appendix 7.C: Operational Noise Modelling Information

Regulation Reference	APFP Regulation 5(2)(a)
Planning Inspectorate Case Reference	TR030008
Application Document Reference	TR030008/APP/6.4
Author	Associated British Ports Air Products BR

Version	Date	Status of Version
Revision 1	21 September 2023	DCO Application

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1. Operational Sound Information

1.1. Noise model settings

1.1.1. An operational noise model covering Work Area No. 3, Work Area No.5 and Work Area No. 7 has been constructed in CadnaA (version 2023 MR1) acoustic modelling software. This software implements the sound propagation calculation methodology set out in ISO 9613-2:1996: Attenuation of Sound during Propagation Outdoors.

1.2. Data Sources

1.2.1. The data sources presented in **Table 1** have been used to construct the noise model:

Table 1: Modelling Input Data

Model element	Data package	Format	Source file	Received from	Received Data
Digital Terrain Map	Light Detection and Ranging (LIDAR)	.tiff	LIDAR-DTM-2m-2020-TA11ne LIDAR-DTM-2m-2020-TA11se LIDAR-DTM-2m-2020-TA21nw LIDAR-DTM-2m-2020-TA21sw	Downloaded from Open Survey Data (www.environment.data.gov.uk/DefraDataDownload)	27 September 2022
Topography; Building Height Attribute; Ground Absorption	OS Master Map Topography Layer	.shp	OSMM.shp	Internal AECOM Project Team	25 May 2022
Site Layout	Overall scheme designs and plot layouts	.pdf .dwg	EN222517-PIP-PP501-001 - Overall Site Plan CAD Export.dwg EN222517-PIP-PP501-001 - Overall Site Plan CAD Export No Base.dwg EN222517-PIP-PP501-001 – Overall Site Plan 6 Jun.pdf EN222517-PIP-PP502-001 – Overall West Site Plot Plan 1.pdf EN222517-PIP-PP503-001 – Overall East Site Dissociator Plot Plan.pdf	Internal AECOM Project Team Timon Robson, Stephen Bradley Air Products PLC	22 September 2022 to 5 June 2023

Model element	Data package	Format	Source file	Received from	Received Data
			EN222517-PIP-PP504-001 – Overall East Site Ammonia Storage Plot Plan.pdf EN222517-231-PP501-001 – Unit 231 Plot Plan.pdf EN222517-271-PP501-001 – Unit 271 Plot Plan.pdf EN222517-272-PP501-001 – Unit 272 Plot Plan.pdf Various mark-up drawings provided by Clive Horrell (Air Products PLC).		
Proposed Development Building Information and Heights	Building Information	.xlsx	Buildings and structures list for DCO 18 May.xlsx	Air Products PLC	18 May 2023
Sound source data	Air products Ammonia Terminal – Data for Noise Study	.xlsx	30011350-600GL1-00001 Noise Source List Rev0 EN-22-1545-600GL1-00001 Noise Source List Rev3	Stephen Bradley (Air Products PLC) Clive Horrell	29 September 2022 June 2023

1.3. Modelling Assumptions

1.3.1. The model was configurated with the following specifications:

a. Maximum number of reflections: 2.

b. Maximum source to receiver distance: 3km.

c. Areas of ground absorption determined from the OS Topography Layer. ‘Natural’ areas that are not water were assumed to be acoustically soft while all other areas were assumed to be acoustically hard.

d. All of the Work Areas are considered to be acoustically hard.

e. All buildings have an absorption coefficient of 0.21.

f. Existing residential buildings have been assumed to be 4m for one storey, 6m for 2 storeys and plus 2.5m for every storey thereafter.

g. Receivers have been positioned at 1.5m for one storey buildings and 4m from ground for two storey buildings.

h. Maximum building dimensions within the Work Areas No. 5 and No. 7 have been provided by Air Products Plc.

i. Sound emission data for key sound emitting plant/ buildings across Work Areas No. 5 and No. 7 have been provided by Air Products Plc and is listed in **Table 2**.

Table 2: Sound Power Level Data

Source	Linear sound power levels each frequency band (dB)									Number in model	LWA (dB)
	31	63	125	250	500	1k	2k	4k	8k		
West Site Utilities – Low Noise Cooling Tower											
Cooling Tower Air Inlet Face (Side A & Side B)	104	106	106	103	100	97	95	95	93	2	104
Cooling Tower Fan Air Outlet	100	102	102	98	95	93	88	85	82	6	98
West Site Utilities – Nitrogen Generator (24 HPN)											
Compressor with On-Skid Close-Fit Enclosure	96	97	95	90	91	93	86	85	79	1	96
Compressor Inlet filter	86	87	90	89	97	99	90	88	81	1	101
U004 Process Container	97	96	98	92	89	91	92	93	89	1	99
U004 Vent	84	91	3	85	81	55	94	100	98	1	103
Tepsa Skid C182A/B	92	92	90	85	85	88	89	91	87	1	96
Expanders	80	78	75	71	73	75	84	81	82	1	88
Vacuum Can S218	90	92	85	81	87	86	89	92	89	1	96
600 West Site Utilities - Other											
Instrument Air Compressor	92	87	87	86	89	92	92	90	87	2	97
Cooling Water Pump	89	90	91	93	93	96	93	89	83	6	100
Cooling Water Pump Motor	85	87	89	90	90	93	93	85	78	6	98
H2 Refuelling Station Reciprocating pumps										2	121
LP Tube Fill Compressor		107	109	107	105	104	102	98	93	2	109
LP Tube Compressor Motor	90	92	94	94	94	94	94	91	84	2	100
Air-cooled Intercooler	83	86	86	83	80	78	75	70	67	8	83
Common Air-cooled Cylinder Jacket Water Cooler	83	86	86	83	80	78	75	70	67	1	83
HP Tube Fill Comp. Hydraulic Oil Pump Motor	94	96	98	98	98	98	98	95	88	6	104
HP Tube Fill Comp. Glycol Circuit Air Cooler	83	86	86	83	80	78	75	70	67	6	83
Chiller for K400A/B/C/D Aftercooler	83	86	86	83	80	78	75	70	67	1	83

Source	Linear sound power levels each frequency band (dB)									Number in model	LWA (dB)
	31	63	125	250	500	1k	2k	4k	8k		
741 East Site Utilities – Other											
Instrument Air Compressor	93	88	88	87	90	93	93	91	88	2	99
741 East Site – Storage Area											
NH3 Transfer Pump	82	84	86	86	86	86	86	83	76	3	92
Boil Off Gas Compressor Package (@ 50%) - Enclosure	101	104	108	117	109	93	77	68	62	2	110
231 – LHY1 (Liquifier Areas)											
H2 Recycle Compressor + Lube Oil system		112	113	111	109	107	106	101	96	4 buildings containing all 4 items of equipment	113
H2 Recycle Compressor Motor		89	96	97	101	108	108	98	91		112
N2 Recycle Compressor + Lube Oil System		124	128	129	123	127	128	126	115		133
N2 Recycle Compressor Motor		103	108	100	100	97	105	85	76		107
Two N2 Companders + Lube Oil System	105	107	108	98	108	105	107	116	112	4	119
Intercooler Skids/Oil Removal Skids										18 per each Liquifier area (72 altogether)	90
271 – NH3 Dissoc (Dissociator Area)											
H2 PSA	63	78	81	89	102	106	107	109	104	6	113
Flue Stack (ID Fan)	108	100	97	105	92	77	69	62	48	6	97
ID Fan	90	91	87	87	90	94	97	83	72	6	100
ID Fan Motor	86	88	90	90	90	90	90	87	80	6	96
Air Inlet (FD Fan)	96	93	92	96	96	86	87	76	67	6	95
FD Fan	96	93	92	96	96	86	87	76	67	6	95
FD Fan Motor	80	82	84	84	84	84	84	81	74	6	90
Tail Gas Compressor		104	105	103	101	99	98	93	88	6 buildings containing these items of equipment	105
Tail Gas Compressor Motor	56	71	83	91	96	99	101	97	88		105
NH3 Dissociator – North Wall	81	88	95	93	88	77	67	52	37	6 buildings radiating these noise sources	89
NH3 Dissociator – South Wall	81	88	95	93	88	77	67	52	37		89

Source	Linear sound power levels each frequency band (dB)									Number in model	LWA (dB)
	31	63	125	250	500	1k	2k	4k	8k		
NH3 Dissociator – East Wall	80	87	95	92	87	76	66	52	36		88
NH3 Dissociator – West Wall	80	87	95	92	87	76	66	52	36		88
NH3 Dissociator – Ventilation Gril – North	89	86	90	84	82	81	80	75	71	6	87
NH3 Dissociator – Ventilation Gril – South	89	86	90	84	82	81	80	75	71	6	87
NH3 Dissociator – Ventilation Gril – East	89	86	90	84	82	81	80	75	71	6	87
NH3 Dissociator – Ventilation Gril – West	89	86	90	84	82	81	80	75	71	6	87
NH3 Dissociator – Burner Pipes – East	92	92	98	90	90	87	87	83	83	6	94
NH3 Dissociator – Burner Pipes – West	92	92	98	90	90	87	87	83	83	6	94

1.4. Buildings (Vertical Sources and Area Sources)

1.4.1. For noise sources located inside buildings within Work Area No. 5 and No. 7, the breakout noise from each building is calculated and represented by vertical and area sources (around each building).

1.4.2. There are two building variations within the operational noise model that contain internal noise sources, these are:

a. The Hydrogen Production Unit Compressor Building.

b. The LHY35 Compressor Building

1.4.3. It is assumed that each building contains an internal lining of 150mm glass or mineral wool blanket as standard. A lightweight composite panel system has also been applied to the walls and roof.

1.4.4. **Table 3** presents the sound reduction induces for the lightweight composite panel system that has been used within each building.

Table 3: Sound Reduction Indices for Buildings

Lightweight composite panel system	Linear sound power levels each frequency band (dB)									R_w (dB)
	31	63	125	250	500	1k	2k	4k	8k	
Wall	15	16	19	23	26	22	39	39	15	25
Roof	20	18	20	24	20	29	39	47	20	25

1.5. Uncertainty

1.5.1. It should be noted than any predictions of sound levels have an associated degree of uncertainty. Modelling and measurement processes have been carried out in such a way to reduce the uncertainty. In particular, the following sources of uncertainty have been noted:

a. Sound emission data for key sound emitting plant/buildings within Work Areas No. 5 and No. 7 have been based on data provided by Air Products Plc. These data are assumed to be representative of the proposed plant, although the precise methodology by which these data were gathered by third parties, and hence the uncertainty associated with these, is not known.

b. Predictions of sound pressure levels according to ISO 9613 are based on an assumption of moderate downwind propagation, and hence could be considered as a worst-case calculation. However, the standard also indicates an estimated accuracy of ±3 dB(A) in predicted levels.